



Operation and Maintenance Manual

323F Excavator

XCF 1-UP (323F)
YEJ 1-UP (323F)
PLB 1-UP (323F)
KBY 1-UP (323F)
NCW 1-UP (323F)

Language: Original Instructions



Scan to find and purchase genuine Cat® parts and related service information.



Important Safety Information

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

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

Do not operate or perform any lubrication, maintenance or repair on this product, until you verify that you are authorized to perform this work, and have read and understood the operation, lubrication, maintenance and repair information.

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

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



The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

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

A non-exhaustive list of operations that may cause product damage are identified by "NOTICE" labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. You must not use this product in any manner different from that considered by this manual without first satisfying yourself that you have considered all safety rules and precautions applicable to the operation of the product in the location of use, including site-specific rules and precautions applicable to the worksite. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that you are authorized to perform this work, and that the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.

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

NOTICE

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

Other parts may not meet certain original equipment specifications.

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

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

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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:

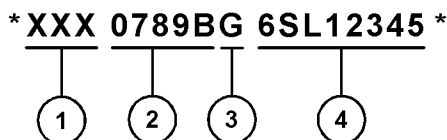


Illustration 1

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

i05944420

Safety Messages

SMCS Code: 7000; 7405

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 visible. 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 Cat dealer can provide new safety messages.

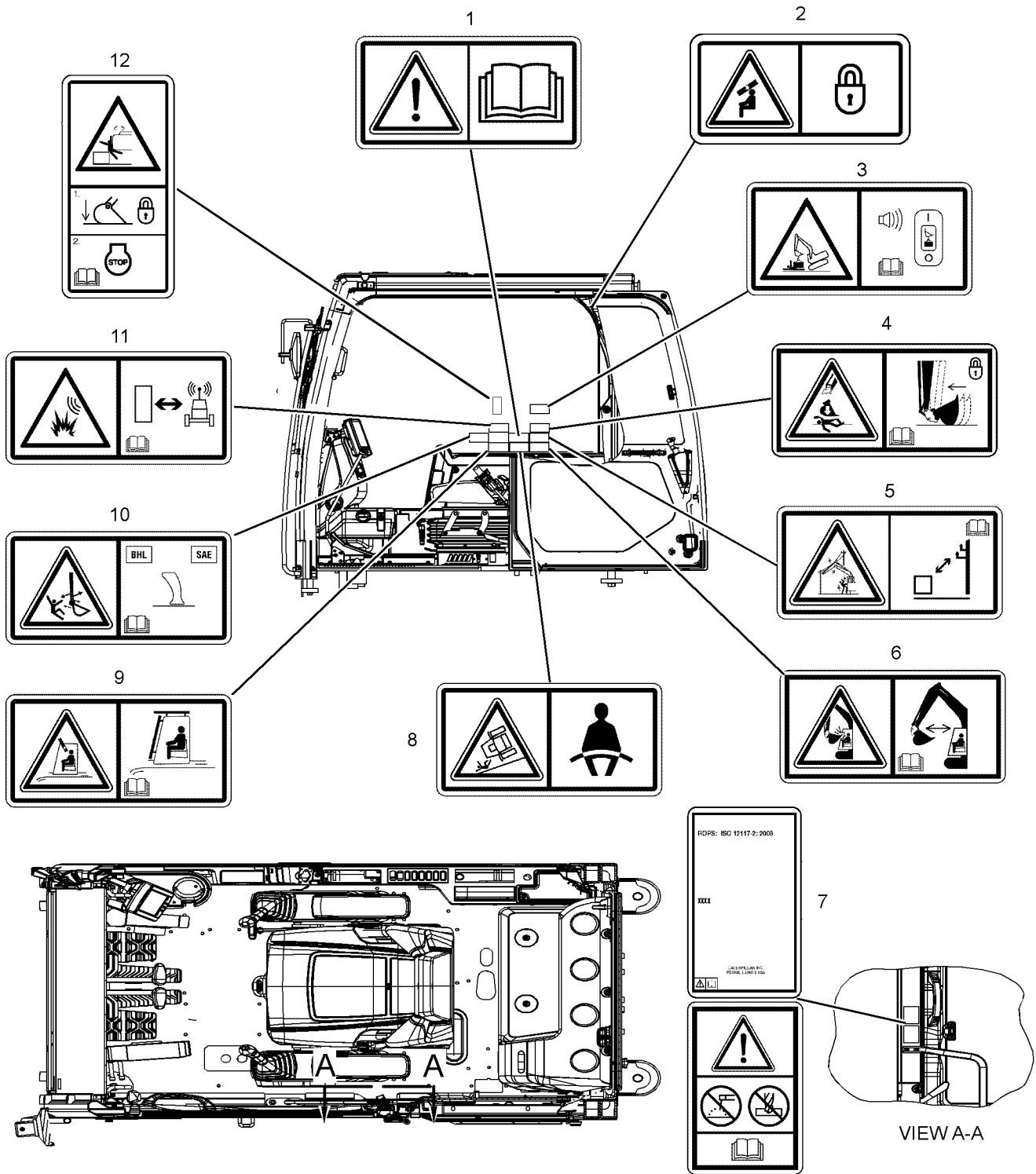


Illustration 2

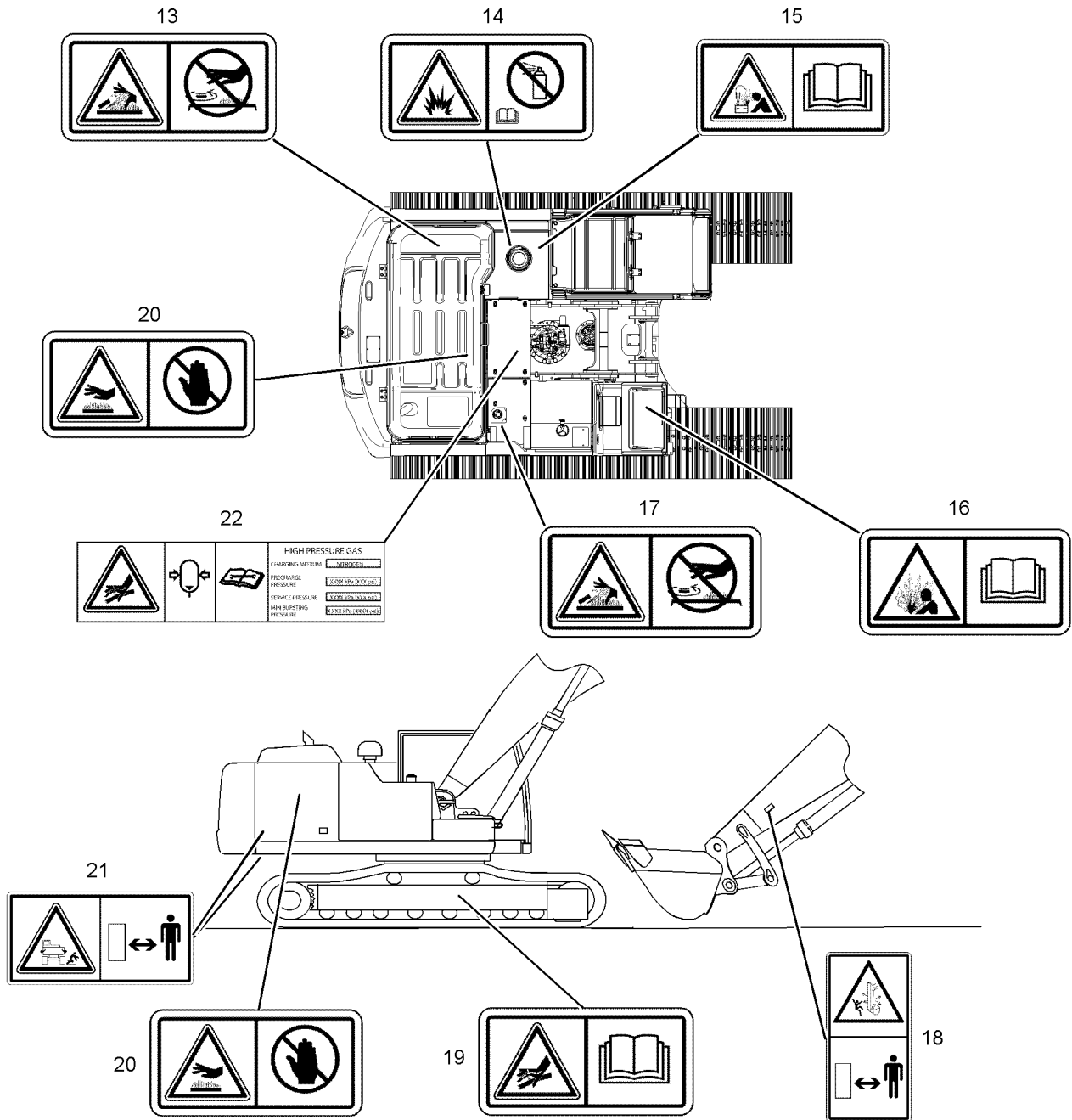


Illustration 3

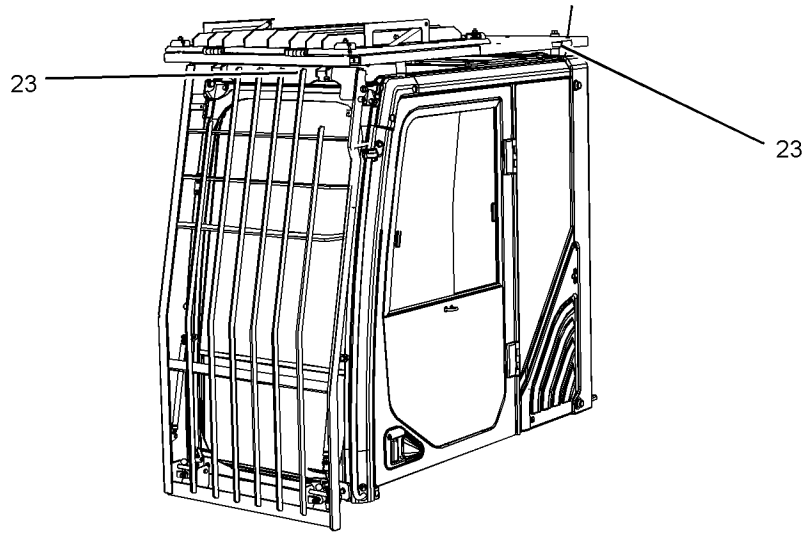


Illustration 4

g03733029

Do Not Operate (1)

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



Illustration 5

g01370904

⚠ WARNING

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

Crushing Hazard (2)

This safety message is located in rear of the cab.



Illustration 6

g02061339

⚠ WARNING

Personal injury can result if the window is not latched in the overhead position; ensure the auto lock is engaged.

Refer to Operation and Maintenance Manual, "Window (Front)" for further information.

Overload Warning Device (3)

If equipped, this safety message is located in the cab on the right side window.

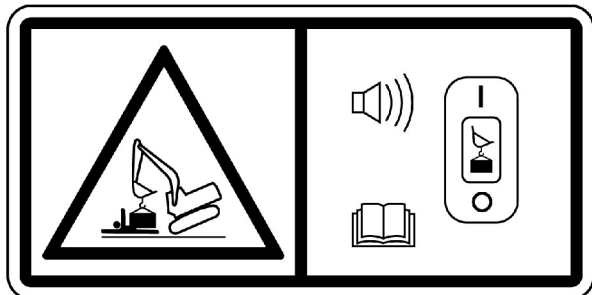


Illustration 7

g01602013

⚠ WARNING

Overloading the machine could impact the machine's stability which could result in a tipover hazard. A tipover hazard could result in serious injury or death. Always activate the overload warning device before you handle or lift objects.

Refer to Operation and Maintenance Manual, "Operator Controls" for further information.

Crushing Injury (4)

If equipped, this safety message is located in the cab on the right side window.

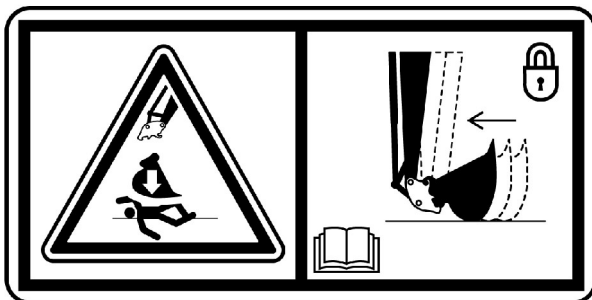


Illustration 8

g01374035

⚠ WARNING

Crush injury. Could cause serious injury or death. Always confirm that the quick coupler is engaged onto the pins. Read the Operator's Manual.

Refer to Operation and Maintenance Manual, "Quick Coupler Operation" for further information.

Electrical Power Lines (5)

This safety message is located in the cab.

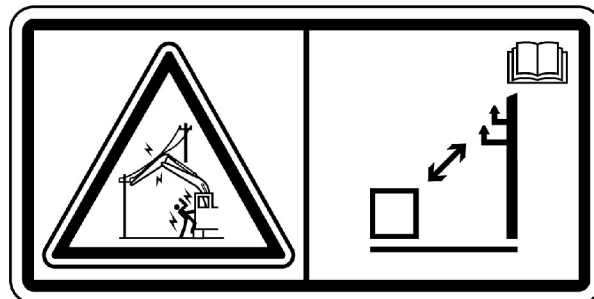


Illustration 9

g01374045

⚠ DANGER

Electrocution Hazard! Keep the machine and attachments a safe distance from electrical power. Stay clear 3 m (10 ft) plus twice the line insulator length. Read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions and warnings will cause serious injury or death

Refer to Operation and Maintenance Manual, "Specifications" for further information.

Crushing Hazard (6)

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



Illustration 10

g01373971

⚠ WARNING

Crushing Hazard! Certain machine front linkage combinations (boom, stick, quick coupler, work tool) may require keeping the work tool away from the cab during operation. Personal injury or death may result if the work tool contacts the cab during operation.

Do Not Weld or Drill on ROPS (7)



Illustration 11

g01970802

If equipped, this safety message is located on the left side pillar in the cab.

⚠ WARNING

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

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

Refer to Operation and Maintenance Manual, "Guards (Operator Protection)" for more information.

Seat Belt (8)

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

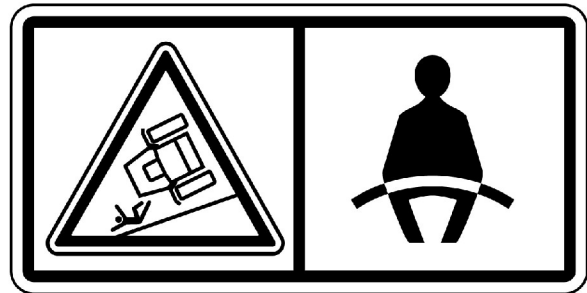


Illustration 12

g01370908

⚠ 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.

Crushing Hazard (9)

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

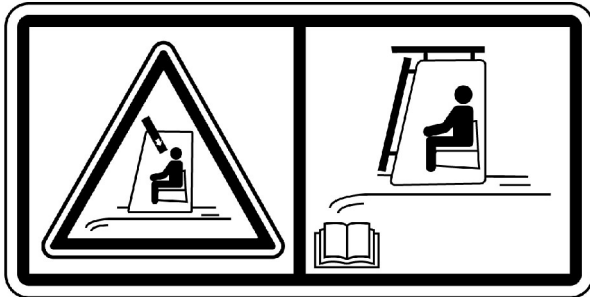


Illustration 13

g01374048

⚠ WARNING

The impact from objects that strike the front of the cab or the top of the cab could result in a crushing hazard with the potential for personal injury or death.

The front guard and the top guard should be installed on the cab for applications where the hazard of falling objects exist. Read the **Operation and Maintenance Manual**.

Refer to Operation and Maintenance Manual, "Guards" for further information.

Joystick Controls Alternate Patterns (10)

If equipped, this safety message is located in the cab on the right side window.

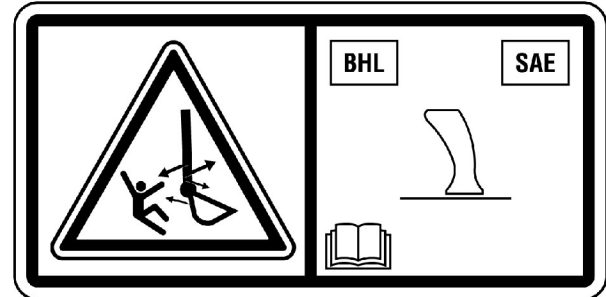


Illustration 14

g01374050

⚠ WARNING

Crush Hazard. Improper joystick setting could cause possible unexpected movement of the boom, stick, or worktool which could result in serious injury or death. Confirm that the joystick settings are properly configured before you operate the machine. Read the **Operation and Maintenance Manual**.

Refer to Operation and Maintenance Manual, "Joystick Controls Alternate Patterns" for further information.

Product Link (11)

If equipped, this safety message is located in the cab on the right side window.

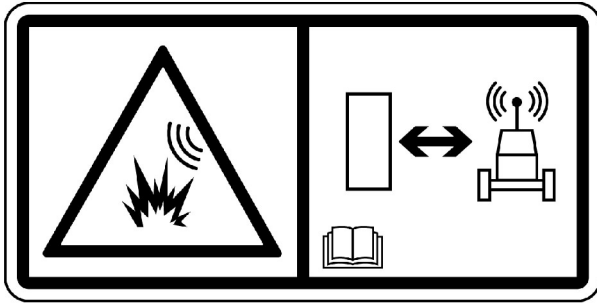


Illustration 15

g01370917

⚠ WARNING

This machine is equipped with a Caterpillar Product Link communication device. When electric detonators are used, this communication device should be deactivated within 12 m (40 ft) of a blast site for satellite-based systems and within 3 m (10 ft) of a blast site for cellular based systems, 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.

In cases where the type of Product Link module cannot be identified, Caterpillar recommends that the device be disabled no less than 12 m (40 ft) from the blast perimeter.

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

Crushing Hazard (12)

If equipped, this safety message is located in the cab on the right side window.

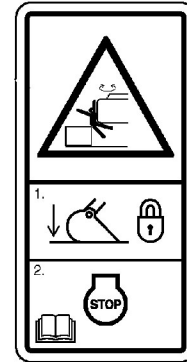


Illustration 16

g02282255

⚠ WARNING

Crush Hazard! A machine may move unexpectedly and without warning resulting in personal injury or death.

Before leaving the machine lower the work tool to the ground, lock operator controls, shut off the engine and remove the key.

Pressurized System (13)

This safety message is located on the cooling system pressure cap.



Illustration 17

g01371640

⚠ WARNING

Pressurized system! Hot coolant can cause serious burns, injury or death. To open the cooling system filler cap, stop the engine and wait until the cooling system components are cool. Loosen the cooling system pressure cap slowly in order to relieve the pressure. Read and understand the Operation and Maintenance Manual before performing any cooling system maintenance.

Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check" for further information.

Aerosol Starting Aid (14)

This safety message is located near the precleaner. The following information is not applicable to machines that are equipped with an ether starting aid.

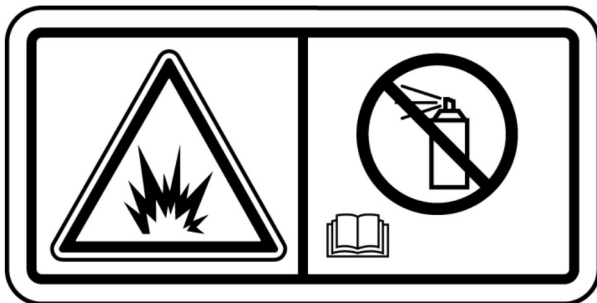


Illustration 18

g01372254

WARNING

Explosion hazard! Do not use ether! This machine is equipped with an air inlet heater. Using ether can create explosions or fires that can cause personal injury or death. Read and follow the starting procedure in the Operation and Maintenance Manual.

Refer to Operation and Maintenance Manual, "Engine Starting" for the proper starting procedure.

Jump Start Cables (15)

This safety message is positioned on the circuit breaker panel.

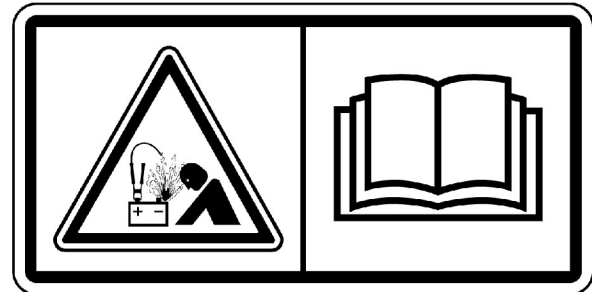


Illustration 19

g01370909

WARNING

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

Refer to Operation and Maintenance Manual, "Engine Starting with Jump Start Cables" for further information.

Vapor Explosion (16)

If equipped, this safety message is located on the storage compartment for the fuel transfer pump.

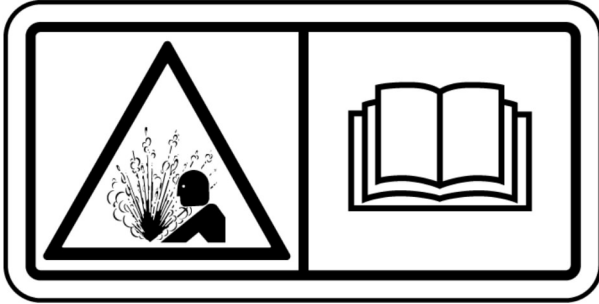


Illustration 20

g01407639

⚠ WARNING

Explosion hazard! Fuel vapors can accumulate in the refueling pump compartment and can be ignited by improper operation of the refueling pump. Failure to follow the operating instructions for the refueling pump could result in personal injury or death. Read and follow the operating instructions for the refueling pump in the Operation and Maintenance Manual.

Refer to Operation and Maintenance Manual, "Fuel Transfer Pump (Refueling)" for further information.

Relieve Hydraulic Tank Pressure (17)

This safety message is located on top of the hydraulic tank.



Illustration 21

g01371640

⚠ WARNING

HYDRAULIC TANK

RELIEVE TANK PRESSURE WITH ENGINE OFF BY REMOVING CAP SLOWLY TO PREVENT BURNS FROM HOT OIL.

Crushing Hazard (18)

This safety message is located on both sides of the stick.

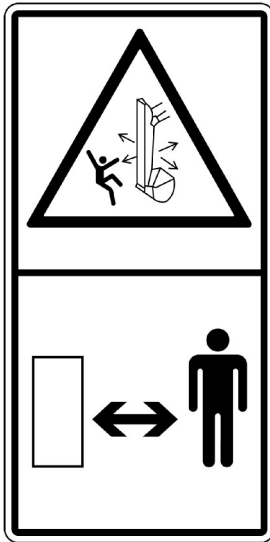


Illustration 22

g01385579

⚠ WARNING

A crushing hazard exists when the stick and boom are in motion and when the machine is being used in object handling applications. Failure to stay clear of the stick and boom when the machine is in operation can result in personal injury or death. Stay clear of the stick and boom when the machine is in operation.

High Pressure Cylinder (19)

This safety message is positioned on the track adjuster on both sides of the machine.

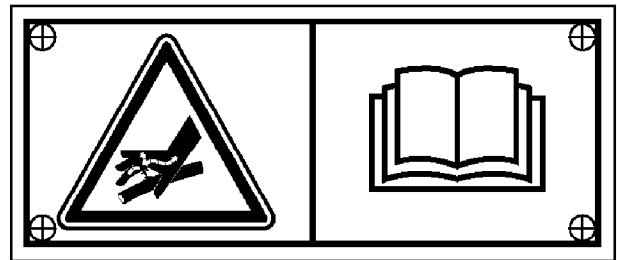


Illustration 23

g01076729

⚠ WARNING

High Pressure Cylinder. Do not remove any parts from the cylinder until all of the pressure has been relieved. This will prevent possible personal injury or death.

Refer to Operation and Maintenance Manual, "Track Adjustment - Adjust" for the adjustment procedure.

Hot Surface (20)

This message is located on the outside of the engine hood and on the inside of the engine hood.

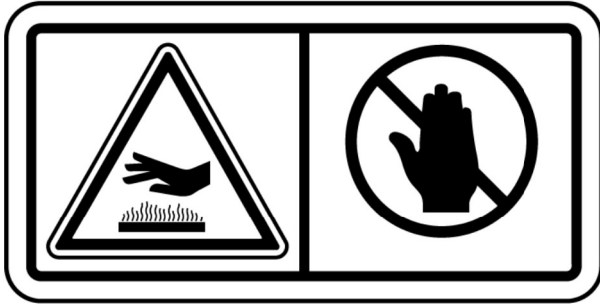


Illustration 24

g01372256

! WARNING

Engine hood and engine hood parts can be hot while engine is running or immediately after engine shutdown. Hot parts or hot components can cause burns or personal injury. Do not allow these parts to contact your skin, when engine is running or immediately after engine shutdown. Use protective clothing or protective equipment to protect your skin.

Crushing Hazard (21)

This safety message is located on the rear of each side of the machine.

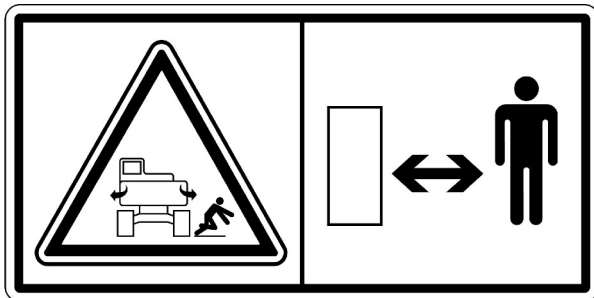


Illustration 25

g01374060

! WARNING

Machine swings. Stay back. Crushing hazard could cause serious injury or death.

High Pressure Gas (22)

This safety message is positioned on the accumulator.

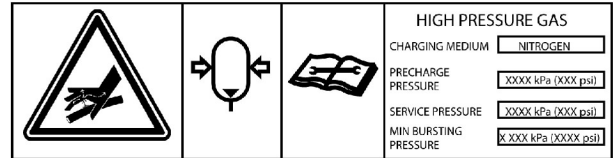


Illustration 26

g01374065

! WARNING

Pressurized System!

Hydraulic accumulators contain gas and oil under high pressure. DO NOT disconnect lines or disassemble any component of a pressurized accumulator. All gas pre-charge must be removed from the accumulator as instructed by the service manual before servicing the accumulator or any accumulator component.

Failure to follow the instructions and warnings could result in personal injury or death.

Only use dry nitrogen gas to recharge accumulators. See your Cat dealer for special equipment and detailed information for accumulator service and charging.

Refer to Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped" for further information.

Falling Object Guard Structure (23)

This safety message is located on top of the front falling object guard structure. This safety message is also located on the left side of the falling object guard structure on the top of the cab.

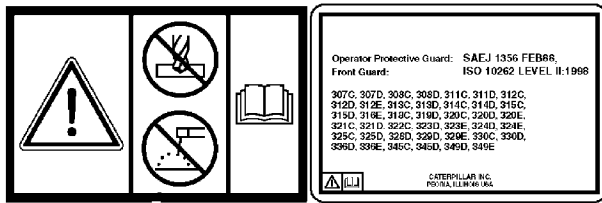


Illustration 27

g02428757

WARNING

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

i06893786

Additional Messages

SMCS Code: 7000; 7405

There are several specific messages on this machine. The exact location of the messages and the description of the information are reviewed in this section. Please become familiar 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 Cat dealer can provide new messages.

Safety Section
Additional Messages

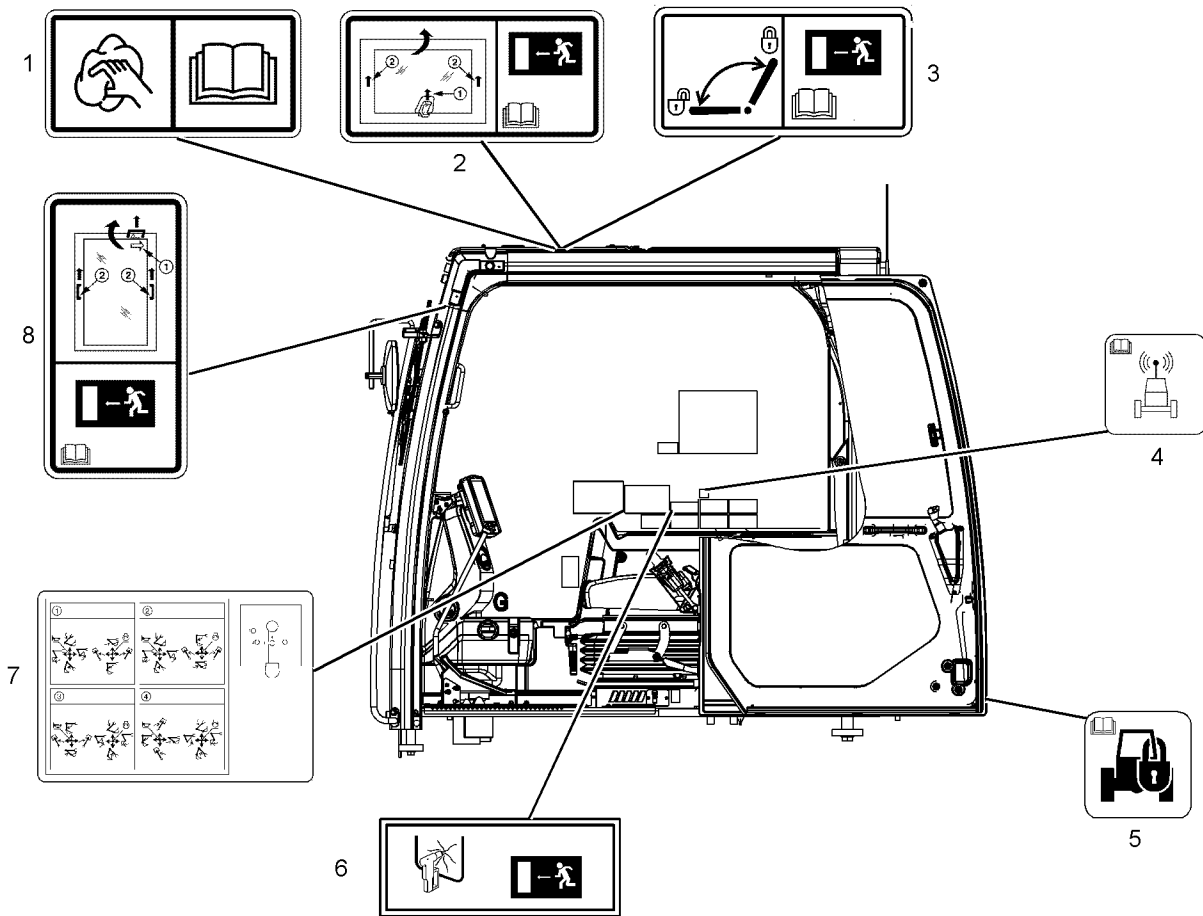


Illustration 28

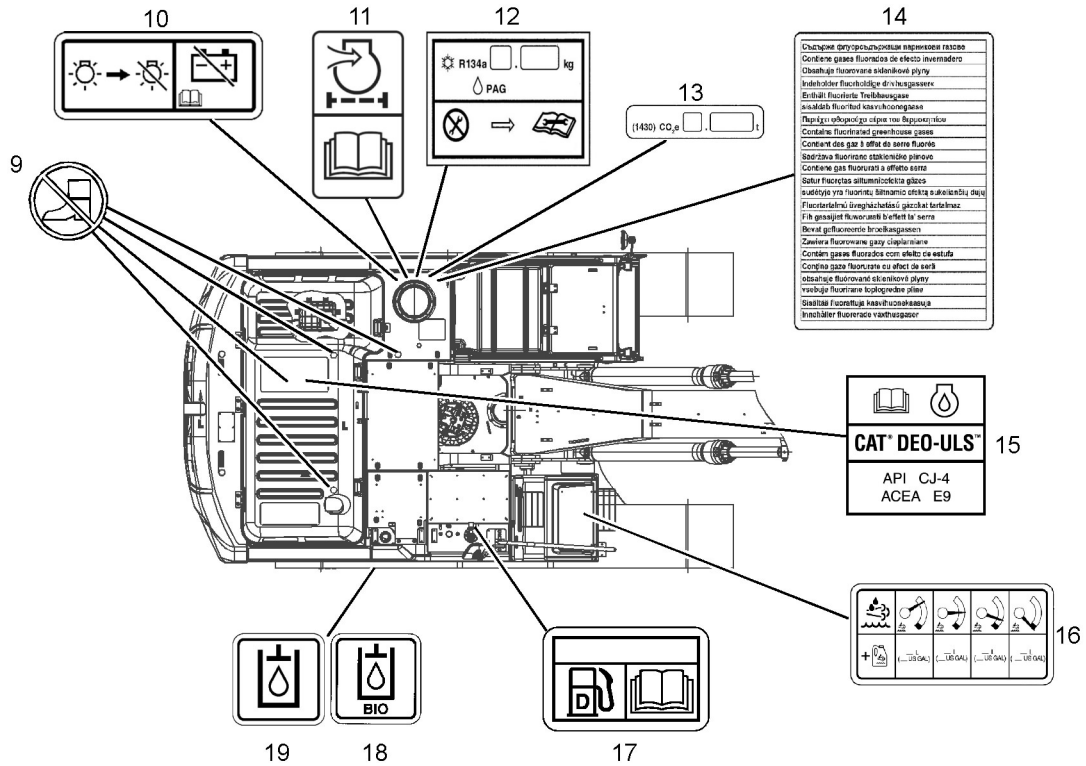


Illustration 29

g06156869

Cleaning Windows (1)

This message is located in the cab on the polycarbonate windows.

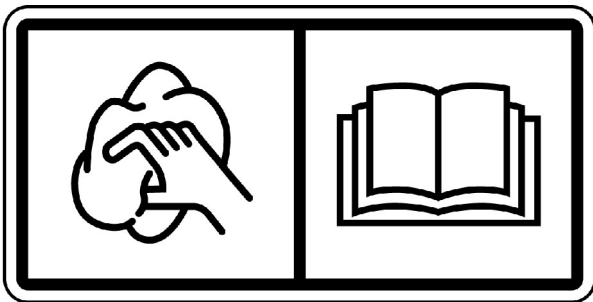


Illustration 30

g01134495

NOTICE

Clean windows with a wet cloth or sponge. Dry cloth or sponge may scratch window material.

Alternate Exit (2)

If equipped, this message is located on the roof hatch.

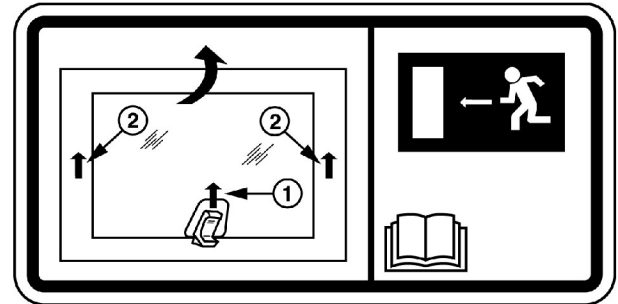


Illustration 31

g02052833

If the Primary exits are blocked, exit the machine through the opening.

For more information, refer to Operation and Maintenance Manual, "Alternate Exit".

Alternate Exit Lock/Unlock (3)

If equipped, this message is located on the roof hatch.

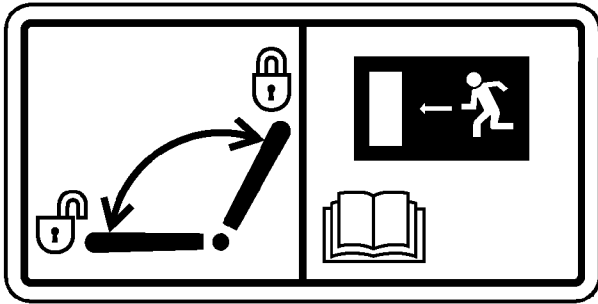


Illustration 32

g02052873

NOTICE

Unlock alternate exit window during machine operations.

Move the lever to the left to the UNLOCK position. Move the lever to the right to the LOCK position. Exit through the opening.

For more information, refer to Operation and Maintenance Manual, "Alternate Exit".

Data Privacy (4)

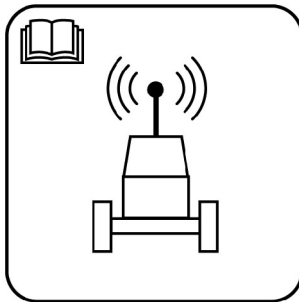


Illustration 33

g01418953

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

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

Machine Security System (5)

This message is located on the bottom corner of the cab door.



Illustration 34

g00951606

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

Refer to Operation and Maintenance Manual, "Machine Security System" for more information.

Alternate Exit (6)

If equipped, this message is located on the right side window of the cab.

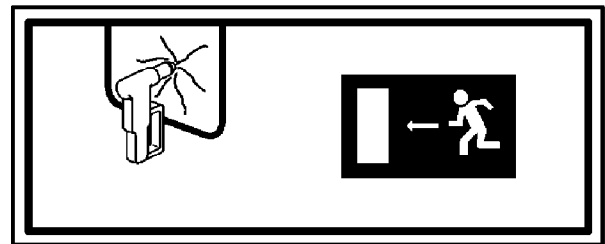


Illustration 35

g01069768

Break glass in order to exit.

Refer to Operation and Maintenance Manual, "Alternate Exit" for further information.

Joystick Controls Alternate Patterns (7)

If equipped, this message is located on the right side window of the cab.

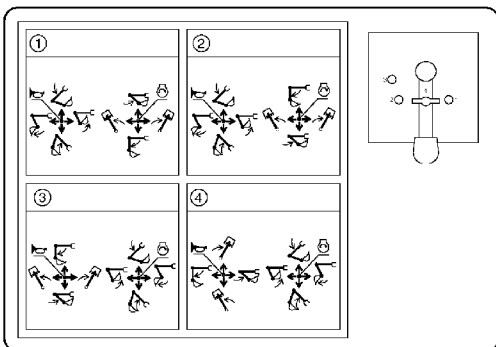


Illustration 36

g03094696

Refer to Operation and Maintenance Manual, "Joystick Controls Alternate Patterns" for further information.

Alternate Exit (8)

If equipped, this message is located on the front window of the cab in the upper left-hand corner.

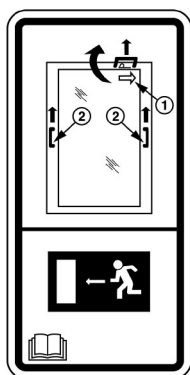


Illustration 37

g02052913

Move the lever to the right in order to unlock the front window. Raise the window into the storage position. Exit through the opening.

Refer to Operation and Maintenance Manual, "Alternate Exit" for further information.

No Step (9)

This message is located on the engine hood on the top of the machine. This message is also located on the left side of the machine behind the cab, as well as on the engine valve cover.

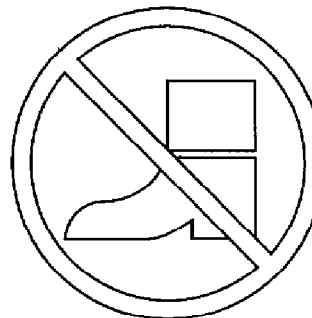


Illustration 38

g00911158

Do not step in this area.

DEF Purge Indicator Lamp (10)

This message is located behind the cab near the disconnect switch.

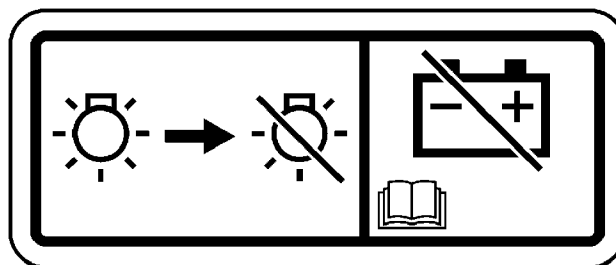


Illustration 39

g03422337

NOTICE

After the engine is shutdown apply the battery disconnect switch. Applying the battery disconnect too soon will prevent the DEF system from being purged and could cause DEF to freeze in the lines.

Radial Seal Air Filters (11)

This message is located on the air cleaner.

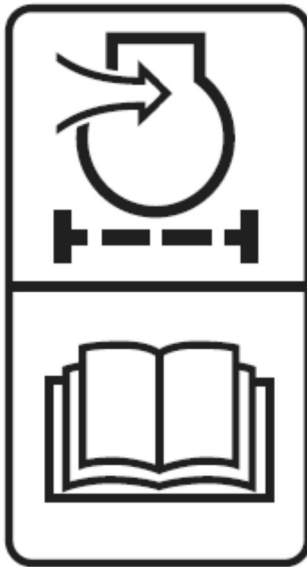


Illustration 40

g03732507

To avoid engine damage, use only Cat radial seal air filters. Other filters will not seal properly. Read the Operation and Maintenance Manual.

Refer to Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace".

Air Conditioner (12), (13), (14)

These messages are positioned on the left door behind the cab.

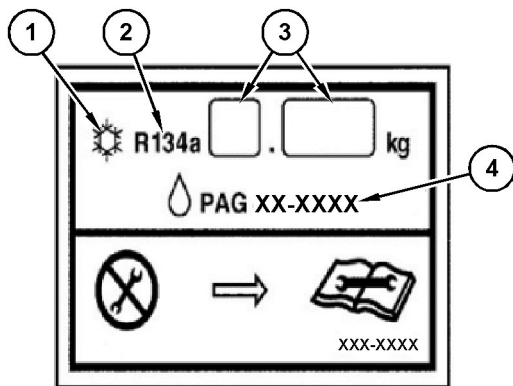


Illustration 41

g06155396

- (1) Air conditioning symbol
- (2) R134a (Refrigerant type common name)
- (3) The system contains 1.0 kg of refrigerant
- (4) The lubricating oil type for this system is PAG (polyalkylene glycol)

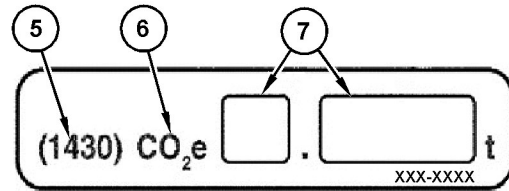


Illustration 42

g06155409

If equipped, this plate provides the below additional European Union required greenhouse gas information.

- (5) (1430) - This is the Global Warming Potential of R134a
- (6) CO₂ equivalent
- (7) The system contains 1.430 metric tonne of CO₂ equivalent

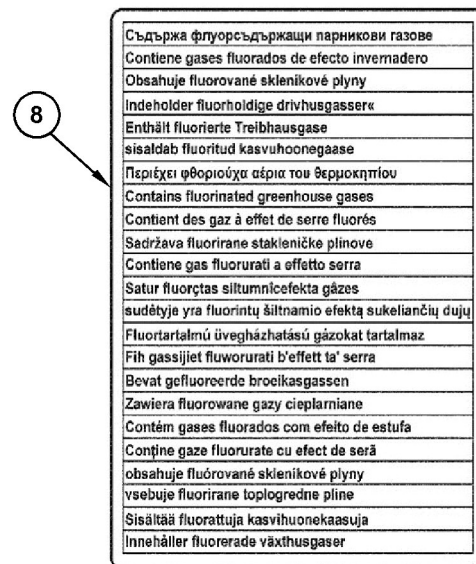


Illustration 43

g06155418

- (8) If equipped, this film provides the required language translations of the text "Contains fluorinated greenhouse gases" for the European Union greenhouse gas regulation.

These messages for the air conditioner system have the appropriate information for the following services: the air conditioner lubricant, the refrigerant charge, and the refrigerant capacity.

Engine Oil Requirements (15)

This message is located on top of the engine.

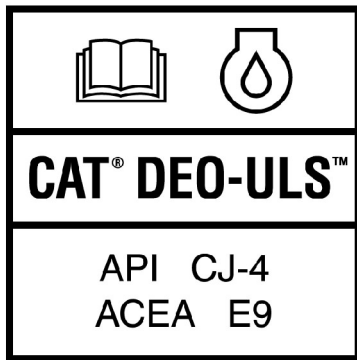


Illustration 44 g02176761

Refer to Operation and Maintenance Manual, "Lubricant Viscosities".

Diesel Exhaust Fluid Fill (16)

This message is located on the right side of the machine near the storage box.

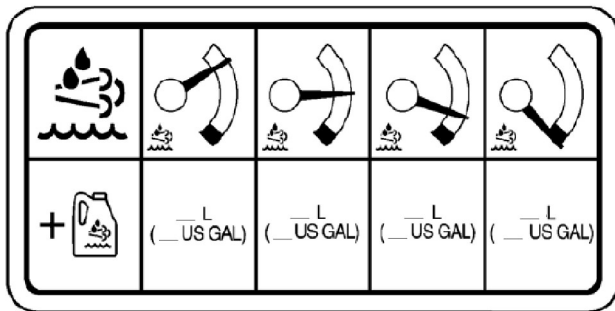


Illustration 45 g03650401

This film provides an estimate of diesel exhaust fluid needed to fill the DEF tank.

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Diesel Exhaust Fluid - Fill" for more information.

Diesel Fuel Requirements (17)

This message is located by the fuel tank.

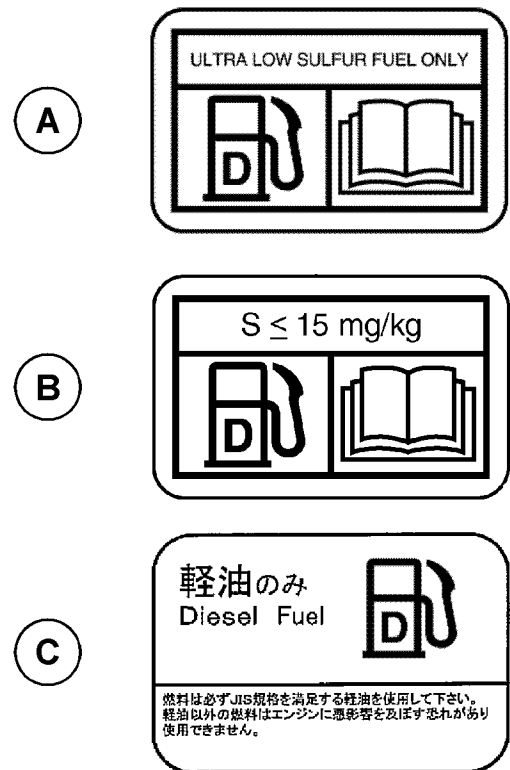


Illustration 46 g03218956

- (A) NACD film
- (B) EAME film
- (C) Japan film

Oil Biodegradable (18)

This message is located on the left side of the machine by the fuel tank.

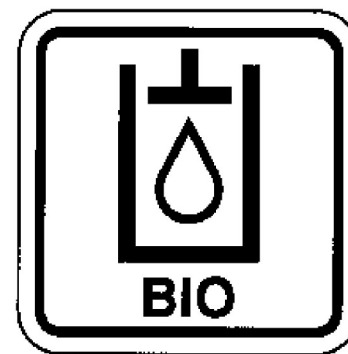


Illustration 47 g03621717

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for more information about the oil.

Hydraulic Oil (19)

This message is located on the left side of the machine by the fuel tank.



Illustration 48

g03621736

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for more information about the oil.

i07746355

General Hazard Information

SMCS Code: 7000

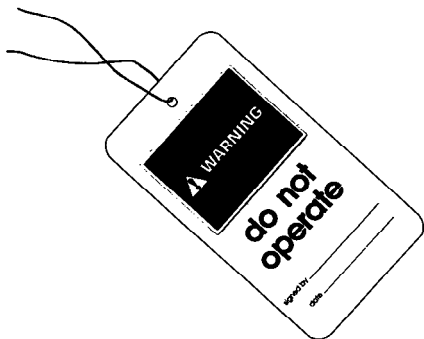


Illustration 49

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 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.

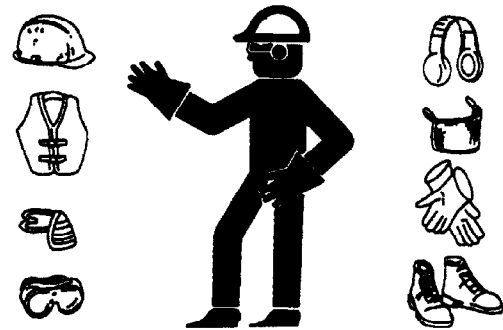


Illustration 50

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.

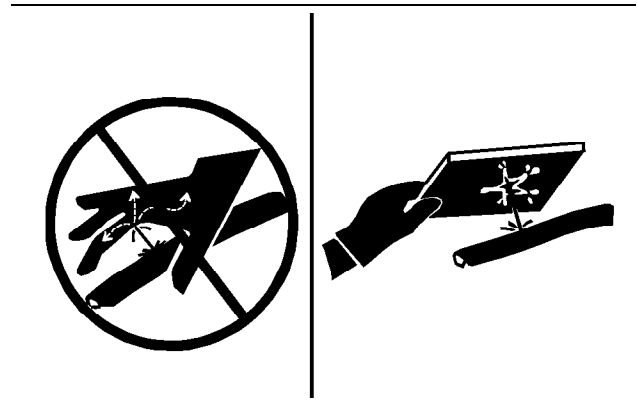


Illustration 51

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

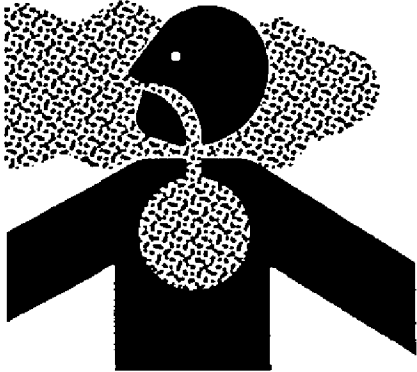


Illustration 52

g02159053

Exhaust

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

Asbestos Information

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

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

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

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

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

Dispose of Waste Properly

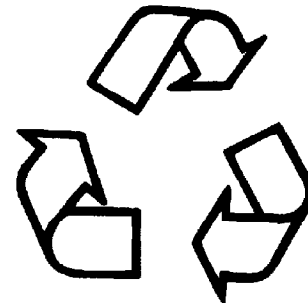


Illustration 53

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.

i07399130

Burn Prevention

SMCS Code: 7000

Do not touch any part of an operating engine. Allow machine systems to cool before any maintenance is performed. 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.

Induction System

WARNING

Sulfuric Acid Burn Hazard may cause serious personal injury or death.

The exhaust gas cooler may contain a small amount of sulfuric acid. The use of fuel with sulfur levels greater than 15 ppm may increase the amount of sulfuric acid formed. The sulfuric acid may spill from the cooler during service of the engine. The sulfuric acid will burn the eyes, skin and clothing on contact. Always wear the appropriate personal protective equipment (PPE) that is noted on a material safety data sheet (MSDS) for sulfuric acid. Always follow the directions for first aid that are noted on a material safety data sheet (MSDS) for sulfuric acid.

Coolant

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

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

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

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

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

Oils

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

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

Batteries

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

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

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

i06179517

Fire Prevention and Explosion Prevention

SMCS Code: 7000



Illustration 54

g00704000

Regeneration

The exhaust gas temperatures during regeneration will be elevated. Follow proper fire prevention instructions and use the disable regeneration function (if equipped) when appropriate.

General

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

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

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

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

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

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

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

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

Do not operate the machine near any flame.

Keep shields in place. Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in 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 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 55

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 56

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

Safety Section

Fire Prevention and Explosion Prevention

- 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.

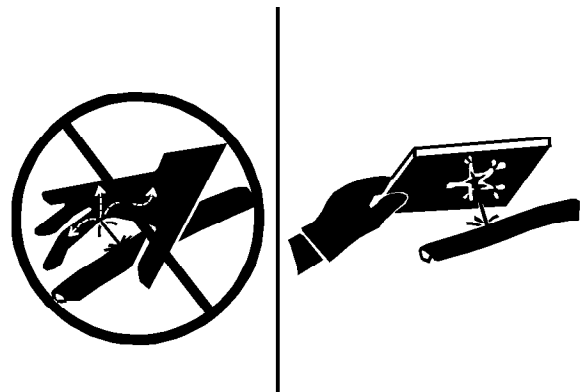


Illustration 57

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" .

WARNING

Manually spraying Ether into an engine with a Diesel Particulate Filter (DPF) may result in the accumulation of Ether in the DPF and an explosion. This in conjunction with other factors may result in an injury or death.

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

Do not store ether cylinders in living areas or in the operator compartment of a machine. Do not store ether cylinders in direct sunlight or in temperatures above 49° C (120.2° F). Keep ether cylinders away from open flames or sparks.

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

Fire Extinguisher

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

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

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

i07041871

Fire Safety

SMCS Code: 7000

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

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

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

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

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

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

Notify emergency personnel of the fire and your location.

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

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

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

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

- Tires on wheeled machines pose a risk of explosion as tires burn. Hot shrapnel and debris can be thrown great distances in an explosion.
- Tanks, accumulators, hoses, and fittings can rupture in a fire, spraying fuels and shrapnel over a large area.

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

i02546320

i03767099

Fire Extinguisher Location

SMCS Code: 7000; 7419

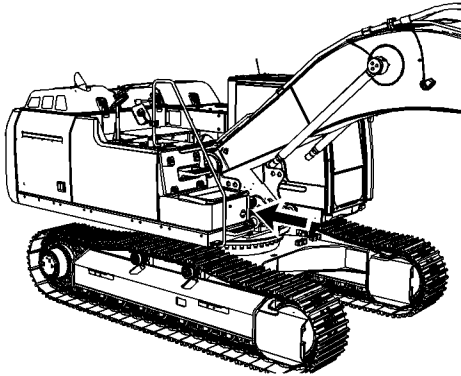


Illustration 58

g02030713

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

The recommended location for mounting the fire extinguisher is in the storage box.

i01329108

Track Information

SMCS Code: 4170; 7000

Track adjusting systems use either grease or oil under high pressure to keep the track under tension.

Grease or oil under high pressure coming out of the relief valve can penetrate the body causing injury or death. Do not watch the relief valve to see if grease or oil is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

The pins and bushings in a dry track pin joint can become very hot. It is possible to burn the fingers if there is more than brief contact with these components.

High Pressure Fuel Lines

SMCS Code: 1000; 1274; 7000

WARNING

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

The high pressure fuel lines are the fuel lines that are between the high pressure fuel pump and the high pressure fuel manifold and the fuel lines that are between the fuel manifold and cylinder head. These fuel lines are different from fuel lines on other fuel systems.

This is because of the following differences:

- The high pressure fuel lines are constantly charged with high pressure.
- The internal pressures of the high pressure fuel lines are higher than other types of fuel system.
- The high pressure fuel lines are formed to shape and then strengthened by a special process.

Do not step on the high pressure fuel lines. Do not deflect the high pressure fuel lines. Do not bend or strike the high pressure fuel lines. Deformation or damage of the high pressure fuel lines may cause a point of weakness and potential failure.

Do not check the high pressure fuel lines with the engine or the starting motor in operation. After the engine has stopped allow 10 minutes to pass in order to allow the pressure to be purged before any service or repair is performed on the engine fuel lines.

Do not loosen the high pressure fuel lines in order to remove air from the fuel system. This procedure is not required.

Visually inspect the high pressure fuel lines before the engine is started. This inspection should be each day.

If you inspect the engine in operation, always use the proper inspection procedure in order to avoid a fluid penetration hazard. Refer to Operation and Maintenance Manual, "General hazard Information".

- Inspect the high pressure fuel lines for damage, deformation, a nick, a cut, a crease, or a dent.
- Do not operate the engine with a fuel leak. If there is a leak do not tighten the connection in order to stop the leak. The connection must only be tightened to the recommended torque. Refer to Disassembly and Assembly for your engine.

- If the high pressure fuel lines are torqued correctly and the high pressure fuel lines are leaking the high pressure fuel lines must be replaced.
- Ensure that all clips on the high pressure fuel lines are in place. Do not operate the engine with clips that are damaged, missing or loose.
- Do not attach any other item to the high pressure fuel lines.
- Loosened high pressure fuel lines must be replaced. Also removed high pressure fuel lines must be replaced. Refer to Disassembly and Assembly for your engine.

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.

i00771840

Before Starting Engine

SMCS Code: 1000; 7000

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

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

Adjust the seat so that full pedal travel can be achieved with the operator's back 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 machine lights are working properly.

Before you start the engine and before you move the machine, make sure that no one is underneath the machine, around the machine, or on the machine. Make sure that the area is free of personnel.

i07746368

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.

i06952725

Restricted Visibility

SMCS Code: 7000

The size and the configuration of this machine may result in areas that cannot be seen when the operator is seated. For restricted visibility areas, an appropriate 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".

Illustrations 59 - 61 provide an approximate visual indication of the areas at ground level inside a radius of 12 m (39 ft) from the operator of significant restricted visibility for various machine configurations. Refer to the correct illustration for your machine configuration. All restricted visibility areas less than 300 mm wide may not be shown. These illustrations do not indicate areas of restricted visibility for distances outside of the shown radius. The areas of restricted visibility shown in the illustrations are with the track and work tool of the machine in the Travel position. Illustration 62 shows the position of the work tool in the travel position. The Caterpillar authorized work tool that resulted in the largest visibility restriction was used.

Illustration 59 indicates restricted visibility areas at ground level inside the shown radius from the operator without the use of visual aids that may be optional for this product in some markets.

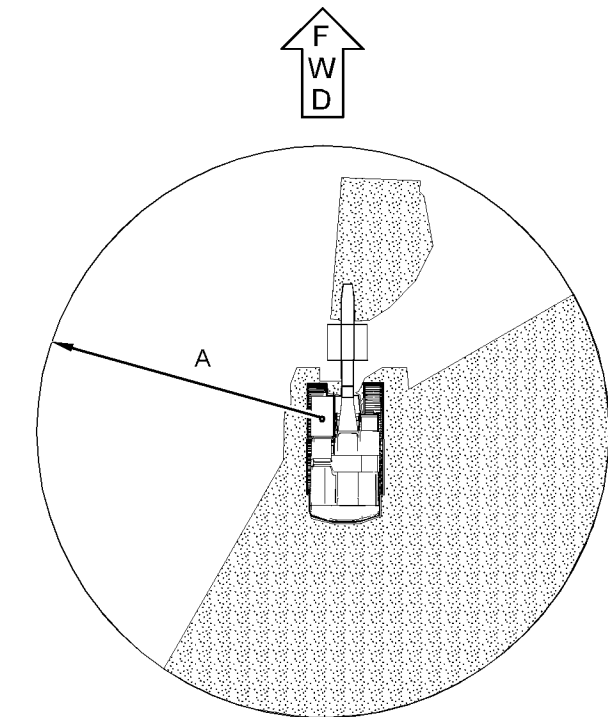


Illustration 59

g03866505

Top view of the machine, ground level visibility without use of optional visual aids

(A) 12 m (39 ft)

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

Illustration 60 indicates restricted visibility areas at ground level inside the shown radius from the operator with the use of available rear camera, right side mirror, and left side mirror installed.

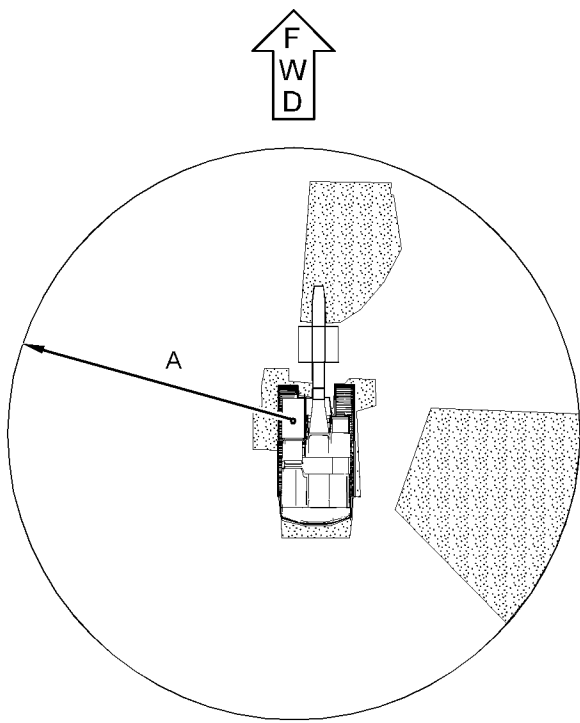


Illustration 60 g03866521
Top view of the machine, ground level visibility with available camera, left side mirror and right side mirror
(A) 12 m (39 ft)

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

Illustration 61 indicates restricted visibility areas at ground level inside the shown radius from the operator with the use of available rear camera, right side camera (if equipped), left side mirrors installed.

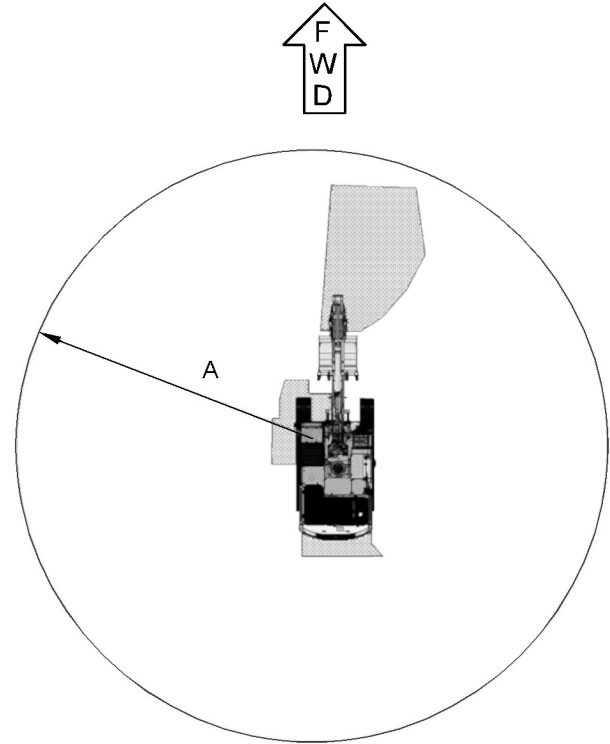


Illustration 61 g06034492
Top view of the machine, ground level visibility with available camera, left side mirror.
(A) 12 m (39 ft)

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

Restricted visibility is measured when the front linkage of the machine is in the travel position. Illustration 62 shows the machine in the travel position.

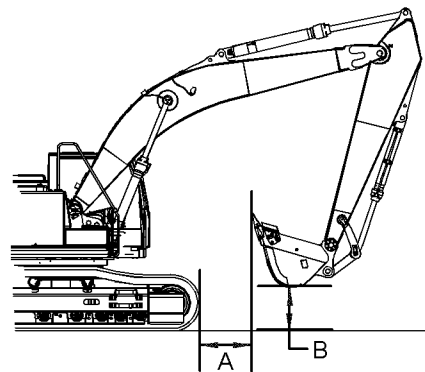


Illustration 62 g02155813
(A) 1 m (3.0 ft) from the front of the machine to the bucket
(B) 0.5 m (1.6 ft) from ground level

i03562260

i04159629

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. Also, do not move any controls.

Make sure that you are seated before you start the engine.

Move all hydraulic controls to the HOLD position before you start the engine. Move the hydraulic lockout control to the LOCKED position. For further details on this procedure, refer to Operation and Maintenance Manual, "Operator Controls".

Diesel engine exhaust contains products of combustion which can be harmful to your health. Always run 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.

i01340061

Before Operation

SMCS Code: 7000

Clear all personnel from the machine and from the area.

Clear all obstacles from the machine's path. Beware of hazards (wires, ditches, etc).

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

Adjust the rearview mirrors (if equipped) for the best visibility close to the machine. Make sure that the horn, the travel alarm (if equipped), and all other warning devices are working properly.

Fasten the seat belt securely.

Warm up the engine and the hydraulic oil before operating the machine.

Before moving the machine, check the position of the undercarriage. The normal travel position is with the idler wheels to the front under the cab and the drive sprockets to the rear. When the undercarriage is in the reversed position, the directional controls must be operated in opposite directions.

Work Tools

SMCS Code: 6700

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

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

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

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

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

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

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

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

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

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

Never use the work tool for a work platform.

i07889511

Operation

SMCS Code: 7000

Machine Operating Temperature Range

The machine must function satisfactorily in the anticipated ambient temperature limits that are encountered during operation. The standard machine configuration is intended for use within an ambient temperature range of $-18\text{ }^{\circ}\text{C}$ ($0\text{ }^{\circ}\text{F}$) to $43\text{ }^{\circ}\text{C}$ ($109\text{ }^{\circ}\text{F}$). Special configurations for different ambient temperatures may be available. Consult your Cat dealer for additional information on special configurations of your machine.

Limiting Conditions and Criteria

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

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

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

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

Critical Failures

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

Safety Section
Operation

Table 1

System or Component Name	Limiting Condition	Criteria for Action	Required Action
Line, tubes, and hoses	End fittings are damaged or leaking. Outer coverings are chafed or cut. Wires are exposed. Outer coverings are swelling or ballooning. Flexible parts of the hoses are kinked. Outer covers have exposed embedded armoring. End fittings are displaced.	Visible corrosion, loose, or damaged lines, tubes, or hoses. Visible fluid leaks.	Immediately repair any lines, tubes, or hoses that are corroded, loose, or damaged. Immediately repair any leaks as these may provide fuel for fires.
Electrical Wiring	Signs of fraying, abrasion, cracking, discoloration, cuts on the insulation	Visible damage to electrical wiring	Immediately replace damaged wiring
Battery cable(s)	Signs of fraying, abrasion, cracking, discoloration, cuts on the insulation of the cable, fouling, corroded terminals, damaged terminals, and loose terminals	Visible damage to battery cable(s)	Immediately replace damaged battery cables
Operator Protective Structure	Structures that are bent, cracked, or loose. Loose, missing, or damaged bolts.	Visible damage to structure. Loose, missing, or damaged bolts.	Do not operate machine with damaged structure or loose, missing, or damaged bolts. Contact your Cat dealer for inspection and repair or replacement options.
Seat Belt	Worn or damaged seat belt or mounting hardware	Visible wear or damage	Immediately replace parts that are worn or damaged.
Seat Belt	Age of seat belt	Three years after date of installation	Replace seat belt three years after date of installation
Safety Messages	Appearance of safety message	Damage to safety messages making them illegible	Replace the illustrations if illegible.
Audible Warning Device(s) (if equipped)	Sound level of audible warning	Reduced or no audible warning present	Immediately repair or replace audible warning devices not working properly.
Camera(s) (if equipped)	Dirt or debris on camera lens	Dirt or debris obstructing camera view	Clean camera before operating machine.
Cab Windows (if equipped)	Dirt, debris, or damaged windows	Dirt or debris obstructing operator visibility. Any damaged windows.	Clean windows before operating machine. Repair or replace damaged windows before operating machine.
Mirrors (if equipped)	Dirt, debris, or damaged mirror	Dirt or debris obstructing operator visibility. Any damaged mirrors.	Clean mirrors before operating machine. Repair or replace damaged mirrors before operating machine.
Braking System	Inadequate braking performance	System does not pass Braking System - Test(s) included in Maintenance Section or in the Testing and Adjusting Manual	Contact your Cat dealer to inspect and, if necessary, repair the brake system.
Cooling System	The coolant temperature is too high.	Monitoring System displays Warning Category 3	Stop the engine immediately. Check the coolant level and check the radiator for debris. Refer to Operation and Maintenance Manual, Cooling System Coolant Level - Check. Check the fan drive belts for the water pump. Refer to Operation and Maintenance Manual, Belts - Inspect/Adjust/ Replace. Make any necessary repairs.
Engine Oil System	A problem has been detected with the engine oil pressure.	Monitoring System displays Warning Category 3	If the warning stays on during low idle, stop the engine and check the engine oil level. Perform any necessary repairs as soon as possible.
Engine system	An engine fault has been detected by the engine ECM.	Monitoring System displays Warning Category 3	Stop the engine immediately. Contact your Cat dealer for service.
Fuel System	A problem has been detected with the fuel system.	Monitoring System displays Warning Category 3	Stop the engine. Determine the cause of the fault and perform any necessary repairs.
Hydraulic Oil System	The hydraulic oil temperature is too high.	Monitoring System displays Warning Category 3	Stop the engine immediately. Check the hydraulic oil level and check the hydraulic oil cooler for debris. Perform any necessary repairs as soon as possible.

(continued)

(Table 1, contd)

System or Component Name	Limiting Condition	Criteria for Action	Required Action
Steering System	A problem has been detected with the steering system. (If equipped with steering system monitoring.)	Monitoring System displays Warning Category 3	Move machine to a safe location and stop the engine immediately. Contact your Cat dealer to inspect and, if necessary, repair the steering system.
Overall Machine	Machine service is required.	Monitoring System displays Warning Category 3	Stop the engine immediately. Contact your Cat dealer for service.

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 of all protective devices while you operate the machine slowly in an open area.

When the machine is moving watch the clearance of the boom. Uneven ground can cause the boom to move in all directions.

Make sure that no personnel will be endangered before you move the machine. Do not allow riders on the machine unless the machine has an additional seat with a seat belt.

Report any machine damage that was noted during machine operation. Make any necessary repairs.

Never use the work tool for a work platform.

Hold attachments approximately 40 cm (15 inches) above ground level while you drive the machine. Do not drive the machine close to an overhang, to the edge of a cliff, or to the edge of an excavation.

If the machine begins to sideslip on a grade, immediately dump the load and turn the machine downhill.

Be careful to avoid any ground condition which could cause the machine to tip. Tipping can occur when you work on hills, on banks, or on slopes. Tipping can also occur when you cross ditches, ridges, or other unexpected obstructions.

When possible, operate the machine up slopes and down slopes with the final drive sprockets facing down the slope. Avoid operating the machine across the slope. Place the heaviest end of the machine uphill when you are working on an incline.

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

Avoid changing the direction of travel on a slope. Changing the direction of travel on a slope could result in tipping or side slipping of the machine.

Bring the load close to the machine before traveling any distances.

Bring the load close to the machine before swinging the load.

Lifting capacity decreases as the load is moved further from the machine.

Make sure that the towing eyes and the towing devices are adequate for your needs.

Only connect trailing equipment to a drawbar or to a hitch.

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

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

Check the local regulations, state codes, and/or directives of the job site for a specific minimum distance from obstacles.

Before you operate the machine, check with local utilities for the locations of underground pipes and for the locations of buried cables.

Know the maximum dimensions of your machine.

Watch the load at all times.

Do not operate the machine without the counterweight. The machine can tip when the boom is over the side.

The clamshell, the grapple, or the magnet can swing in all directions. Move the joysticks in a continuous motion. Failure to move the joysticks in a continuous motion can cause the clamshell, the grapple, or the magnet to swing into the cab or into a person in the work area. This will result in personal injury.

Certain machine front linkage combinations (boom, stick, quick coupler, work tool) can allow the work tool to contact the machine undercarriage, swing frame, boom, boom hydraulic cylinder and or the cab. Be aware of the position of the work tool while you operate the machine.

Shut down the machine until damaged or non-functioning visibility aid(s) is repaired (if applicable) or until appropriate job site organization is used to minimize hazards that are caused by any resulting restricted visibility.

Machine Operation when the Machine is not Completely Assembled

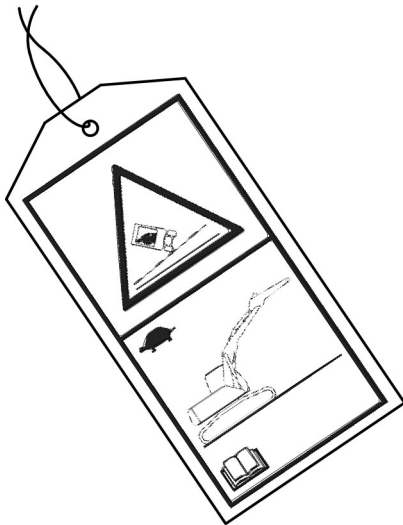


Illustration 63

g02202544

Attach the tag to the controls of the machine. When the tag is attached to the controls, operate the machine as described below.

If the machine needs to be operated without the boom, stick, and/or counterweight being installed, the machine should be operated slowly on flat, stable ground or pavement by qualified operators. Avoid any machine operations which could affect machine stability, including the swing function. The ROPS structural certification depends on the support of the boom, stick, and counterweight in the event of a machine tip over or a machine rollover incident.

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.

i06589158

Lifting Objects

SMCS Code: 7000

There may be local regulations and/or government regulations that govern the use of machines which lift heavy objects. Obey all local and government regulations.

If this machine is used to lift objects within an area that is controlled by the European Directive "2006/42/EC", the machine must be equipped with a boom lowering control valve, a stick lowering control valve, and an overload warning device.

If this machine is used to lift objects within Japan, Japanese regulations require the machine to be equipped with a shovel crane configuration.

Consult your Cat dealer for additional information.

i07749631

Demolition

SMCS Code: 6700

There maybe local regulations and/or government regulations that govern the use of machines which are designed and used as demolition machinery.

Note: Obey all local and government regulations.

Demolition machinery is designed for demolishing by pushing or pulling, or fragmenting. Demolition is done by crushing or shearing, buildings and/or other civil engineering structures and component parts and/or separating the resultant debris.

If this machine is used for demolition within an area that is controlled by the European Directive 2006/42/EC, the machine must be equipped with:

- Rollover Protective Structure (ROPS, not required for demolition excavators)
- Boom Lowering Control Valve (BLCV) / Stick Lowering Control Valve (SLCV)
- Top Guard / Front Guard
- Bottom / Motor / Swivel Guard
- EN 356 class P5A front window glass
- If a roof window is used to provide visibility to the working area, then roof window shall be equipped with motorized windscreen wipers and washers.

Demolition applications may generate flying debris. Ensure that there are no personnel in the area around the machine where flying debris may travel.

Demolition applications may generate airborne dust that can be hazardous to your health. If you operate the machine in a dust generating applications, use appropriate safeguarding or adequate ventilation to minimize risk.

i07393520

Parking

SMCS Code: 7000

The hydraulic system controls remain pressurized if the accumulator is charged. This condition is true even when the engine is not running. The hydraulic control system pressure should decrease in a short time (approximately 1 minute). While the hydraulic controls maintain a charge, the hydraulic work tools and machine controls remain functional.

There can be residual pressure within the hydraulic system even when the accumulator is empty. Refer to this Operation and Maintenance Manual, "System Pressure Release" before any service is performed to the hydraulic system.

Machine movement that is sudden and unexpected will occur if any of the controls are moved. Machine movement that is sudden and unexpected, can cause personal injury or death.

Always move the hydraulic lockout control to the LOCKED position before you shut off the engine or immediately after the engine stops running.

Park the machine on a hard, level surface. If you must park the machine on a grade, chock the tracks of the machine.

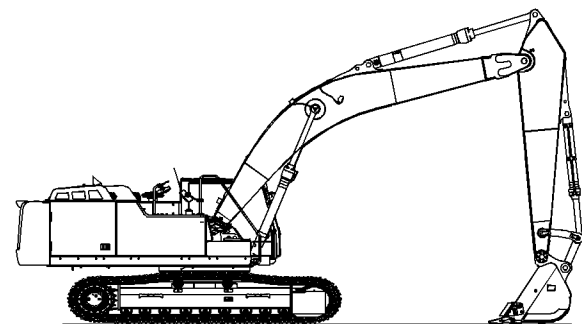


Illustration 64

g02280104

Place the machine in the servicing position.

Note: Make sure that all work tools are in the recommended servicing position before servicing the machine.

Move the hydraulic lockout control to the LOCKED position.

Stop the engine.

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

Turn the battery disconnect switch to the OFF position.

Note: Do not turn the battery disconnect switch OFF until the "Wait to Disconnect Lamp" has turned off. If the battery disconnect switch is turned off before the lamp has shut off, the DEF system will not purge. DEF could freeze and damage the pump and lines.

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

Install barriers or lighting as required to prevent interference in road traffic.

Select places free of danger by flooding and other water damage.

i07746366

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-II

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.

i06731228

Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

The declared dynamic operator sound pressure level is 71 dB(A) when "ISO 6396: 2008" is used to measure the value for an enclosed cab. The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

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, or when the doors and windows are open for extended periods or in a noisy environment.

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

The declared exterior sound power level (LWA) is 103 dB(A) when the value is measured according to the dynamic test procedures and conditions that are specified in "ISO 6395:2008". The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds.

The declared dynamic operator sound pressure level is 71 dB(A) when "ISO 6396: 2008" is used to measure the value for an enclosed cab. The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

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

Vibration Data for Track Type Excavator

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 track type excavators.

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 2 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 2

"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
Track Type Excavators	excavating	0,44	0,27	0,30	0,24	0,16	0,17
	hydraulic breaker application	0,53	0,31	0,55	0,30	0,18	0,28
	mining application	0,65	0,42	0,61	0,21	0,15	0,32
	transfer	0,48	0,32	0,79	0,19	0,20	0,23

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, SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC" 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.

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 track type excavators.
 - 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.

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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, SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC" 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

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Operator Station

SMCS Code: 7300; 7301; 7325

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

Guards (Operator Protection)

SMCS Code: 7000; 7150

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

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

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

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

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

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

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

Other Guards (If Equipped)

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

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

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

- Demolition applications
- Rock quarries
- Forestry products

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

Product Information Section

General Information

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Regulatory Information (Japan)

SMCS Code: 7000

Qualifications for Machine Operation

The following qualifications are required for the operation of this machine:

Excavation and Loading

Completion of the construction machines (for land leveling, hauling, loading, and excavation) operation skill training course. (Qualification by the Industrial Safety and Health Act)

Demolition

Completion of the construction machines (for demolition) operation skill training course. (Qualification by the Industrial Safety and Health Act)

Mining Jobs

Certification by the Director General or Deputy Director General of Bureau of Mine Safety after completion of the safety training course. (Qualification by the Mine Safety Act)

Crane Slinging for the Bucket with a Hook

Completion of the special slinging training for the crane for loads weighing less than 1 ton. (Qualification by the Industrial Safety and Health Act)

Trailer Transportation

In principle, this machine should be transported by a trailer. Select the appropriate trailer regarding the machine weight and measurements shown in the major specifications in the specification part of this manual. Be aware machine weight and transportation measurements differ depending on the various types of attachments.

- In the event heavy items are to be transported, observe the related laws. These laws include Road Traffic Law, Road Laws, Road Transportation Vehicle Laws, and Vehicle Restriction Laws.

- Conduct prior investigation of the road width, ground clearance of road/railway bridges, weight restrictions etc. of the planned transportation route, to confirm the viability of the transportation execution.

Load

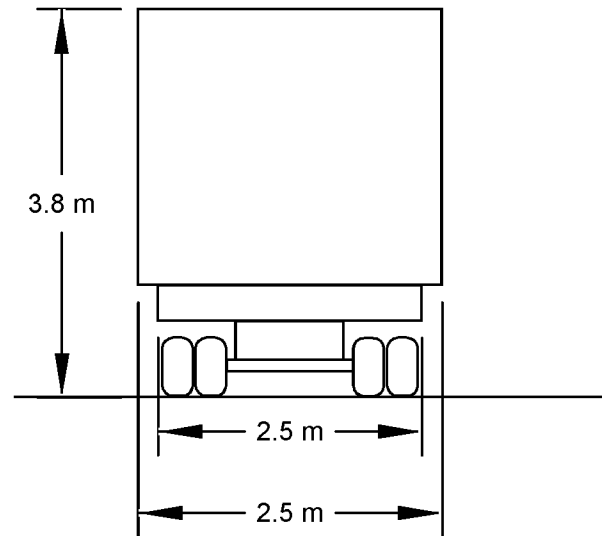


Illustration 65

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- Not more than 3.8 m (12 ft 6 inch)
- Not more than 2.5 m (8 ft 2 inch)(Safety Standard)
- Not more than 2.5 m (8 ft 2 inch) (Vehicle Restriction Laws)
- Items that protrude out are not allowed. (Government ordinance for Road Traffic Laws)

Transportation weight and measurements are restricted by the Vehicle Restriction Laws. If the actual weight/measurements exceed the limitation figures, you must submit the restriction relaxation request to the pertinent governmental agencies. For details, consult your Cat dealer.

Table 3

Total Length	Not more than 12 m (39 ft 4 inch)
Total Width (A)	Not more than 2.5 m (8 ft 2 inch)

(continued)

(Table 3, contd)

Total Height (B)	Not more than 3.8 m (12 ft 6 inch) when loaded on the trailer.
Total Weight	20 to 25 ton (depending on road, axle, and vehicle length)

Operation of Construction Equipment and the Governing Laws and Regulations

NOTICE

Various laws and regulations, including Industrial Safety and Health Act, are enforced to ensure prevention of injuries on and around construction equipment and safe and comfortable operation of equipment. Be sure to obey them.

NOTICE

The notices regarding machine operation, inspection, maintenance, and safety contained in this manual are applicable only to cases in which the machine is used for the specified jobs. It is impossible for this kind of manual to cover every kind of operation. Therefore, the content of this manual does not necessarily explain all possible cases. Be sure to pay careful attention also to the items not covered by this manual and confirm the safety before starting jobs to prevent human injury and machine damage accidents.

Qualification of Operators

Operation of construction equipment is limited to persons who have any of the following licenses by law.

Note: Employers will face imprisonment up to a maximum of 6 months or a fine of up to a maximum of five hundred thousand yen if they let unqualified personnel operate equipment. Unqualified operators will also be fined up to a maximum of five hundred thousand yen.

- One who completed an operating skill course for vehicle-type construction equipment at a registered training institution.
- One who passed the construction equipment and technologies license examination (Type 1-3) defined by the Construction Industry Law.
- One who completed an operating training course for construction equipment defined by the Vocational Training Law.

- One who took a special training (rules and skills) at a registered training institution to operate equipment weighing less than 3 tons.
- With an auto-drivers license, an operator does not need to complete an operating skill course for construction equipment to operate equipment on the roads that apply to the rules of the Road Traffic Act. However, the operator needs to complete the course to engage in snow clearing or excavating on the roads.
- The operator must be qualified under the Mine Safety Act to operate construction equipment in a mine.

Acquisition of the Qualifications

The company offers training courses for construction machine operation, in addition to other skills. For details, contact the company's dealer in your area.

Regarding machine operation qualifications, also refer to the laws related to the construction machines shown at the end of this manual.

Subsidy System

Small-to-medium-sized construction business companies are eligible to receive a subsidy for a part of training fees and wages when they have their employees attend a training course to improve skills.

Operation of Construction Equipment and the Governing Laws and Regulations

NOTICE

Information about operating skill course for vehicle-type construction equipment (for ground leveling, transporting, loading, excavating).

Industrial Safety and Health Act requires operators of construction equipment weight 3 tons and over to acquire a certificate of completion of an operating skill course. Registered with and authorized by the respective directors general of the regional labor bureaus, we offer operating skill courses for vehicle-type construction equipment and special trainings.

Request for Periodical Self-Inspection

Rules of Periodical Self-Inspection

The employer shall, as provided for by the Ordinance of the Ministry of Health, Labor and Welfare, conduct self-inspection periodically. The employer shall keep the records of the results in respect to construction equipment such as tractor shovels and power shovels, etc., specified by Cabinet Order. (from Article 45, Industrial Safe and Health Act)

Ordinance on Industrial Safety and Hygiene

Periodical self-inspections Article 167

(1) The employer shall, as regards a vehicle type construction machine, carry out self-inspections for the following matters periodically once every period within a year. However, this shall not apply to the non-use period of a vehicle type construction machine, which is not used for a period exceeding 1 year.

(2) The employer shall, as regards a vehicle type construction machine set forth in the proviso of the preceding paragraph, carry out self-inspection for abnormalities in each part of a construction machine before resuming the operation.

Periodical self-inspections Article 168

(1) The employer shall, as regards a vehicle type construction machine, carry out self-inspections for the following matters periodically once every period within a month. However, this shall not apply to the non-use period of a vehicle type construction machine, which is not used for a period exceeding one month:

- (i) Abnormalities in a brake, a clutch, a controlling device, and working devices.
- (ii) Damage in a wire, rope, and a chain
- (iii) Damage in a bucket, a dipper, etc.

(2) The employer shall, as regards to the vehicle type construction machine set forth in the proviso of the preceding paragraph, carry out self-inspection for the matters listed in each item of the same paragraph before resuming the operation.

Record of Periodical Self-Inspections Article 169

The employer shall, when having carried out the self-inspections set forth in the preceding two Articles, record the results and retain the records for 3 years.

Specified Self-Inspection Article 169-2

The specified self-inspection pertaining to the vehicle type construction machine shall be the self-inspection (prescribed by Article 167) and carried out by qualified personnel. The employer shall, when having carried out the specified self-inspection pertaining to a vehicle type construction machine, affix an inspection sticker stating the month and year when the said specified self-inspection was carried out at a readily visible location of the said machine.

- Caterpillar Japan has a supporting program for self-inspection as a registered inspection agency. Qualified personnel and inspection equipment are available to help customers who do not conduct internal inspections or do not have time to conduct the specified self-inspections. Contact a Cat dealer near you for details.
- Maintenance and inspection record book for a record-saving purpose can be purchased at Caterpillar Japan.
- Penalty: Employer who fails to carry out self-inspections and to record the results will face a fine of up to five hundred thousand yen.

Checkup before Commencing the Work Article 170

The employer shall, when carrying out the work using a vehicle type construction machine, check functions of a brake and a clutch before commencing the work for the day.

Other Rules

Besides qualification for operating equipment and self inspections, the following obligations are set forth in the Industrial Safety and Health Act:

- To conduct health and safety training for new recruits and shop foremen.
- To appoint the operation leader or supervisor, and establish health and safety management system.
- To inform employees of a chain of command at the worksite, communication and signal rules, traveling route of equipment, speed limits, signs of restricted areas, etc. for securing safety in the workplace.

The Industrial Safety and Health Act further also set obligations related to mechanical structures and rental activities of equipment.

Safety comes before anything else. Establish a workplace where no injuries occur by observing the governing laws and by referring to this manual, specifically the descriptions on safety.

Construction Equipment and Environmental Laws

Prohibition of Emissions and Obligations to Recover Fluorocarbons

Law Concerning the Recovery and Destruction of Fluorocarbons (Enforcement date: April 1, 2015)

Being emitted into the atmosphere, Fluorocarbons, used as refrigerants of air conditioning, destroy the ozone layer and accelerate the global warming as a cause of environmental destruction. Follow the instructions below required by law when handling air conditioners to protect the global environment.

1. 1. Do not arbitrarily emit the encapsulated refrigerant installed on the product into the atmosphere.
2. 2. Recover the encapsulated refrigerant when disposing of the product.

Note: Violators of the law will face a maximum one-year imprisonment or a fine up to a maximum of five hundred thousand yen.

When you need to fill, recover a refrigerant or dispose of a product with an encapsulated refrigerant installed, please ask a filling-recovery operator registered with the government of the local prefecture as "class-1 filling-recovery operator." And carry out the simple inspection of air conditioner and keep the record.

Class-1 Specified products sold after October 1, 2015 shall have the label inside of the cab showing the type and quantity of refrigerant, GWP (Global Warming Potential), and precautions for use. (Refer to the fluorocarbon label in the OMM safety section)

Standard Certificate of Transfer

Dear Customers

Japan Construction Equipment Manufacturers Association

Standard Certificate of Transfer

Issued by the Japan Construction Equipment Manufacturers Association

Standard Certificate of Transfer issued by the Japan Construction Equipment Manufacturers Association proves the ownership of your equipment. Request us to issue the certificate as a proof of transfer of ownership.

Commercial transactions of construction equipment are generally made on a long-term installment plan basis with a special provision of reservation of ownership that the seller retains the ownership of the sold equipment until the buyer completely pays off the installments.

Ownership of some construction equipment can be proved with a vehicle inspection certificate, but the certificate is not issued for most of the equipment. Therefore, the buyer will need to present a third party with a proof of ownership of the sold equipment.

Japan Construction Equipment Manufacturers Association launched a system of standard certificate of transfer in 1971 to normalize trading in construction equipment and establishes a business practice relating to transfer of ownership. Customers are kindly requested to understand the intent of the system and request your seller to issue a certificate of transfer.

1. About the standard certificate of transfer

- a. Japan Construction Equipment Manufacturers Association (hereinafter referred to as CEMA) sets the rules and form of standard certificate of transfer (hereinafter referred to as certificate of transfer), and members of the CEMA issue the certificate of transfer. A certificate of transfer proves the ownership of equipment.

2. Purpose of issuance

- a. A certificate of transfer will be issued for the purpose of clarifying the ownership of equipment and preventing misconduct such as trades of stolen equipment or fraud.

3. Issuer

- a. A certificate of transfer will be issued by a distributor (Primary transferer) who sells new construction equipment and is authorized by the CEMA.

4. Eligibility

- a. A certificate of transfer will be issued for the equipment, which is sold by CEMA-member distributors and defined as construction equipment by the CEMA

5. Issuance

- a. A certificate of transfer will be issued and directly given to a buyer upon the buyer's request when he/she buys eligible equipment from an issuer.
- b. A certificate of transfer may not be issued for the equipment, which was sold as new merchandise more than 10 years ago.
- c. A certificate of transfer is not permitted to substitute a vehicle inspection certificate.

6. Prohibition of reissuance

- a. Certificate of transfer should be safely stored as it will not be reissued under any circumstances.

7. In case a certificate description runs out of space
- a. Discretionary page/s to the certificate will be valid with a tally seal of the issuer at the joint of two pages.

Contact CEMA-member companies or distributors for more details of the system.

Industrial Safety and Health Act

Article 164 (Extracted) of Industrial Safety and Health Act (Restriction on use Other Than Main Application)

Article 164

Business Operator must not use construction machineries of vehicle type for applications other than main application of the applicable construction machineries of vehicle type such as: lifting cargos by hydraulic excavator or lifting/lowering workers using the clamshell.

[2] The previous clause will not be applied for any of the following cases:

1. In performing cargo lifting, any one of the following may be applicable.
 - a. Cannot be avoided due to the nature of the work or necessary in view of performing work in safe.
 - b. When working with attachments installed for metals of hook or shackle etc or other devices for lifting application applicable to any one of the following as implements for boom or bucket etc
 - Enough strength is retained bearable for loads to be applied.
 - Load lifted up is not feared to be dropped from the applicable instrument used, due to provided locking device is in use or etc.
 - Load not feared of disengaging from the implement.
2. In performing work other than cargo lifting, nothing is feared to do harm to the workers.

[3] The business operator must take the following measures, in performing cargo lifting work applicable to Items 1a and 1b of Step 1 above. To prevent any danger of workers from contact with lifted cargo, drop of lifted cargo or turnover or falling down of construction machineries of vehicle type.

1. Designate one person who issues a sign as well as setting up fixed signs related to cargo lifting work, and follow his signs.
2. Perform work on a flat ground.
3. Keep any worker away from any place where is feared to cause any danger to worker due to contact with a cargo or drop of lifted cargo.

[4] Do not perform any work applying load exceeding the allowed rated max load specified according to structure or materials of the applicable construction machineries of the vehicle type.

[5] In using wire rope in slinging device, use wire rope applicable to every item of the followings.

- Safety coefficient is 6 or more. (The safety coefficient here must be the same as specified in Article 213 item 2 in Safety Rules on Crane Works (Article 34 in Ordinance of Ministry of Labor, 1972) etc. Hereinafter called as "Crane Rules")
- Among wire rope 1 strands, numbers of cut strands (other than filler) are less than 10%.
- Reduction of diameter is 7% or less than nominal diameter.
- Free from kinking.
- Free from badly collapse and corrosion.

[6] In using lifting chain as slinging device, the chain is applicable to every item of the followings.

- Safety coefficient is 5 or more.
- Elongation is 5% or less than the length when the applicable lifting chain was fabricated.
- Reduction of diameter of the cross section of link is 10% or less than diameter of cross section of the applicable link when the applicable lifting chain was manufactured.
- Free from cracks.

[7] In using those other than wire rope and lifting chain as slinging device, they must be free from bad damage and corrosion.

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Specifications

SMCS Code: 7000

Intended Use

The intended use of this machine is for excavating with a bucket or working with approved work tools. The machine should be operated with the undercarriage in a stationary position since the upper structure is normally capable of 360 degree swing with mounted equipment. This machine can be used in object handling applications that are within the lift capacity of the machine. When this machine is used in object handling applications, ensure that the machine is properly configured and operated properly. Obey any local governmental regulations and regional governmental regulations. Only lift objects from approved lifting points and with approved lifting devices.

Expected Life

The expected life, defined as total machine hours, of this machine is dependent upon many factors including the machine owner's desire to rebuild the machine back to factory specifications. The expected life interval of this machine is 10,000 service hours. The expected life interval corresponds to the service hours to engine overhaul or replacement. Service hours to engine overhaul or replacement may vary based on overall machine duty cycle. At the expected life interval, remove the machine from operation and consult your Cat dealer for inspect, repair, rebuild, install remanufactured, install new components, or disposal options and to establish a new expected life interval. If a decision is made to remove this machine from service, refer to Operation and Maintenance Manual, "Decommissioning and Disposal".

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

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

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

Application/Configuration Restrictions

The maximum travel operating slope for machine lubrication is 35 degrees.

The operator station is ROPS certified up to a mass of 27800 kg (61288 lb) per ISO 12117-2:2008.

Specification Data

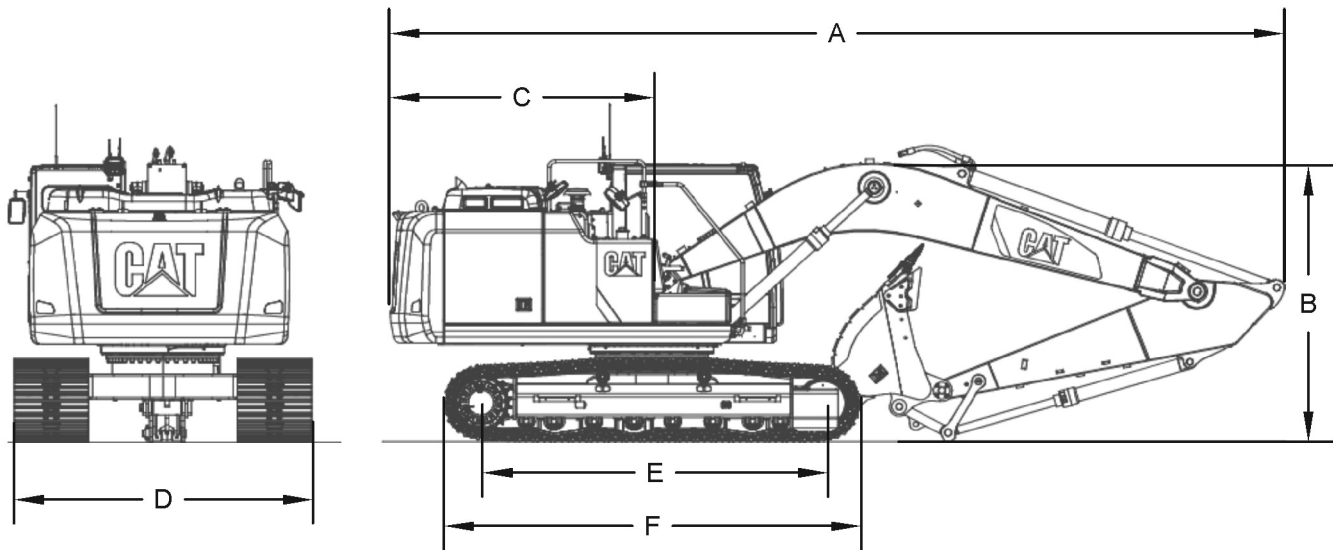


Illustration 66

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Table 4

323F Specifications							
Boom		Reach Boom			Variable Angle Boom		SLR Boom
Stick		3.9 m (12 ft 10 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	6.28 m (20 ft 7 inch)
Bucket		0.81 m ³ (1.06 yd ³)	1.19 m ³ (1.56 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	0.57 m ³ (0.75 yd ³)
Shipping Weight		24998 kg ⁽¹⁾ (55111 Lb) ⁽¹⁾	23096 kg ⁽²⁾ (50918 Lb) ⁽²⁾	23064 kg ⁽³⁾ (50847 Lb) ⁽³⁾	23953 kg ⁽³⁾ (52807 Lb) ⁽³⁾	23937 kg ⁽³⁾ (52772 Lb) ⁽³⁾	24218 kg ⁽³⁾ (53392 Lb) ⁽³⁾
Overall Length (A)		9340 mm (30 ft 8 inch)	9540 mm (31 ft 4 inch)	9450 mm (31 ft 0 inch)	9780 mm (32 ft 1 inch)	9820 mm (32 ft 3 inch)	12750 mm (41 ft 10 inch)
Overall Height (B)		3450 mm (11 ft 4 inch)	3130 mm (10 ft 3 inch)	3050 mm (10 ft 0 inch)	2970 mm (9 ft 9 inch)	3020 mm (9 ft 11 inch)	3210 mm (10 ft 6 inch)
Swing Radius (C)		2830 mm (9 ft 3 inch)	2830 mm (9 ft 3 inch)	2830 mm (9 ft 3 inch)	2830 mm (9 ft 3 inch)	2830 mm (9 ft 3 inch)	2830 mm (9 ft 3 inch)
Overall Width (D)	600 mm (24 inch)	2980 mm (9 ft 9 inch)	2980 mm (9 ft 9 inch)	2980 mm (9 ft 9 inch)	2980 mm (9 ft 9 inch)	2980 mm (9 ft 9 inch)	2980 mm (9 ft 9 inch)
	700 mm (30 inch)		3080 mm (10 ft 1 inch)	3080 mm (10 ft 1 inch)	3080 mm (10 ft 1 inch)	3080 mm (10 ft 1 inch)	3080 mm (10 ft 1 inch)
	790 mm (31 inch)	3170 mm (10 ft 5 inch)	3170 mm (10 ft 5 inch)	3170 mm (10 ft 5 inch)	3170 mm (10 ft 5 inch)	3170 mm (10 ft 5 inch)	3170 mm (10 ft 5 inch)

(continued)

Product Information Section
Specifications

(Table 4, contd)

323F Specifications						
Boom	Reach Boom			Variable Angle Boom		SLR Boom
Stick	3.9 m (12 ft 10 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	6.28 m (20 ft 7 inch)
Bucket	0.81 m ³ (1.06 yd ³)	1.19 m ³ (1.56 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	0.57 m ³ (0.75 yd ³)
Length to centers of rollers (E)	3650 mm (12 ft 0 inch)	3650 mm (12 ft 0 inch)	3650 mm (12 ft 0 inch)	3650 mm (12 ft 0 inch)	3650 mm (12 ft 0 inch)	3650 mm (12 ft 0 inch)
Length of Track (F)	4460 mm (14 ft 8 inch)	4460 mm (14 ft 8 inch)	4460 mm (14 ft 8 inch)	4460 mm (14 ft 8 inch)	4460 mm (14 ft 8 inch)	4460 mm (14 ft 8 inch)

- (1) Equipped with 790 mm (31 inch) HD Triple Grouser Track
 (2) Equipped with 790 mm (31 inch) Triple Grouser Track
 (3) Equipped with 700 mm (30 inch) HD Triple Grouser Track

Working Ranges

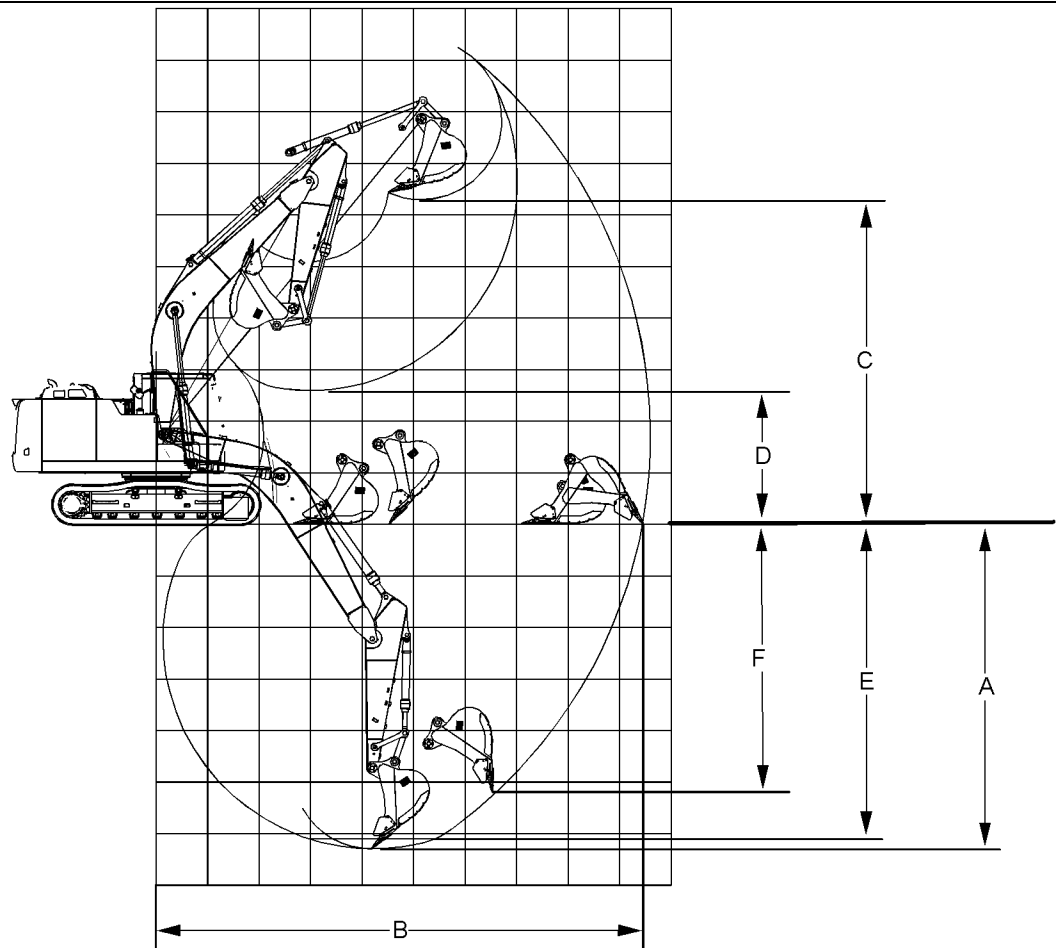


Illustration 67

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Table 5

323F Specifications						
Boom	Reach Boom			Variable Angle Boom		SLR Boom
Stick	3.9 m (12 ft 10 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	2.95 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	6.28 m (20 ft 7 inch)
Bucket	0.81 m ³ (1.06 yd ³)	1.19 m ³ (1.56 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	0.57 m ³ (0.75 yd ³)
Maximum Digging Depth (A)	7580 mm (24 ft 10 inch)	6720 mm (22 ft 1 inch)	6290 mm (20 ft 8 inch)	6680 mm (21 ft 11 inch)	6270 mm (20 ft 7 inch)	11690 mm (38 ft 4 inch)
Maximum Reach at Ground Level (B)	10680 mm (35 ft 1 inch)	9860 mm (32 ft 4 inch)	9450 mm (31 ft 0 inch)	10200 mm (33 ft 6 inch)	9800 mm (32 ft 2 inch)	15720 mm (51 ft 7 inch)
Maximum Loading Height (C)	7030 mm (23 ft 1 inch)	6490 mm (21 ft 4 inch)	6300 mm (20 ft 8 inch)	8410 mm (27 ft 7 inch)	8070 mm (26 ft 6 inch)	11290 mm (37 ft 1 inch)

(continued)

(Table 5, contd)

323F Specifications						
Boom	Reach Boom			Variable Angle Boom		SLR Boom
Stick	3.9 m (12 ft 10 inch)	2.9 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	2.95 m (9 ft 6 inch)	2.5 m (8 ft 2 inch)	6.28 m (20 ft 7 inch)
Bucket	0.81 m ³ (1.06 yd ³)	1.19 m ³ (1.56 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	1.3 m ³ (1.70 yd ³)	0.57 m ³ (0.75 yd ³)
Minimum Loading Height (D)	1310 mm (4 ft 4 inch)	2170 mm (7 ft 1 inch)	2600 mm (8 ft 6 inch)	3270 mm (10 ft 9 inch)	3670 mm (12 ft 1 inch)	2090 mm (6 ft 10 inch)
Maximum Cut Depth (E) ⁽¹⁾	7440 mm (24 ft 5 inch)	6550 mm (21 ft 6 inch)	6100 mm (20 ft 0 inch)	6580 mm (21 ft 7 inch)	6170 mm (20 ft 3 inch)	11280 mm (37 ft 0 inch)
Maximum Digging Depth (Vertical wall) (F)	6910 mm (22 ft 8 inch)	5060 mm (16 ft 7 inch)	5210 mm (17 ft 1 inch)	5290 mm (17 ft 4 inch)	4890 mm (16 ft 1 inch)	10670 mm (35 ft 0 inch)

⁽¹⁾ 2440 mm (8 ft) level bottom

i06547274

Boom/Stick/Bucket Combinations

SMCS Code: 6000; 6700

This machine can be equipped with a large variety of boom-stick-bucket combinations in order to meet the needs of various applications.

Buckets are grouped into different families by capacity. As a rule, use a bucket with a smaller capacity when you are using a longer stick and/or a longer boom. Conversely, use a bucket with a larger capacity when you are using a shorter stick and/or a shorter boom. This rule ensures better machine stability and protection against structural machine damage.

A stick is designed to match only one specific family of buckets.

Note: The selection of a compatible boom-stick-bucket combination is a guide. Work tools, uneven ground conditions, soft ground conditions, or poor ground conditions have effects on machine performance. The operator is responsible for being aware of these effects.

Consult your Cat dealer for information on selecting the correct boom-stick-bucket combination.

The following tables show various compatible boom-stick-bucket combinations. Select an optimum combination according to the working conditions and according to the type of work that is being done.

Without Quick Coupler

Table 6

323F L Excavator without a quick coupler												
Bucket Type	Link-age	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
General Duty (GD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	549 kg (1210 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	620 kg (1366 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	666 kg (1468 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	800 kg (1763 lb)		(1)	(1)	(1)	(1)	(1)	(2)	
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	832 kg (1833 lb)		(1)	(2)	(2)	(1)	(1)	(2)	(3)
General Duty (GDC)	B	600 mm (24 inch)	0.55 m ³ (0.72 yd ³)	618 kg (1363 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.75 m ³ (0.98 yd ³)	710 kg (1566 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.95 m ³ (1.24 yd ³)	786 kg (1733 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1050 mm (42 inch)	1.16 m ³ (1.52 yd ³)	847 kg (1867 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1200 mm (48 inch)	1.38 m ³ (1.80 yd ³)	925 kg (2038 lb)		(2)	(2)	(2)	(1)	(1)	(2)	(3)
Heavy Duty (HD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	649 kg (1430 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	747 kg (1647 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	825 kg (1818 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 6, contd)

323F L Excavator without a quick coupler												
Bucket Type	Link-age	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	879 kg (1937 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	906 kg (1998 lb)		(1)	(1)	(1)	(1)	(1)	(2)	(2)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	917 kg (2021 lb)		(1)	(2)	(1)	(1)	(1)	(2)	(3)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	970 kg (2138 lb)		(1)	(2)	(1)	(1)	(1)	(2)	(3)
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	960 kg (2117 lb)		(2)	(2)	(2)	(1)	(1)	(2)	(3)
Severe Duty (SD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	693 kg (1527 lb)	90	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	801 kg (1765 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	887 kg (1955 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	962 kg (2121 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	1051 kg (2316 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	1000 kg (2204 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(2)
Super Long reach	A	900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	403 kg (888 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)

(1) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.(2) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.(3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

Table 7

323F L Excavator without a quick coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4700 kg (10362 lb) Counterweight	
						Super Long Reach Boom	
						6300 mm (20 ft 8 inch) Stick	
						600 mm (24 inch) Track	790 mm (31 inch) Track
Super Long reach	A	900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	403 kg (888 lb)	100	(1)	(1)

(1) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

With Pin Grabber Coupler

Table 8

323F L Excavator with pin grabber coupler												
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
General Duty (GD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	549 kg (1210 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	546 kg (1204 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	620 kg (1366 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	617 kg (1361 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	666 kg (1468 lb)		(1)	(1)	(1)	(1)	(1)	(1)	

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 8, contd)

323F L Excavator with pin grabber coupler												
Bucket Type	Link-age	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
General Duty (GDC)	B	1000 mm (39 inch)	0.93 m ³ (1.22 yd ³)	710 kg (1566 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	731 kg (1611 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	800 kg (1763 lb)		(2)	(2)	(2)	(1)	(1)	(2)	(3)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	799 kg (1761 lb)		(2)	(2)	(2)	(1)	(1)	(2)	(3)
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	832 kg (1833 lb)		(2)	(3)	(3)	(1)	(2)	(3)	(4)
		1400 mm (55 inch)	1.43 m ³ (1.87 yd ³)	867 kg (1910 lb)		(3)	(4)	(3)	(2)	(2)	(4)	(4)
		1400 mm (55 inch)	1.43 m ³ (1.87 yd ³)	866 kg (1909 lb)		(3)	(4)	(3)	(2)	(2)	(4)	(4)
General Duty (GDC)	B	600 mm (24 inch)	0.55 m ³ (0.72 yd ³)	618 kg (1363 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.75 m ³ (0.98 yd ³)	710 kg (1566 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.95 m ³ (1.24 yd ³)	786 kg (1733 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1050 mm (42 inch)	1.16 m ³ (1.52 yd ³)	847 kg (1867 lb)		(2)	(2)	(2)	(1)	(1)	(2)	(3)
		1200 mm (48 inch)	1.38 m ³ (1.80 yd ³)	925 kg (2038 lb)		(3)	(4)	(3)	(2)	(2)	(4)	(4)
		1350 mm (54 inch)	1.59 m ³ (2.08 yd ³)	1002 kg (2209 lb)		(4)	(4)	(4)	(3)	(3)	(4)	(5)
Heavy Duty (HD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	649 kg (1430 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)

(continued)

(Table 8, contd)

323F L Excavator with pin grabber coupler												
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
		600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	629 kg (1386 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	747 kg (1647 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	728 kg (1605 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	825 kg (1818 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	806 kg (1775 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	879 kg (1937 lb)		(1)	(1)	(1)	(1)	(1)	(2)	(3)
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	860 kg (1895 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(3)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	906 kg (1998 lb)		(2)	(3)	(2)	(1)	(1)	(3)	(4)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	917 kg (2021 lb)		(2)	(3)	(2)	(1)	(1)	(3)	(4)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	970 kg (2138 lb)		(2)	(3)	(3)	(1)	(2)	(3)	(4)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	916 kg (2018 lb)		(2)	(3)	(2)	(1)	(1)	(3)	(4)
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	960 kg (2117 lb)		(3)	(3)	(3)	(1)	(2)	(3)	(4)
		1350 mm (54 inch)	1.38 m ³ (1.81 yd ³)	1018 kg (2244 lb)		(3)	(4)	(4)	(2)	(3)	(4)	(5)
		1350 mm (54 inch)	1.38 m ³ (1.81 yd ³)	1018 kg (2244 lb)		(3)	(4)	(4)	(2)	(3)	(4)	(5)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 8, contd)

323F L Excavator with pin grabber coupler													
Bucket Type	Link-age	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight	
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom	
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick	
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track		
		1500 mm (60 inch)	1.58 m ³ (2.06 yd ³)	1079 kg (2378 lb)		(3)	(4)	(4)	(2)	(3)	(4)	(5)	
		1500 mm (60 inch)	1.58 m ³ (2.06 yd ³)	1079 kg (2378 lb)		(4)	(4)	(4)	(3)	(3)	(5)	(5)	
Severe Duty (SD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	693 kg (1527 lb)	90	(1)	(1)	(1)	(1)	(1)	(1)	(1)	
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	801 kg (1765 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	887 kg (1955 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	868 kg (1913 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	
		1050 mm (42 inch)	1.00 m ³ (1.31 yd ³)	962 kg (2121 lb)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	1051 kg (2316 lb)		(2)	(3)	(2)	(1)	(1)	(1)	(3)	(4)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	1000 kg (2204 lb)		(2)	(2)	(2)	(1)	(1)	(1)	(2)	(3)

(1) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.

(2) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.

(3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

(4) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.

(5) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

With Quick Coupler (CW40, CW40s)

Table 9

323F L Excavator with a quick coupler												
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	4100 kg (9039 lb) Counterweight			5350 kg (11795 lb) Counterweight			4100 kg (9039 lb) Counterweight
						5.7 m (18 ft 8 inch) Boom			5.7 m (18 ft 8 inch) Heavy Lift Boom			VA Boom
						2.5 m (8 ft 2 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Stick	2.9 m (9 ft 6 inch) Thumb Ready Stick	3.9 m (12 ft 10 inch) Stick	2.9 m (9 ft 6 inch) Stick
						600 mm (24 inch) Track		790 mm (31 inch) Track	790 mm (31 inch) Track		600 mm (24 inch) Track	
General Duty (GDC)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	502 kg (1106 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		750 mm (30 inch)	0.64 m ³ (0.84 yd ³)	587 kg (1293 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		900 mm (36 inch)	0.81 m ³ (1.06 yd ³)	653 kg (1439 lb)		(1)	(1)	(1)	(1)	(1)	(1)	
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	767 kg (1690 lb)		(1)	(2)	(2)	(1)	(1)	(2)	(3)
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	798 kg (1758 lb)		(2)	(2)	(2)	(1)	(1)	(3)	(3)
		1400 mm (55 inch)	1.43 m ³ (1.87 yd ³)	834 kg (1838 lb)		(2)	(3)	(3)	(1)	(2)	(3)	(4)
Heavy Duty (HD)	B	600 mm (24 inch)	0.46 m ³ (0.61 yd ³)	584 kg (1286 lb)	100	(1)	(1)	(1)	(1)	(1)	(1)	(1)
		1200 mm (48 inch)	1.19 m ³ (1.56 yd ³)	873 kg (1924 lb)		(1)	(2)	(2)	(1)	(1)	(2)	(3)
		1300 mm (51 inch)	1.30 m ³ (1.71 yd ³)	927 kg (2044 lb)		(2)	(3)	(3)	(1)	(2)	(3)	(4)

(1) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.
 (2) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.
 (3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.
 (4) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.

i08066605

Lifting Capacities

SMCS Code: 7000

WARNING

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

There may be local regulations and/or government regulations that govern the use of excavators which lift heavy objects. Obey all local and government regulations.

Lifting capacities should be used as a guide. Work tools, uneven ground conditions, soft ground conditions, or poor ground conditions have effects on lifting capacities. The operator is responsible for being aware of these effects.

The lifting capacities are defined by "ISO 10567 2007". The lifting capacities are defined as the lower value of 75% of the static tipping capacity or 87% of the hydraulic lift capacity.

Note: Lifting capacities are based upon a standard machine with the following conditions:

- Lift point: Stick nose without bucket
- Lubricants full
- Fuel tank full
- Steel track
- Complete cab with a 75 kg (165 lb) operator

Lifting capacities will vary with different work tools and attachments. The weight of a work tool attachment must be subtracted from the lift capacity. Consult your Cat dealer regarding the lifting capacities for specific work tools and attachments.

This machine may be equipped with various sticks. Lifting capacities may vary between the different sticks. Measure the distance on the stick between the boom hinge pin and the work tool hinge pin. This distance will inform you of the size of the stick that is equipped on the machine.

Use the lifting eye that is provided on the stick nose in order to lift objects. When the lifting eye is used, the connection must be made with a sling or shackle.

Note: Japan regulations require a shovel crane configuration in order to lift certain objects. A shovel crane has a rated load capacity, therefore, the lift capacities discussed below do not apply to a shovel crane configuration. Contact your Cat dealer for additional information.

Note: In European countries, regulations require a load sensing indicator and a boom and stick lowering control device if more than 1000 kg (2200 lb) is lifted during object handling applications. Regulations also require a load sensing indicator and a boom lowering control device if a force that is greater than 40000 N·m (29500 lb ft) is created during object handling applications. Even if the hydraulic lift capacity is capable, do not exceed a load of 1000 kg (2200 lb). Do not exceed a force of 40000 N·m (29500 lb ft) in European object handling applications.

Symbols Found in the Lifting Capacity Charts

Below are symbols that are commonly found on lifting capacity charts for track excavators.

Note: Depending on the machine configuration, some symbols may not be used.

(mm)
(inch) **Measurements are provided in millimeters and inches**



Lift Capacities are provided in kilograms and pounds



Load is limited by hydraulic lifting capacity rather than by a tipping load



Lift point radius



Lift point height



Lifting capacity over the front of the machine



Lifting capacity over the side of the machine



Heavy Lift ON

Reach Boom with a 4100 kg (9039 lb) Counterweight

2.9 m (9 ft 6 inch) Stick

Product Information Section
Lifting Capacities

600 mm (24 inch) Triple Grouser Track

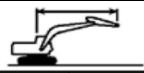












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4550	* 4550			* 3900	* 3900	6150
6000 240							* 4950	* 4950			* 3650	* 3650	7290
4500 180							* 10900	* 10900			* 8000	* 8000	290
3000 120					* 8000	* 8000	* 6250	5300	* 5450	3850	* 3550	* 3550	7990
1500 60					* 17150	* 17150	* 13600	11450	* 11850	* 11850	* 11250	8450	320
0					* 9650	7600	* 7100	5100	5750	3750	* 3850	3150	8360
0			* 6200	* 6200	* 10600	7300	* 7700	4950	5650	3650	* 8500	6950	340
-1500 -60	* 6650	* 6650	* 10750	* 10750	* 10700	7250	7750	4850	5650	3650	* 4250	3200	8260
-3000 -120	* 14850	* 14850	* 24400	* 24400	* 23150	15550	16700	10450	12150	7800	* 9400	7050	330
-4500 -180	* 11400	* 11400	* 14150	14050	* 10000	7300	* 7450	4900			* 5000	3450	7780
	* 25600	* 25600	* 30700	30050	* 21600	15700	* 15950	10500			* 11050	7600	310
			* 11300	* 11300	* 8150	7500					* 6100	4050	6950
			* 24200	* 24200	* 17300	16150					* 13400	8950	280
											* 6150	5550	5600
											* 13500	12500	220

Illustration 68

g03731902

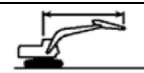












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4950	* 4950			* 4300	* 4300	6150
6000 240							* 5450	* 5450			* 3950	* 3950	7290
4500 180							* 12000	* 12000			* 8750	* 8750	290
3000 120							* 6000	5550	* 5650	3950	* 3900	3550	7990
1500 60							* 13100	11950	* 12450	8450	* 8550	7900	320
0					* 8800	8050	* 6900	5300	5900	3850	* 4000	3250	8360
0			* 6600	* 6600	* 11650	7300	7850	4950	5650	3650	* 8750	7200	330
-1500 -60	* 7050	* 7050	* 11400	* 11400	* 11800	7250	7750	4850	5650	3650	* 4650	3200	8260
-3000 -120	* 15750	* 15750	* 25850	* 25850	* 25500	15550	16700	10450	12150	7800	* 10250	7050	330
-4500 -180	* 12100	* 12100	* 15600	14050	* 11050	7300	7800	4900			* 5350	3450	7780
	* 27100	* 27100	* 33850	30050	* 23850	15700	16750	10500			11850	7600	310
			* 12500	* 12500	* 9000	7500					* 6350	4050	6950
			* 26750	* 26750	* 19100	16150					14050	8950	280
											* 6800	5550	5600
											* 14950	12500	220

Illustration 69

g03731918

Product Information Section
Lifting Capacities

790 mm (31 inch) Triple Grouser Track


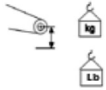











(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4550	* 4550			* 3900	* 3900	6150
6000 240							* 4950	* 4950			* 3650	* 3650	7290
4500 180							* 10900	* 10900			* 8000	* 8000	290
3000 120					* 8000	* 8000	* 6250	5450	* 5450	3950	* 3650	3350	8360
1500 60					* 17150	* 17150	* 13600	11750	* 11900	8500	* 8000	7400	330
0					* 9650	7800	* 7100	5250	* 5900	3850	* 3850	3250	8450
0			* 6200	* 6200	* 10600	7500	* 7700	5050	5850	3750	* 4250	3300	8260
-1500 -60	* 6650	* 6650	* 10750	* 10750	* 10700	7450	* 7900	5000	5800	3750	* 5000	3550	7780
-3000 -120	* 14850	* 14850	* 24400	* 24400	* 23150	16000	* 17100	10750	12500	8050	* 11050	7850	310
-4500 -180	* 11400	* 11400	* 14150	* 14150	* 10000	7500	* 7450	5000			* 6100	4150	6950
	* 25600	* 25600	* 30700	* 30700	* 21600	16100	* 15950	10800			* 13400	9200	280
			* 11300	* 11300	* 8150	7700					* 6150	5700	5600
			* 24200	* 24200	* 17300	16550					* 13500	12800	220

Illustration 70

g03731904

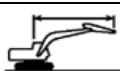












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4950	* 4950			* 4300	* 4300	6150
6000 240							* 5450	* 5450			* 3950	* 3950	7290
4500 180							* 12000	* 12000			* 8750	* 8750	290
3000 120					* 6000	5700	* 5650	4050	* 5650	4050	* 3900	3650	7990
1500 60					* 13100	12200	* 12450	8650	* 8550	8100	* 8550	8100	320
0					* 8800	8250	* 6900	5450	* 6050	3950	* 4000	3350	8360
0			* 6600	* 6600	* 11650	7500	8050	5050	5850	3750	* 4650	3300	8260
-1500 -60	* 7050	* 7050	* 11400	* 11400	* 11800	7450	8000	5000	5800	3750	* 5500	3550	7780
-3000 -120	* 15750	* 15750	* 25850	* 25850	* 25500	16000	17150	10750	12500	8050	* 12100	7850	310
-4500 -180	* 12100	* 12100	* 15600	14400	* 11050	7500	8000	5000			6500	4150	6950
	* 27100	* 27100	* 33850	30850	* 23850	16100	17250	10800			14450	9200	280
			* 12500	* 12500	* 9000	7700					* 6800	5700	5600
			* 26750	* 26750	* 19100	16550					* 14950	12800	220

Illustration 71

g03731919

**Heavy Lift Reach Boom with a
5350 kg (11795 lb) Counterweight**

3.9 m (12 ft 10 inch) Heavy Lift Stick

790 mm (31 inch) Triple Grouser Track
















(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				(mm) (inch)	
																
7500 300														* 2700	* 2700	7320
														* 6000	* 6000	290
6000 240									* 4200	* 4200				* 2550	* 2550	8300
									* 8750	* 8750				* 5600	* 5600	330
4500 180									* 4800	4750				* 2500	* 2500	8920
									* 10500	10150				* 5500	* 5500	350
3000 120					* 7150	* 7150	* 5900	* 5900	* 5300	4600	* 3500	3500		* 2550	* 2550	9250
					* 15450	* 15450	* 12850	* 12850	* 11500	9850	* 6500	* 6500		* 5550	* 5550	370
1500 60			* 9250	* 9250	* 9300	9150	* 7000	6100	* 5850	4450	* 4050	3400		* 2650	* 2650	9330
			* 22000	* 22000	* 20000	19700	* 15150	13100	* 12750	9550	* 7750	7300		* 5850	* 5850	370
0			* 7600	* 7600	* 10800	8700	* 7900	5850	* 6350	4300	* 3800	3350		* 2900	* 2900	9160
			* 17400	* 17400	* 23400	18750	* 17100	12600	* 13800	9250	* 6600	* 6600		* 6400	* 6400	360
-1500 -60	* 5700	* 5700	* 9800	* 9800	* 11500	8500	* 8400	5700	6500	4250				* 3300	* 3300	8730
	* 12700	* 12700	* 22250	* 22250	* 24850	18300	* 18200	12300	14050	9100				* 7300	* 7300	350
-3000 -120	* 8900	* 8900	* 13600	* 13600	* 11350	8500	* 8350	5650	* 6450	4200				* 4050	3900	8000
	* 19900	* 19900	* 30900	* 30900	* 24500	18250	* 18050	12200	* 13850	9100				* 8950	8600	320
-4500 -180	* 12900	* 12900	* 14700	* 14700	* 10200	8600	* 7500	5750						* 5650	4850	6870
	* 29050	* 29050	* 31650	* 31650	* 21950	18500	* 15950	12400						* 12650	10800	270
-6000					* 7250	* 7250								* 6400	* 6400	4910

Illustration 72

g03731907

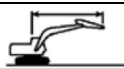














(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				(mm) (inch)	
																
7500 300														* 3000	* 3000	7320
														* 6600	* 6600	290
6000 240									* 4600	* 4600				* 2800	* 2800	8300
									* 9600	* 9600				* 6150	* 6150	330
4500 180									* 5300	4750				* 2750	* 2750	8920
									* 11650	10150				* 6050	* 6050	350
3000 120					* 7900	* 7900	* 6550	6400	* 5850	4600	* 3850	3500		* 2800	* 2800	9250
					* 17000	* 17000	* 14200	13700	* 12750	9850	* 7150	* 7150		* 6150	* 6150	370
1500 60			* 9800	* 9800	* 10250	9150	* 7750	6100	* 6500	4450	* 4450	3400		* 2950	* 2950	9330
			* 23300	* 23300	* 22050	19700	* 16750	13100	* 14100	9550	* 8500	7300		* 6450	* 6450	370
0			* 8050	* 8050	* 11950	8700	* 8700	5850	6600	4300	* 4150	3350		* 3200	* 3200	9160
			* 18450	* 18450	* 25800	18750	* 18900	12600	14200	9250	* 7250	7200		* 7050	* 7050	360
-1500 -60	* 6050	* 6050	* 10400	* 10400	* 12700	8500	9000	5700	6500	4250				* 3650	3450	8730
	* 13500	* 13500	* 23550	* 23550	* 27450	18300	19350	12300	14050	9100				* 8000	7650	350
-3000 -120	* 9400	* 9400	* 14400	* 14400	* 12500	8500	8950	5650	6500	4200				* 4450	3900	8000
	* 21050	* 21050	* 32750	* 32750	* 27050	18250	19300	12200	14050	9100				* 9850	8600	320
-4500 -180	* 13650	* 13650	* 16250	* 16250	* 11300	8600	* 8300	5750						* 6150	4850	6870
	* 30750	* 30750	* 34950	* 34950	* 24250	18500	* 17650	12400						* 13850	10800	270
-6000					* 8050	* 8050								* 7100	* 7100	4910

Illustration 73

g03731932

2.9 m (9 ft 6 inch) Heavy Lift Stick

Product Information Section
Lifting Capacities

790 mm (31 inch) Triple Grouser Track


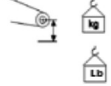







(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4550	* 4550			* 3900	* 3900	6150
6000 240							* 5450	* 5450			* 3650	* 3650	7290
4500 180							* 11950	* 11950			* 8000	* 8000	290
3000 120					* 8750	* 8750	* 6900	6350	* 6000	4600	* 3550	* 3550	7990
1500 60					* 13050	* 13050	* 11400	10150	* 7850	* 7850	* 3650	* 3650	8360
0 0					* 10600	9100	* 6500	4500	* 8000	* 8000	* 8000	* 8000	330
-1500 -60	* 6200	* 6200	* 11650	8800	* 22900	19550	* 16950	13150	* 14050	9700	* 3850	3850	8450
-3000 -120	* 6200	* 6200	* 11650	8800	* 22900	19550	* 16950	13150	* 14050	9700	* 8500	8400	340
-4500 -180	* 14300	* 14300	* 25150	18950	* 18400	12800	14450	9500	* 4250	3900	* 9400	8550	8260
-1500 -60	* 6650	* 6650	* 10750	* 10750	* 11750	8700	* 8700	5850	6700	4400	* 5000	4200	7780
-3000 -120	* 14850	* 14850	* 24400	* 24400	* 25400	18750	* 18800	12650	14400	9450	* 11050	9250	310
-4500 -180	* 11400	* 11400	* 15550	* 15550	* 11000	8750	* 8150	5900			* 6500	4900	6950
-1500 -60	* 25600	* 25600	* 33700	* 33700	* 23750	18850	* 17550	12700			* 14450	10850	280
-3000 -120			* 12450	* 12450	* 8950	* 8950					* 6750	6650	5600
-4500 -180			* 26600	* 26600	* 19050	* 19050					* 14850	* 14850	220

Illustration 74

g03731909










(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4950	* 4950			* 4300	* 4300	6150
6000 240							* 6000	* 6000			* 3950	* 3950	7290
4500 180							* 13150	* 13150			* 8750	* 8750	290
3000 120					* 6600	6550	* 6200	4700	* 3900	* 3900	* 3900	* 3900	7990
1500 60					* 14350	14150	* 12450	10150	* 8550	* 8550	* 3900	* 3900	8360
0 0					* 9650	9550	* 7600	6350	* 6650	4600	* 4000	3950	8360
-1500 -60	* 6600	* 6600	* 12800	8800	* 20750	20600	* 16450	13650	* 14450	9950	* 8750	8700	330
-3000 -120	* 6600	* 6600	* 12800	8800	* 20750	20600	* 16450	13650	* 14450	9950	* 8750	8700	330
-4500 -180	* 15150	* 15150	* 27700	18950	* 11700	9100	* 8600	6100	6800	4500	* 4200	3850	8450
-1500 -60	* 6600	* 6600	* 12800	8800	* 25200	19550	* 18650	13150	14650	9700	* 9250	8400	340
-3000 -120	* 7050	* 7050	* 11400	* 11400	* 12950	8700	9150	5850	6700	4400	* 4650	3900	8260
-4500 -180	* 15750	* 15750	* 25850	* 25850	* 28000	18750	19700	12650	14400	9450	* 10250	8550	330
-1500 -60	* 12100	* 12100	* 17150	16800	* 12100	8750	* 9000	5900			* 5500	4200	7780
-3000 -120	* 27100	* 27100	* 37150	36000	* 26200	18850	* 19400	12700			* 12100	9250	310
-4500 -180			* 13700	* 13700	* 9900	8950					* 7100	4900	6950
-1500 -60			* 29400	* 29400	* 21050	19300					* 15800	10850	280
-3000 -120			* 13700	* 13700	* 9900	8950					* 7500	6650	5600
-4500 -180			* 29400	* 29400	* 21050	19300					* 16450	14950	220

Illustration 75

g03731933

2.9 m (9 ft 6 inch) Thumb Ready Stick

790 mm (31 inch) Triple Grouser Track

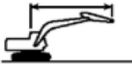












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4450	* 4450			* 3850	* 3850	6150
											* 8550	* 8550	240
6000 240							* 5300	* 5300			* 3550	* 3550	7290
							* 11600	* 11600			* 7850	* 7850	290
4500 180							* 5800	* 5800	* 5450	4550	* 3500	* 3500	7990
							* 12650	* 12650	* 11250	9800	* 7700	* 7700	320
3000 120					* 8500	* 8500	* 6700	6150	* 5850	4450	* 3550	* 3550	8360
					* 18350	* 18350	* 14500	13300	* 12700	9600	* 7850	* 7850	330
1500 60					* 10300	8800	* 7600	5900	* 6250	4350	* 3800	3650	8450
					* 22250	19000	* 16450	12750	* 13600	9350	* 8300	8050	340
0 0			* 6150	* 6150	* 11300	8500	* 8250	5750	6550	4250	* 4200	3750	8260
			* 14150	* 14150	* 24450	18350	* 17850	12350	14050	9150	* 9200	8200	330
-1500 -60	* 6600	* 6600	* 10700	* 10700	* 11450	8450	* 8450	5650	6500	4200	* 4950	4050	7780
	* 14700	* 14700	* 24300	* 24300	* 24750	18150	* 18250	12150	14000	9100	* 10900	8850	310
-3000 -120	* 11350	* 11350	* 15150	* 15150	* 10700	8500	* 7950	5700			* 6400	4700	6950
	* 25450	* 25450	* 32850	* 32850	* 23100	18300	* 17050	12250			* 14250	10450	280
-4500 -180			* 12100	* 12100	* 8700	* 8700					* 6550	6450	5600
			* 25850	* 25850	* 18450	* 18450					* 14400	* 14400	220

Illustration 76

g03731910

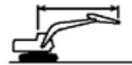












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)
													
7500 300							* 4900	* 4900			* 4200	* 4200	6150
											* 9350	* 9350	240
6000 240							* 5850	* 5850			* 3900	* 3900	7290
							* 12800	* 12800			* 8600	* 8600	290
4500 180							* 6400	* 6400	* 6050	4550	* 3850	* 3850	7990
							* 13950	13850	* 12300	9800	* 8400	* 8400	320
3000 120					* 9400	9350	* 7400	6150	* 6450	4450	* 3900	3800	8360
					* 20200	20200	* 16000	13300	* 14050	9600	* 8600	8350	330
1500 60					* 11400	8800	* 8400	5900	6650	4350	* 4150	3650	8450
					* 24550	19000	* 18150	12750	14300	9350	* 9100	8050	340
0 0			* 6550	* 6550	* 12500	8500	9050	5750	6550	4250	* 4600	3750	8260
			* 15000	* 15000	* 27000	18350	19450	12350	14050	9150	* 10100	8200	330
-1500 -60	* 7000	* 7000	* 11350	* 11350	* 12600	8450	8950	5650	6500	4200	* 5400	4050	7780
	* 15600	* 15600	* 25750	* 25750	* 27300	18150	19250	12150	14000	9100	* 11900	8850	310
-3000 -120	* 12000	* 12000	* 16750	16350	* 11800	8500	* 8750	5700			* 7000	4700	6950
	* 26950	* 26950	* 36250	35050	* 25550	18300	* 18850	12250			* 15600	10450	280
-4500 -180			* 13350	* 13350	* 9600	8700					* 7250	6450	5600
			* 28650	* 28650	* 20450	18800					* 15950	14550	220

Illustration 77

g03731934

Super Long Reach Boom with a 4700 kg (10362 lb) Counterweight

6.3 m (20 ft 8 inch) Stick

Product Information Section
Lifting Capacities

600 mm (24 inch) Triple Grouser Track





















	1500		3000		4500		6000		7500		9000		10500		12000		13500			(mm) (inch)	
	(mm) (inch)	60	120	180	240	300	360	420	480	540	600	660	720	780	840	900	960	1020			1080
12000 480																				* 1250 * 1250 10350 * 2800 * 2800 400	
10500 420													* 2150 * 2150 * 4700 * 4700							* 1200 * 1200 11660 * 2600 * 2600 460	
9000 360													* 2150 * 2150 * 2000 * 2000 * 4700 * 4700 * 3650 * 3650							* 1150 * 1150 12660 * 2450 * 2450 500	
7500 300													* 2200 * 2200 * 2150 2000 * 4850 * 4850 * 4750 4250							* 1100 * 1100 13410 * 2400 * 2400 530	
6000 240													* 2350 * 2350 * 2250 1950 * 1850 1500 * 5100 * 5100 * 4300 4150 * 3250 3150							* 1100 * 1100 13370 * 2400 * 2400 550	
4500 180												* 2750 * 2750 * 2500 2400 * 2350 1850 * 2250 1450 * 5950 * 5950 * 5450 5100 * 5100 3950 * 4600 3100							* 1100 * 1100 14340 * 2400 * 2400 570		
3000 120			* 4700 * 4700 * 5350 * 5350 * 4350 * 4350 * 3550 * 3550 * 3050 2850 * 2700 2250 * 2500 1750 * 2300 1400																	* 1150 * 1150 14550 * 2500 * 2500 580	
1500 60					* 6750 6700 * 5150 4600 * 4000 3450 * 3350 2650 * 2900 2100 * 2600 1650 2300 1350 * 1200 1150															* 2600 2500 580	
0 0			* 2000 * 2000 * 4650 * 4650 * 5750 4150 * 4450 3100 * 3650 2450 * 3100 1950 2650 1600 2200 1300 * 1250 1150																		* 2750 2450 570
-1500 -60	* 2050 * 2050 * 2700 * 2700 * 4650 * 4650 * 6100 3850 * 4700 2900 * 3850 2300 3100 1850 2600 1500 2150 1250 * 1350 1150																				14230 560
-3000 -120	* 2850 * 2850 * 3500 * 3500 * 5200 * 5200 * 6250 3700 4850 2750 3750 2150 3050 1750 2550 1450 2150 1200 * 1500 1200																				13730 550
-4500 -180	* 3650 * 3650 * 4400 * 4400 * 6050 5600 * 6250 3700 4750 2700 3700 2100 3000 1700 2500 1450 * 1700 1250																				13170 520
-6000 -240	* 4550 * 4550 * 5400 * 5400 * 7200 5700 * 6000 3700 * 4750 2700 3700 2150 3000 1750 2550 1450 * 2000 1400																				12340 490
-7500 -300	* 5500 * 5500 * 6550 * 6550 * 7100 5900 * 5500 3850 * 4450 2800 * 3650 2200 * 2950 1800 * 2500 1650																				11240 440
-9000 -360			* 7350 * 7350 * 5350 * 5350 * 4700 4050 * 3800 2950 * 3050 2350 * 2600 2100																		3800 380

Illustration 78

g03731911

790 mm (31 inch) Triple Grouser Track




















[mm] (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360		10500 420		12000 480		13500 540			(mm) (inch)				
																								
12000 480																			* 1250 * 2800	* 1250 * 2800	10350 400			
10500 420														* 2150 * 4700	* 2150 * 4700					* 1200 * 2600	* 1200 * 2600	11660 460		
9000 360														* 2150 * 4700	* 2150 * 4700	* 2000 * 3650	* 2000 * 3650			* 1150 * 2450	* 1150 * 2450	12660 500		
7500 300														* 2200 * 4850	* 2200 * 4850	* 2150 * 4750	2050 4400			* 1100 * 2400	* 1100 * 2400	13410 530		
6000 240														* 2350 * 5100	* 2350 * 5100	* 2250 * 4300	2000 4250	* 1850 * 3250	1550 3250	* 1100 * 2400	* 1100 * 2400	13370 550		
4500 180														* 2750 * 5950	* 2750 * 5950	* 2500 * 5450	2450 5250	* 2350 * 5100	1900 4100	* 2250 * 4600	1500 3200	* 1100 * 2400	* 1100 * 2400	14340 570
3000 120			* 4700 * 11850	* 4700 * 11850	* 5350 * 12700	* 5350 * 12700	* 4350 * 3400	* 4350 * 3400	* 3550 * 7650	* 3550 * 7650	* 3050 * 6600	2350 6350	* 2700 * 5900	2300 4350	* 2500 * 5400	1850 3900	* 2300 * 5050	1450 3100	* 1150 * 2500	* 1150 * 2500	14550 580			
1500 60					* 6750 * 15750	* 6750 * 14850	* 5150 * 11050	4750 10250	* 4000 * 8700	3550 7600	* 3350 * 7250	2700 5850	* 2900 * 6300	2150 4600	* 2600 * 5700	1750 3700	2350 5050	1400 2950	* 1200 * 2600	* 1200 * 2600	14600 580			
0 0			* 2000 * 4550	* 2000 * 4550	* 4650 * 10700	* 4650 * 10700	* 5750 * 12400	4300 3250	* 4450 * 3550	3200 6350	* 3650 * 7850	2500 5400	* 3100 * 6750	2000 4300	2750 5300	1650 3500	2300 4900	1350 2850	* 1250 * 2750	1200 2550	14490 570			
-1500 -60	* 2050 * 4550	* 2050 * 4550	* 2700 * 6050	* 2700 * 6050	* 4650 * 10500	* 4650 * 10500	* 6100 * 13250	4000 8600	* 4700 * 10200	3000 6450	* 3850 * 8300	2350 5050	3250 6900	1900 4050	2650 5700	1550 3300	2250 4800	1300 2750	* 1350 * 2950	1200 2600	14230 560			
-3000 -120	* 2850 * 6350	* 2850 * 6350	* 3500 * 7850	* 3500 * 7850	* 5200 * 11750	* 5200 * 11750	* 6250 * 13550	3850 8300	* 4300 * 10550	2850 6150	3900 8350	2250 4850	3150 6750	1850 3300	2600 5600	1500 3200	2250 * 3650	1250 2700	* 1500 * 3300	1250 2700	13790 550			
-4500 -180	* 3650 * 8150	* 3650 * 8150	* 4400 * 3900	* 4400 * 3900	* 6050 * 13700	5800 12400	* 6250 * 13450	3800 8200	* 4300 * 10600	2800 6050	3850 8250	2200 4750	3100 6700	1800 3850	2600 5600	1500 3200			* 1700 * 3750	1350 2900	13170 520			
-6000 -240	* 4550 * 10100	* 4550 * 10100	* 5400 * 12150	* 5400 * 12150	* 7200 * 16350	5900 12700	* 6000 * 12900	3850 8300	* 4750 * 10250	2850 6100	3850 8250	2200 4750	3100 6700	1800 3850	2650 * 5150	1550 3300			* 2000 * 4450	1500 3250	12340 490			
-7500 -300	* 5500 * 12250	* 5500 * 12250	* 6550 * 14800	* 6550 * 14800	* 7100 * 15250	6100 13150	* 5500 * 11850	3350 8550	* 4450 * 3500	2900 6250	* 3650 * 7750	2250 4900	* 2950 * 6250	1850 4050					* 2500 * 5650	1750 3850	11240 440			
-9000 -360			* 7350 * 16350	* 7350 * 16350	* 5350 * 12700	* 5350 * 12700	* 4700 * 10050	4150 9000	* 3800 * 8050	3050 6600	* 3050 * 6300	2400 5250							* 2600 * 5700	2200 4350	9800 380			

Illustration 79

g03731913

**Variable Boom with a 5350 kg
(11795 lb) Counterweight**

2.5 m (98 inch) Stick

600 mm (24 inch) Triple Grouser Track

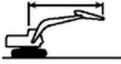









(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)	
														
9000 360													* 6200 * 6200 * 14100 * 14100	4110 150
7500 300					* 6850 * 14900	* 6850 * 14900	* 5200 * 5200	* 5200 * 5200					* 5050 * 5050 * 11200 * 11200	6080 240
6000 240					* 6800 * 14600	* 6800 * 14600	* 4750 * 10450	* 4750 * 10450					* 4650 4650 * 10300 * 10300	7230 290
4500 180			* 10400 * 22600	* 10400 * 22600	* 6650 * 14350	* 6650 * 14350	* 4650 * 10800	* 4650 * 10800	* 4700 * 10450	4350 9300			* 4550 3950 * 10050 8750	7930 310
3000 120			* 9650 * 21850	* 9650 * 21850	* 6450 * 13900	* 6450 * 13900	* 5200 * 11300	* 5200 * 11300	* 4900 * 11250	4200 9050			* 4650 3600 * 10200 7900	8300 330
1500 60			* 7050 * 14400	* 7050 * 14400	* 7800 * 16750	* 7800 * 16750	* 5850 * 12700	5500 11900	* 5650 * 12300	4050 8750			* 4850 3500 * 10700 7650	8390 330
0 0	* 9650 * 20900	* 9650 * 20900	* 6350 * 14100	* 6350 * 14100	* 10150 * 21700	7900 17000	* 6800 * 14700	5350 11500	6250 13450	4000 8550			* 5350 3550 * 11700 7800	8210 330
-1500 -60	* 10700 * 23800	* 10700 * 23800	* 9700 * 21650	* 9700 * 21650	* 9650 * 20950	7900 17000	* 7550 * 16300	5300 11400	* 5500 * 11600	4000 8600			* 5100 3850 * 11150 8450	7720 310
-3000 -120	* 16600 * 37150	* 16600 * 37150	* 11900 * 25850	* 11900 * 25850	* 7550 * 16300	* 7550 * 16300	* 5650 * 11900	5400 11600					* 4900 4650 * 10650 10300	6770 270
-4500 -180	* 23000 * 23000	* 23000 * 23000	* 12250 * 26400	* 12250 * 26400									* 8600 * 8600 * 20350 * 20350	4140 160

Illustration 80

g06531406

Lift Chart Above: heavy lift function OFF.

Product Information Section
Lifting Capacities

600 mm (24 inch) Triple Grouser Track

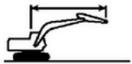












(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				(mm) (inch)		
															
9000 360													* 6700 * 15350	* 6700 * 15350	4110 150
7500 300					* 7500 * 16300	* 7500 * 16300	* 5600 * 12200	* 5600 * 12200					* 5500 * 12200	* 5500 * 12200	6080 240
6000 240					* 7500 * 16000	* 7500 * 16000	* 5200 * 11350	* 5200 * 11350					* 5050 * 11200	4650 10400	7230 290
4500 180			* 11400 * 24800	* 11400 * 24800	* 7300 * 15750	* 7300 * 15750	* 5050 * 11750	* 5050 * 11750	* 5100 * 11350	4350 9300			* 4950 * 10900	3950 8750	7930 310
3000 120			* 10200 * 24050	* 10200 * 24050	* 7100 * 15300	* 7100 * 15300	* 5500 * 11950	* 5500 * 11950	* 5350 * 12200	4200 9050			* 5050 * 11050	3600 7900	8300 330
1500 60			* 7450 * 15250	* 7450 * 15250	* 8250 * 17700	8150 17550	* 6200 * 13450	5500 11900	* 6100 * 13350	4050 8750			* 5300 * 11600	3500 7650	8390 330
0 0	* 10200 * 22100	* 10200 * 22100	* 6700 * 14900	* 6700 * 14900	* 10700 * 22950	7900 17000	* 7200 * 15600	5350 11500	6250 13450	4000 8550			5550 12150	3550 7800	8210 330
-1500 -60	* 11300 * 25150	* 11300 * 25150	* 10250 * 22850	* 10250 * 22850	* 10550 * 22950	7900 17000	* 8300 * 17850	5300 11400	* 6050 * 12700	4000 8600			* 5600 * 12250	3850 8450	7720 310
-3000 -120	* 17550 * 39250	* 17550 * 39250	* 13050 * 28250	* 13050 * 28250	* 8300 * 17850	8050 17300	* 6200 * 13100	5400 11600					* 5350 * 11700	4650 10300	6770 270
-4500 -180	* 24300	* 24300	* 13350 * 28750	* 13350 * 28750									* 9350 * 22200	* 9350 * 22200	4140 160

Illustration 81

g06531408

Lift Chart Above: heavy lift function ON.

Identification Information

i08067876

Plate Locations and Film Locations

SMCS Code: 1000; 7000

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

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

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

Product Identification Number (PIN) Plate

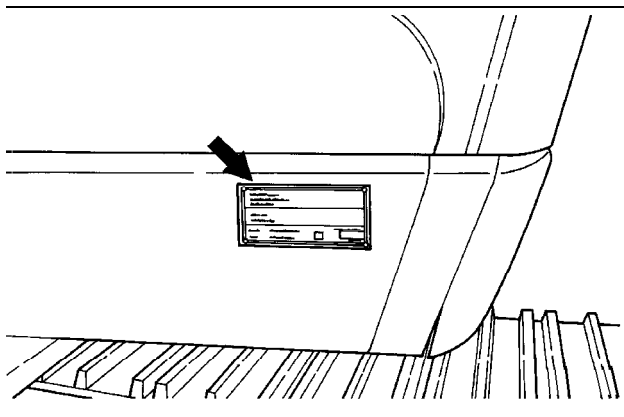


Illustration 82

g00675011

The PIN plate is positioned on the front of the machine, close to the operator compartment.

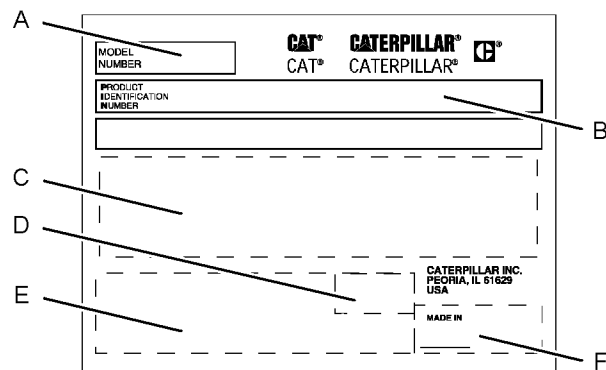


Illustration 83

g02436556

Model number (A) _____

Machine PIN (B) _____

Service Information Plate (C) _____

Year of Manufacture (If Required) (D) _____

Regional Certification Plate (If Required) (E) _____

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

Local regulation may require documentation of the Year of Manufacture in the OMM. Comply with these regulations.

Eurasian Economic Union

For machines compliant to the Eurasian Economic Union requirements, the EAC plate is positioned on or near the Product Identification Number (PIN) plate (see Product Information Section of the machine Operation and Maintenance Manual). The EAC plate is placed on machines certified to the Eurasian Economic Union requirements effective at the time of market entry.

Note: One of the below plates may be installed on the machine.



Illustration 84

g06094564

If equipped, The Month and Year of Manufacture are on the PIN plate.

Product Information Section
Plate Locations and Film Locations

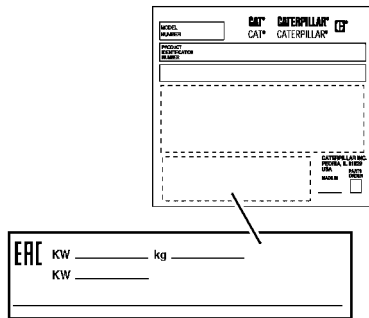


Illustration 85

g06531512

If equipped, the following information is stamped onto the EAC plate. For quick reference, record this information in the spaces provided below.

- Primary Engine Power (kW) _____
- Additional Engine Power (KW) (If Equipped) _____
- Typical Machine Operating Weight for Eurasian Economic Union (kg) _____
- Month and Year of Manufacture _____
- Machine Type _____

Manufacturer Information

Manufacturer:

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

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

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

European Union

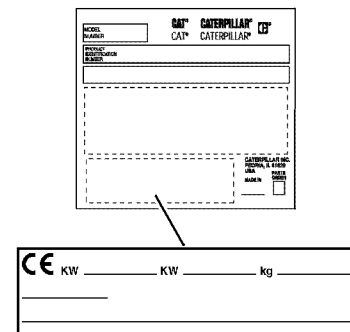


Illustration 86

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 _____

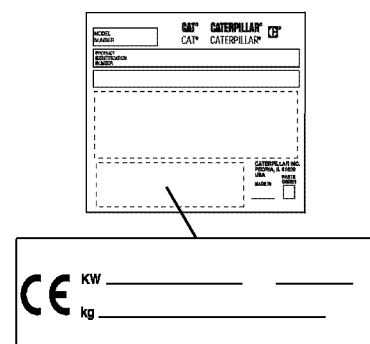


Illustration 87

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 “1998/42/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) _____
- 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.

For manufacturer name and address and the country of origin, see the PIN plate.

Machine Specification Film

The machine specification film is on machines that are going into Japan.

The Japanese Industrial Safety and Health Act requires machine specifications to be displayed on a film that can easily be seen by the operator.

If equipped, this film will be located on the cab door.

CAT®		最高 走行 速度		前進 後進		km/h	
機体質量	kg						
定格出力	kW						
仕様	標準仕様	労働安全衛生法による 最も不利な仕様 (含解体用機械)					
機械総質量	kg						
平均接地圧	kPa						
バケット容量	m³						
バケット質量	kg						
最大積載質量(含バケット)	kg						
解体用つかみ具 アタッチメント装着可能質量	kg	飲骨切断具 コンクリート圧砕具 (ブレーカユニット)					
<small>アタッチメント装着可能質量は本体の安定度から計算された最大の質量である。 解体用つかみ具 損んだ物の質量含む。 ブレーカユニット 性能面から適合する最大質量: 仕様: カウンタウエイト: キャタピラー-ジャパン合同会社</small>							

Illustration 88

g06178867

Typical example

Electromagnetic Emissions

Note: This label is on machines that are going into Canada.

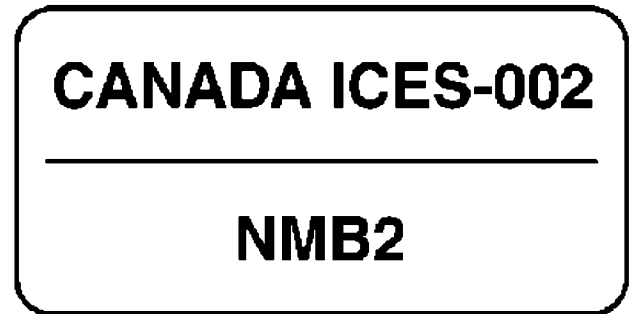


Illustration 89

g06063443

If equipped, this label is located next to the Pin plate. This label verifies that the product meets the requirements of ICES-002 Issue 6. Compliance to ICES-002 Issue 6 is accomplished by meeting electromagnetic emissions industry standard CISPR-12.

Engine Serial Number

This label is located on the engine.

Engine Serial Number _____

Sound Certification Film

If equipped, this label is located on the cab door.

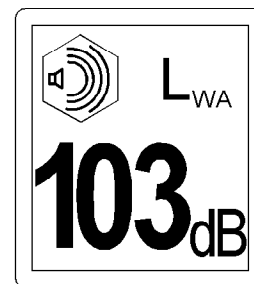


Illustration 90

g01082931

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

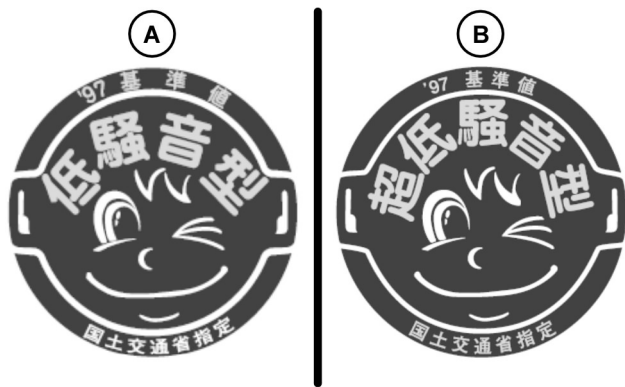


Illustration 91

g03105800

- (A) Low Noise Film
(B) Super Low Noise Film

If equipped, these certification labels are used to verify the Japan Ministry of Land, Infrastructure, Transportation, and Tourism (MLIT) noise designation according to the Japan “Designation Rule of Low Noise Type Construction Machine”.

Low Noise (A) – Verifies that the Japan “MLIT” designates the machine as a “Low Noise” type construction machine.

Super Low Noise (B) – Verifies that the Japan “MLIT” designates the machine as a “Super Low Noise” type construction machine.

i05757951

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Note: This information is pertinent in Japan.



Illustration 92

g03654940

2014 certification label example

A certification label is located on the cab door.

The certification label verifies that the machine conforms to the 2014 Japan Nonroad Special Motor Vehicle Exhaust Regulation.

i07709181

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

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.

Declaration of Conformity

SMCS Code: 1000; 7000

Table 10

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

Original EC or EU DECLARATION OF CONFORMITY

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:	Hydraulic Excavator
	Model/Type:	323F
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfills all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2000/14/EC amended by 2005/88/EC, Note (1)		
2006/42/EC	N/A	
2004/108/EC	N/A	
2014/30/EU	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 **September 2013**, 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: 6700; 7000

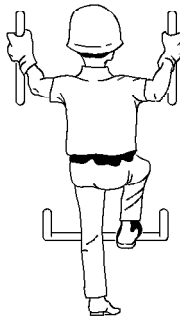


Illustration 93

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".

i05767689

Daily Inspection

SMCS Code: 1000; 6319; 6700; 7000

WARNING

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

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

Steam can cause personal injury.

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

Remove the cooling system pressure cap slowly to relieve pressure.

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

NOTICE

Accumulated grease and oil on a machine is a fire hazard. Remove this debris with steam cleaning or high pressure water, at least every 1000 hours or each time any significant quantity of oil is spilled on a machine.

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

First 100 Hours

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

- Operation and Maintenance Manual, "Boom and Stick Linkage - Lubricate"

- Operation and Maintenance Manual, “ Bucket Linkage - Lubricate”

Severe Applications

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

- Operation and Maintenance Manual, “Boom and Stick Linkage - Lubricate”
- Operation and Maintenance Manual, “ Bucket Linkage - Lubricate”

Operation and Maintenance Manual, “ Blade Linkage - Lubricate”

Daily Basis

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

- Operation and Maintenance Manual, “Fuel Tank Water and Sediment - Drain”
- Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”
- Operation and Maintenance Manual, “Indicators and Gauges - Test”
- Operation and Maintenance Manual, “Seat Belt - Inspect”
- Operation and Maintenance Manual, “Track Adjustment - Inspect”
- Operation and Maintenance Manual, “Travel Alarm - Test”
- Operation and Maintenance Manual, “Undercarriage - Check”

Refer to Operation and Maintenance Manual, “Maintenance Interval Schedule” for all maintenance recommendations.

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

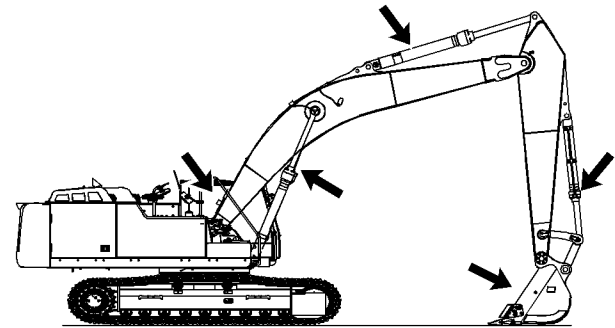


Illustration 94

g02515516

Inspect the attachment control linkage, attachment cylinders, and attachment for damage or excessive wear. Make any necessary repairs.

Inspect the lights for broken bulbs and for broken lenses. Replace any broken bulbs and any broken lenses.

Inspect the engine compartment for any trash buildup. Remove any trash buildup from the engine compartment.

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

Inspect all of the belts for the engine attachments. Replace any belts that are worn, frayed, or broken.

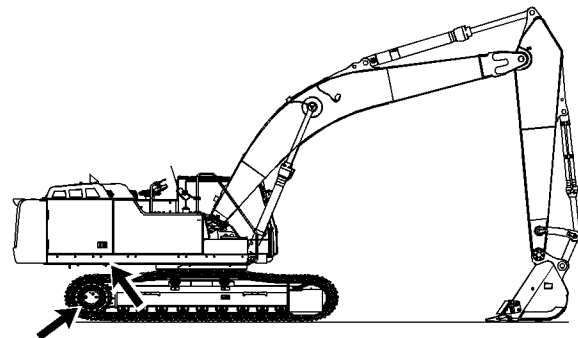


Illustration 95

g02280134

Inspect the hydraulic system for leaks. Inspect the tank, cylinder rod seals, hoses, tubes, plugs, connections, and fittings. Correct any leaks in the hydraulic system.

Inspect the tubes and hoses along the boom and stick for wear and leaks. Replace any hoses or tubes that are worn or leak.

Inspect the differential and the final drives for leaks. Make any necessary repairs.

Operation Section
Daily Inspection

Inspect the swing drive for leaks.

Make sure that all covers and guards are securely attached. Inspect the covers and the guards for damage.

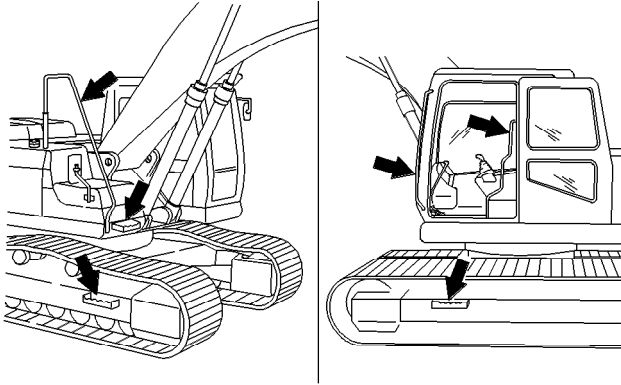


Illustration 96

g00101987

Inspect the steps, the walkways, and the handholds.
Clean the steps, the walkways, and the handholds.
Make any necessary repairs.

Inspect the operator compartment for trash buildup.
Check for trash buildup under the floorplate and on
the crankcase guard. Keep these areas clean.

Adjust the mirrors in order to achieve the best
visibility.

Machine Operation

i06244619

Alternate Exit

SMCS Code: 7310

Front Window (If Equipped)

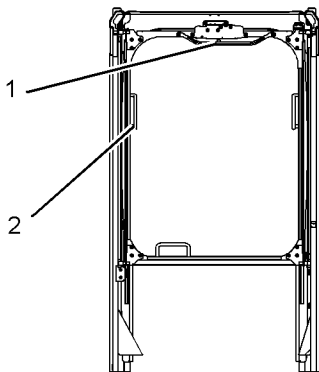


Illustration 97

g02050493

- (1) Lever
- (2) Handle

The front window serves as an alternate exit.

In order to remove the front window, move lever (1) to the right. Grab handles (2) and lift the window into the overhead storage position. Exit through the front window.

Right Side Window

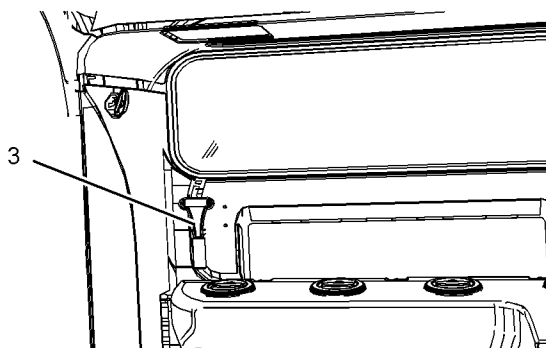


Illustration 98

g02050942

- (3) Hammer (If Equipped)

 **Alternate Exit – The right side window serves as an alternate exit.**



Break Glass – Perform the following procedure in order to exit through the right side window. Hammer (3) is mounted near the rear window of the cab. Strike the right side window with the hammer in order to break the glass. Climb through the opening of the right side window in order to exit the cab.

Roof Hatch (If Equipped)

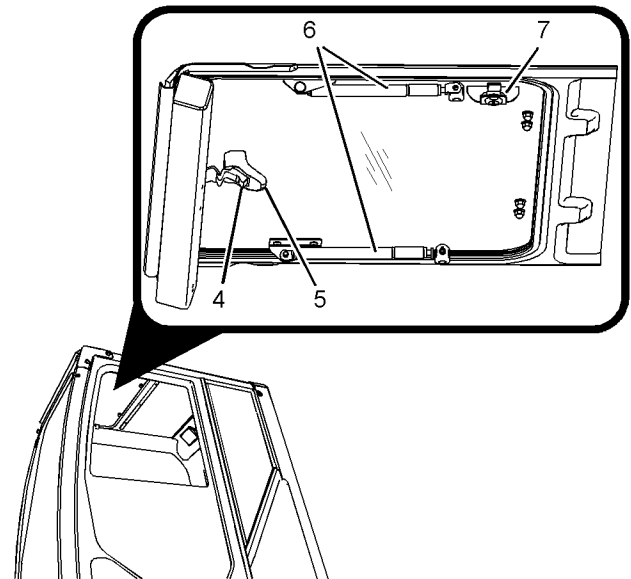


Illustration 99

g02851621

- (4) Latch
- (5) Grip
- (6) Gas springs
- (7) Lock mechanism

Note: Before operating the machine, make sure lock mechanism (7) (if equipped) is unlocked.



Alternate Exit – The roof hatch serves as an alternate exit.

Slide the visor cover back. If equipped, make sure lock mechanism (7) is unlocked.

Release latch (4). Hold grip (5) and push the roof hatch outward.

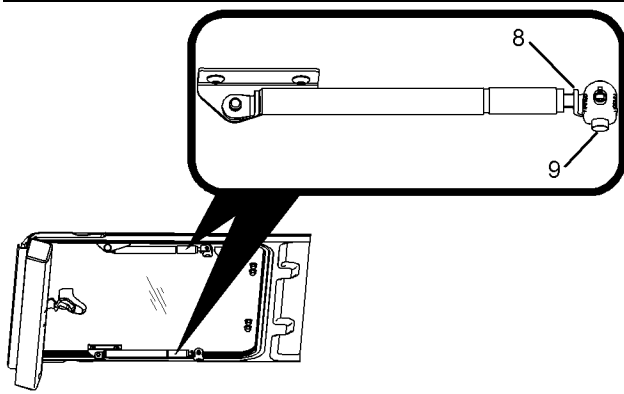


Illustration 100

g02901996

If equipped with gas springs (6), press gas spring release (9) and remove gas spring shaft (8) in order to open hatch wider.

Exit through the roof hatch.

Removing the Roof Hatch from the Outside

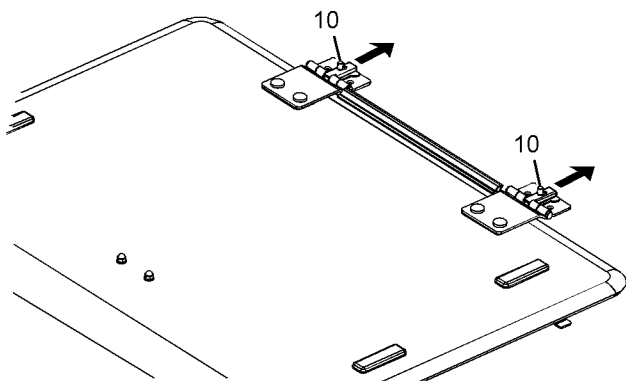


Illustration 101

g02851583

(10) Hinge pin release

If equipped with hinge pin release (10), the roof hatch can also be removed from the outside of the cab.

Press hinge pin release (10) and slide backward. The hinge pin should detach and allow the hatch to be lifted. Exit through the roof hatch.

Note: Lock mechanism (7) (if equipped) must be unlocked in order to allow the hatch to be lifted.

Roof Hatch (If Equipped)

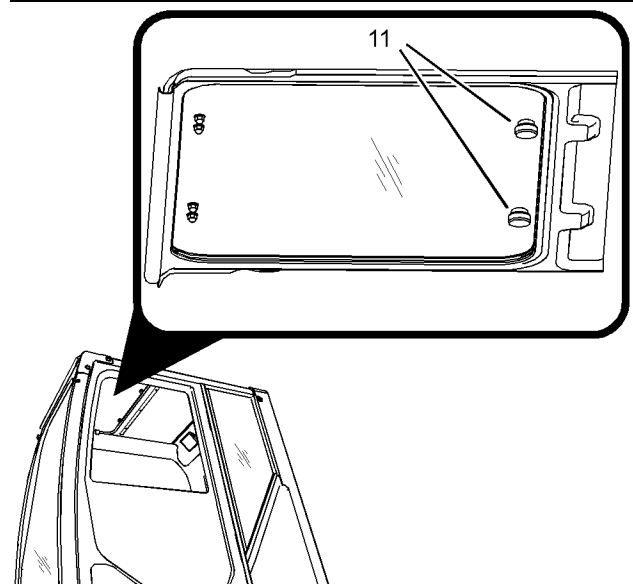


Illustration 102

g02851579



Alternate Exit – The roof hatch serves as an alternate exit.

Slide the visor cover back.

Remove knobs (11) and push the roof hatch outward. Exit through the roof hatch.

Note: Do not open the hatch during general operation in order to maintain the functionality of the alternate exit.

FOGS (If Equipped)

Note: Some FOGS are fixed/bolted-on and others can be opened. This information pertains to FOGS that can be opened.

Top FOGS

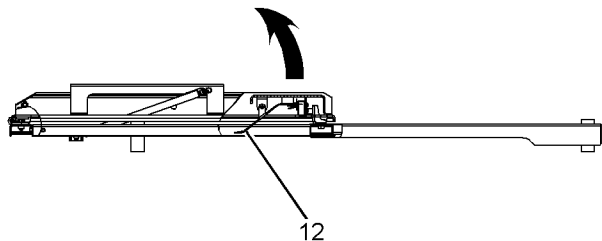


Illustration 103

g02902217

In order to exit through the roof hatch, the FOGS guard is equipped with a release latch. Open the roof hatch as stated above. As the roof hatch is being pushed outward, the roof hatch will hit lever (12). Lever (12) will allow the FOGS to lift upward. Exit through the roof hatch.

In order to open the top FOGS from the outside of the machine, reach under the FOGS and pull up on release lever (12). Follow the directions for removing the hatch from the outside.

Front FOGS

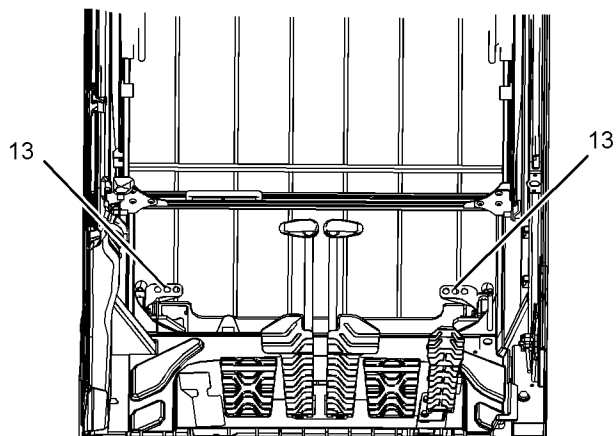


Illustration 104

g02902219

In order to exit through the front window, the FOGS guard is equipped with a release latch. Open the front window as stated above and remove the lower window. Press down on levers (13) in order to open the front FOGS. Exit through the front window.

i07186721

Seat

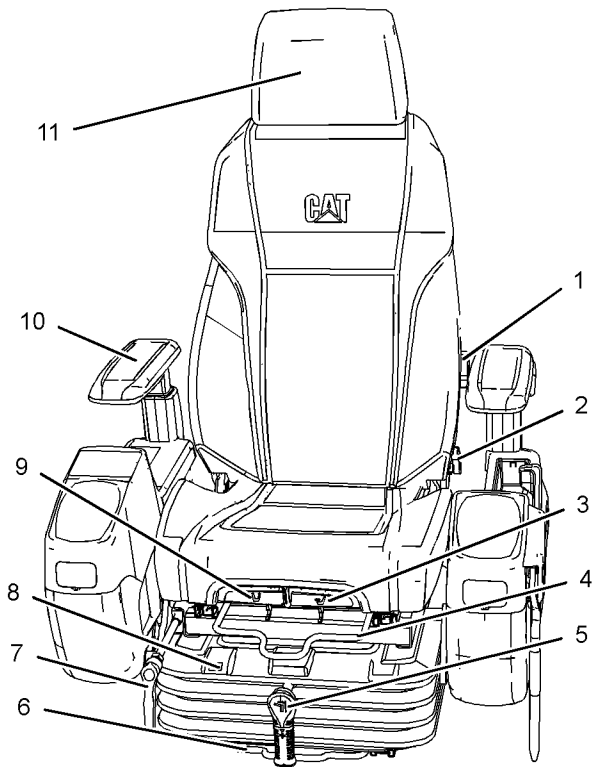
SMCS Code: 5258-025; 7312-025; 7324; 7327

Illustration 105

g01636841

- (1) Adjustment lever for the lumbar support
- (2) Adjustment lever for reclining the seat
- (3) Lever for the seat cushion adjustment
- (4) Seat fore and aft adjustment.
- (5) Seat height adjustment (if equipped)
- (6) Fore and aft seat and console adjustment
- (7) Console adjustment
- (8) Indicator
- (9) Seat angle lever
- (10) Armrest
- (11) Headrest

The lumbar support is located in the back of the seat. Turn knob (1) (if equipped) counterclockwise to increase the force of the lumbar support. To decrease the lumbar support, continue to turn the knob counterclockwise.

Pull up lever (2) to change the angle of the seat. Hold the seat back in the desired position. Release the lever.

Push in lever (3) to adjust the length of the cushion.

To adjust the seat forward or backward, pull up lever (4) and hold the lever. Move the seat to the desired position. To lock the seat in the selected position, release the lever.

Note: Before adjusting the seat forward or backward, make sure that the lever for the seat height adjustment (5) is in the downward position.

Turn lever (5) to adjust the seat and the console to the desired height. To raise the seat height, pull the grip downward and rotate the grip with the plus sign outward. To lower the seat height, pull the grip downward and rotate the grip with the minus sign outward. Release grip to return to the original position.

Pull lever (6) to adjust the seat and the console forward and backward.

Use handle (7) to adjust the height of the console. When the lever is pulled forward, a gear is released. The operator can rotate the lever freely. Release the lever to return to the original position.

Push the lever (9) to adjust the tilt angle of the seat.

The operator can adjust the height of headrest (11). To adjust the headrest, hold the headrest with both hands. Move the headrest up and down. Release the headrest when the desired position is attained. The headrest will remain in the desired position.

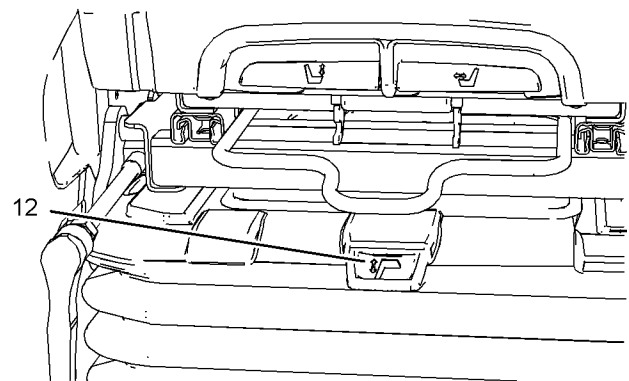


Illustration 106

g01637296

If your machine is equipped with an air ride suspension, the seat will be equipped with a lever (12). Pull up the lever to raise the height of the seat. Push down on the lever to lower the seat. If the adjustment is correct, indicator (8) will turn green. If the indicator shows red, further adjustment is required.

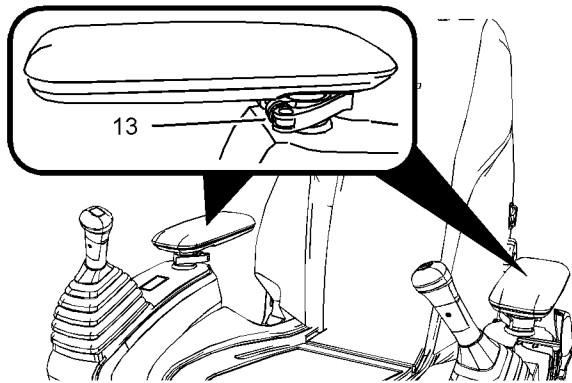


Illustration 107

g02697124

(13) Armrest height adjustment

The height of the armrest can be adjusted. Unlatch lever (13) to adjust the height of the armrest. Move the armrest upward or move the armrest downward. Latch the lever when the armrest is in the desired position.

Heated Seat and Ventilated Seat (If Equipped)

WARNING

Heat-induced burns can occur when some people use a seat heater. Do not use the seat heater if you have a reduced ability to sense temperature changes, a reduced ability to feel pain, or have sensitive skin.

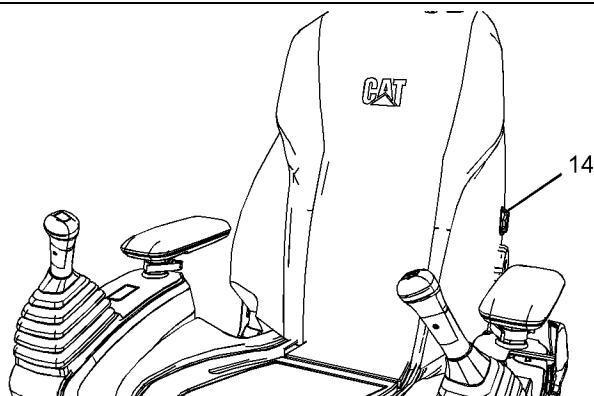


Illustration 108

g02697116

Heated Seat Switch – If equipped with a heated seat, press the top of rocker switch (14) to turn the seat heater to the ON position. Press the bottom of rocker switch (14) to turn the seat heater to the OFF position.

Heated and Ventilated Seat Switch – If equipped with a heated and ventilated seat, press the top of rocker switch (14) for heat. Press the bottom of

rocker switch (14) for ventilation. The center switch position is OFF.

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

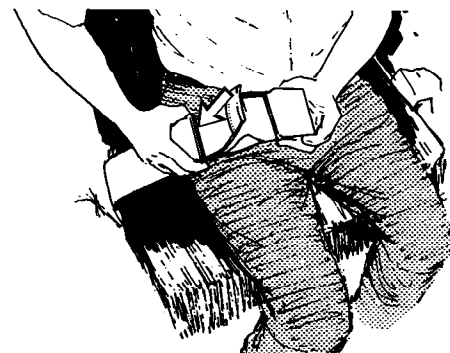


Illustration 109

g00100709

1. Unfasten the seat belt.

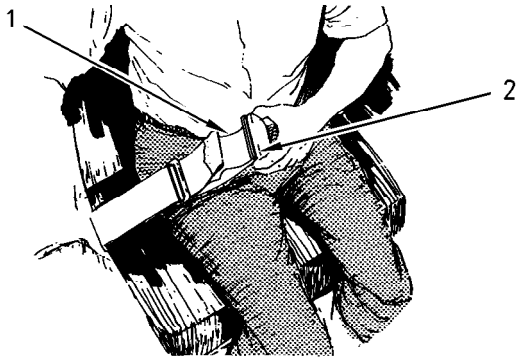


Illustration 110

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

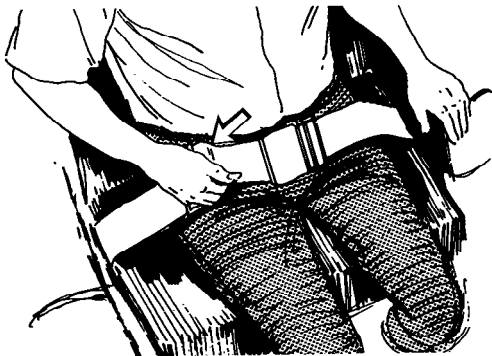


Illustration 111

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

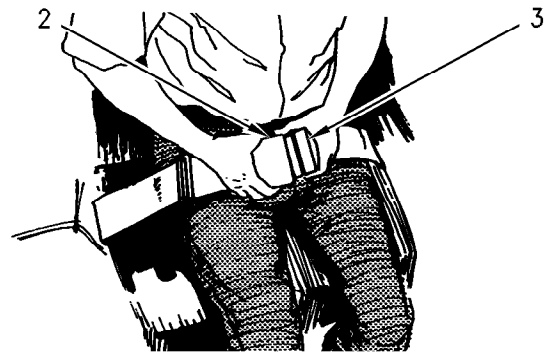


Illustration 112

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

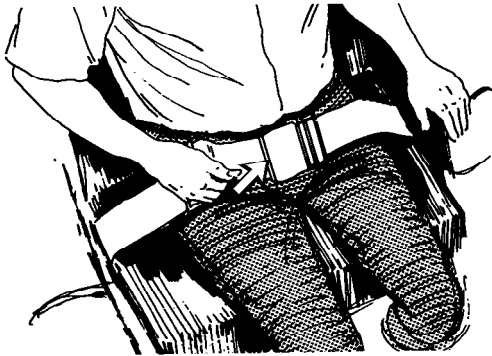


Illustration 113

g00100717

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

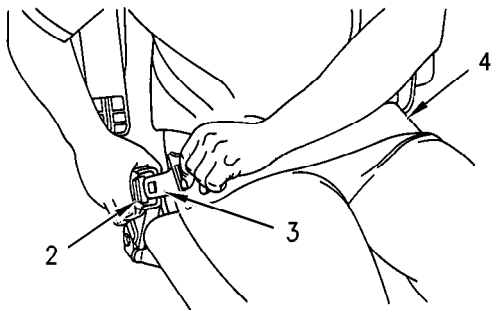


Illustration 114

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

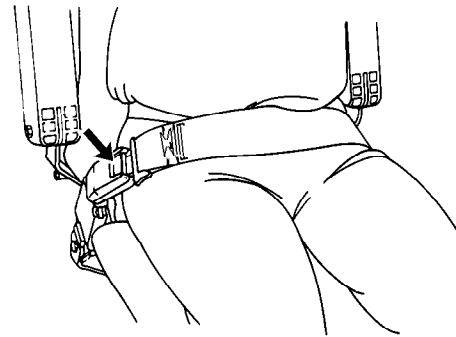


Illustration 115

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.

i06300749

Selective Catalytic Reduction Warning System

SMCS Code: 1091-WXX; 7400

The selective catalytic reduction (SCR) system is a system used to reduce NOx emissions from the engine. Diesel exhaust fluid (DEF) is pumped from the DEF tank and is sprayed into the exhaust stream. The DEF reacts with the SCR catalyst to reduce NOx and leaves a nitrogen and water vapor. The Exhaust Gas Recirculation (EGR) system cools, measures, and introduces recalculated exhaust gas into the intake manifold to aid in NOx reduction.

NOTICE

Stopping the engine immediately after the engine has been working under load can result in overheating of SCR components.

Refer to the Operation and Maintenance Manual, “Engine Stopping” procedure to allow the engine to cool and to prevent excessive temperatures in the turbocharger housing and the DEF injector.

Note: With the operator key in the OFF position, the purge system will activate.

Definitions

Observe the following definitions.

Self-correct – Fault condition no longer exists. An active fault code will no longer be active.

Notification – Action taken by the system to alert the operator of pending Inducement.

Inducement – Engine derates, vehicle speed limits, or other actions intended to prompt the operator to repair or maintain the emission control system.

Inducement Trigger – Fault conditions that result in activation of the inducement strategy. DEF level inducement faults have a diagnostic fault code. DEF quality fault, SCR tampering fault, SCR system fault, and EGR system faults will all have a related diagnostic fault code along with an inducement diagnostic fault code.

First occurrence – A DEF quality fault, SCR tampering fault, SCR system fault, or an EGR system fault becomes active for the first time.

Repeat occurrence – If any DEF quality fault, SCR tampering fault, SCR system fault, or an EGR system fault becomes active again within 40 hours of the first occurrence.

Safe Harbor Mode – Safe harbor mode is a 20 minute engine run time period. The engine can be operated with full power after reaching a level 3 inducement. Once in level 3 inducement, the operator can perform a key cycle and the engine will enter safe harbor mode. Safe harbor mode can only be implemented once. Safe harbor mode is not allowed for DEF level inducements.

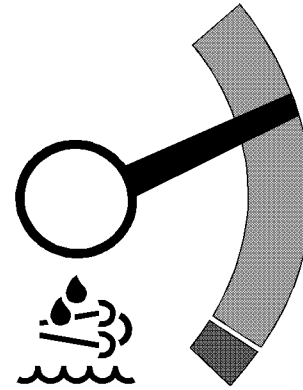


Illustration 116

g03684888

DEF Level Normal

Inducement Strategy for DEF Level

If multiple warnings are present in the system, the most important problem is shown first. Press the right key or press the left key in order to view all of the warnings that are present in the machine. If no keys are pressed within 5 seconds, the display will return to the most important problem.

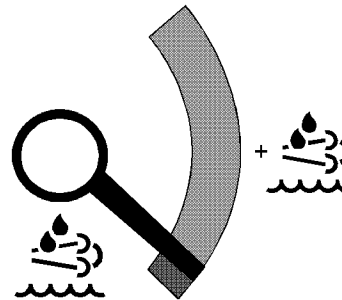


Illustration 117

g03681105

DEF Level Low

If the DEF level falls below 19%, “DEF Level Low” message will be displayed on the monitor. To avoid further inducements, turn the key to the OFF position and add DEF to the DEF tank.

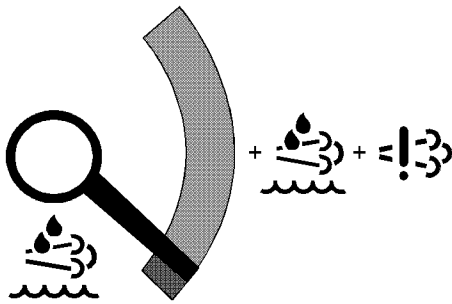


Illustration 118

g03681073

DEF Level Low and Emission Fault

If the DEF level falls below 12.5%, a level 1 inducement event will occur. a “DEF Level Low” message and an “Emission Fault” message will appear on the monitor.

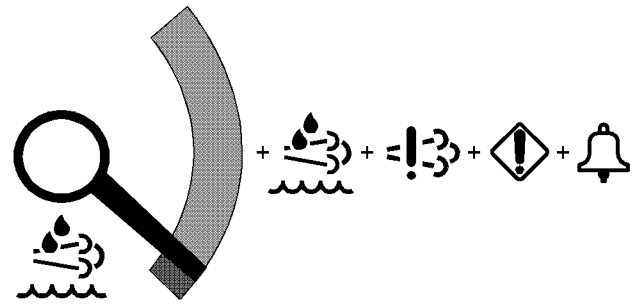


Illustration 120

g03681078

DEF Level Low, Emission Fault, Flashing Action Lamp, and Audible Alarm

If the ECM is configured to “Reduced Performance” and the DEF tank has been emptied of all DEF, the engine will be in a level 3 final inducement. If the ECM is configured to “Reduced Time” and the DEF level is 0%, the engine will be in a level 3 final inducement. Prior to final inducement a “DEF Level Low” message, and an “Emission Fault” message will appear on the monitor. The action lamp on the monitor will flash and an audible alarm will sound 20 seconds prior to the final inducement. The engine will be taken to low idle or will be shut down. Once shut down, the engine can be restarted for 5 minute periods at reduced speed and torque. If set to idle, the engine will idle indefinitely at reduced torque. The amber indicator next to the DEF level gauge on the dash will remain lit.

Note: Turn the key to the OFF position and add DEF to the DEF tank to reset the DEF level inducement.

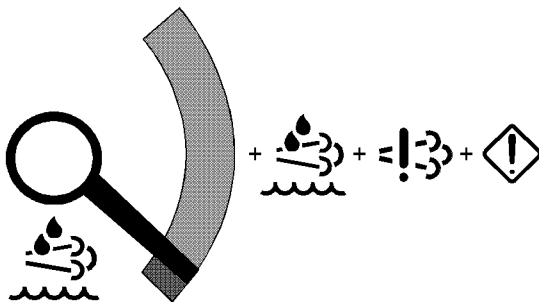


Illustration 119

g03681077

DEF Level Low, Emission Fault, and Flashing Action Lamp

If the DEF level is below 6%, a level 2 inducement event will occur. a “DEF Level Low” message and an “Emission Fault” message will appear on the monitor. The action lamp on the monitor will flash. If the ECM is configured to “Reduced Performance” and the DEF level has reached 0%, the machine will be limited to 75% torque.

Inducement Strategy for DEF Quality, Tampering, SCR System Fault, and Impeded EGR

If multiple warnings are present in the system, the most important problem is shown first. Press the right key or press the left key in order to view all of the warnings that are present in the machine. If no keys are pressed within 5 seconds, the display will return to the most important problem.



Illustration 121

g03623190

A “Engine Fault Check Engine” message and an “Emission Fault” message will appear on the monitor for a fault resulting from poor DEF quality, SCR system tampering, SCR system fault, or an EGR system fault. If the fault is the result of poor DEF quality, SCR system tampering, or SCR system fault, a first occurrence will result in a level 1 inducement for a duration of 2.5 hours. The level 1 inducement will also illuminate the check engine lamp. Repeat occurrences will result in a level 1 inducement duration of 5 minutes. If the fault is the result of an EGR system fault, a first occurrence will result in a level 1 inducement for a duration of 35 hours. Repeat occurrences will result in a level 1 inducement duration of 48 minutes.

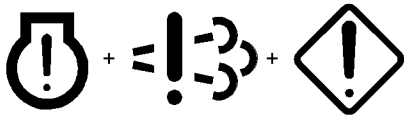


Illustration 122

g03623191

If a fault condition exists for the entire duration of inducement level 1, the strategy advances to inducement level 2. A “Engine Fault Check Engine” message, and an “Emission Fault” message will appear on the monitor and the action lamp on the monitor will flash for a fault resulting from poor DEF quality, SCR system tampering, SCR system fault, or an EGR system fault. For poor DEF quality, SCR system tampering, and SCR system faults, the duration for a level 2 inducement is 70 minutes for the first occurrence. For EGR system faults, the duration for a level 2 inducement is 60 minutes for the first occurrence. Repeat occurrences for poor DEF quality, SCR system tampering, and SCR system faults will result in a level 2 inducement of 5 minutes. Repeat occurrences for EGR system faults will result in a level 2 inducement of 60 minutes.

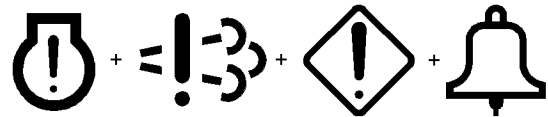


Illustration 123

g03623193

If a fault condition exists for the entire duration of inducement level 2, the strategy advances to inducement level 3. A “Engine Fault Check Engine” message, and an “Emission Fault” message will appear on the monitor, the action lamp will flash, and an audible alarm will sound 20 seconds prior to the level 3 inducement. The engine will be taken to low idle or will be shut down. After the level 3 inducement you may cycle the key, which will allow 20 minutes of engine run time with full torque. After 20 minutes, the engine will be in level 3 final inducement and will allow idle only or be shut down until the issue has been resolved. Once shut down, the engine can be restarted for 5 minute periods at reduced speed and torque. If set to idle, the engine will idle indefinitely at reduced torque.

Note: Contact your Cat dealer for repairs if a fault occurs.

i07232276

Operator Controls

SMCS Code: 7300; 7301; 7451

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

Cat Grade Control (If Equipped)

Cat Grade Control is designed to calculate bucket tip position and provide visual and audible feedback to the operator. This feedback allows the operator to achieve the desired grade safer, quicker and more accurately than traditional grading techniques.

For information on how to use Cat Grade Control, refer to Operation and Maintenance Manual, SEBU8358, "Cat Grade Control Depth and Slope for E Series Excavators".

Operator Controls

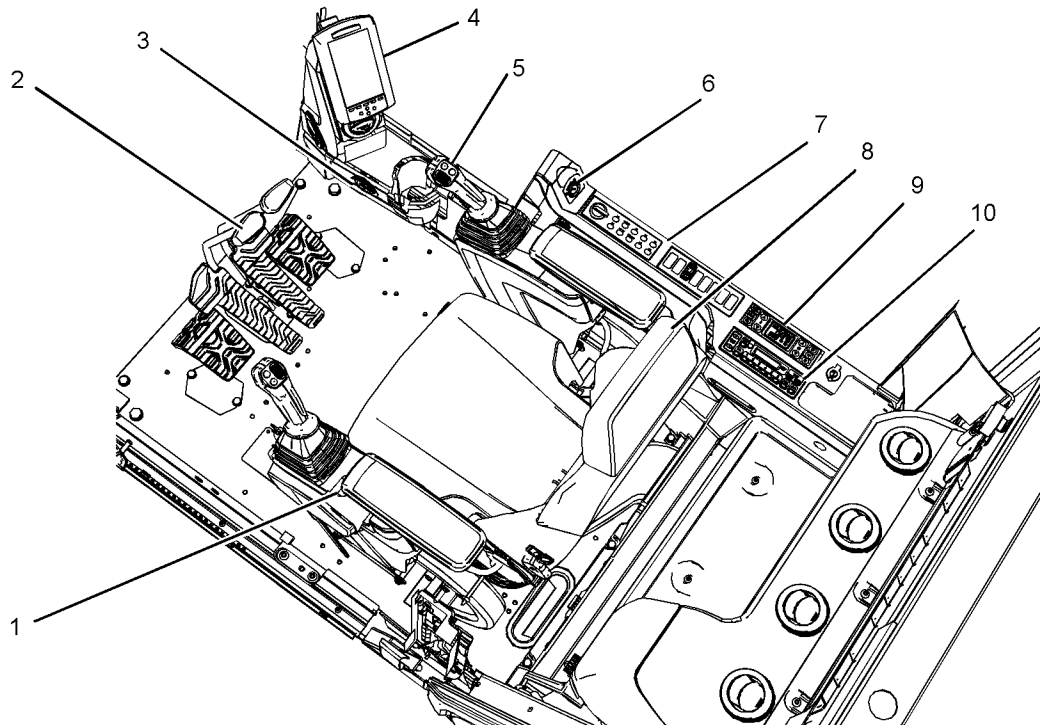


Illustration 124

g03071956

(1) Hydraulic lockout control
(2) Travel controls
(3) Service hour meter
(4) Monitor

(5) Joystick controls
(6) Engine start switch
(7) Right side control panel
(8) Operator seat

(9) Air conditioning and heating control
(10) Radio

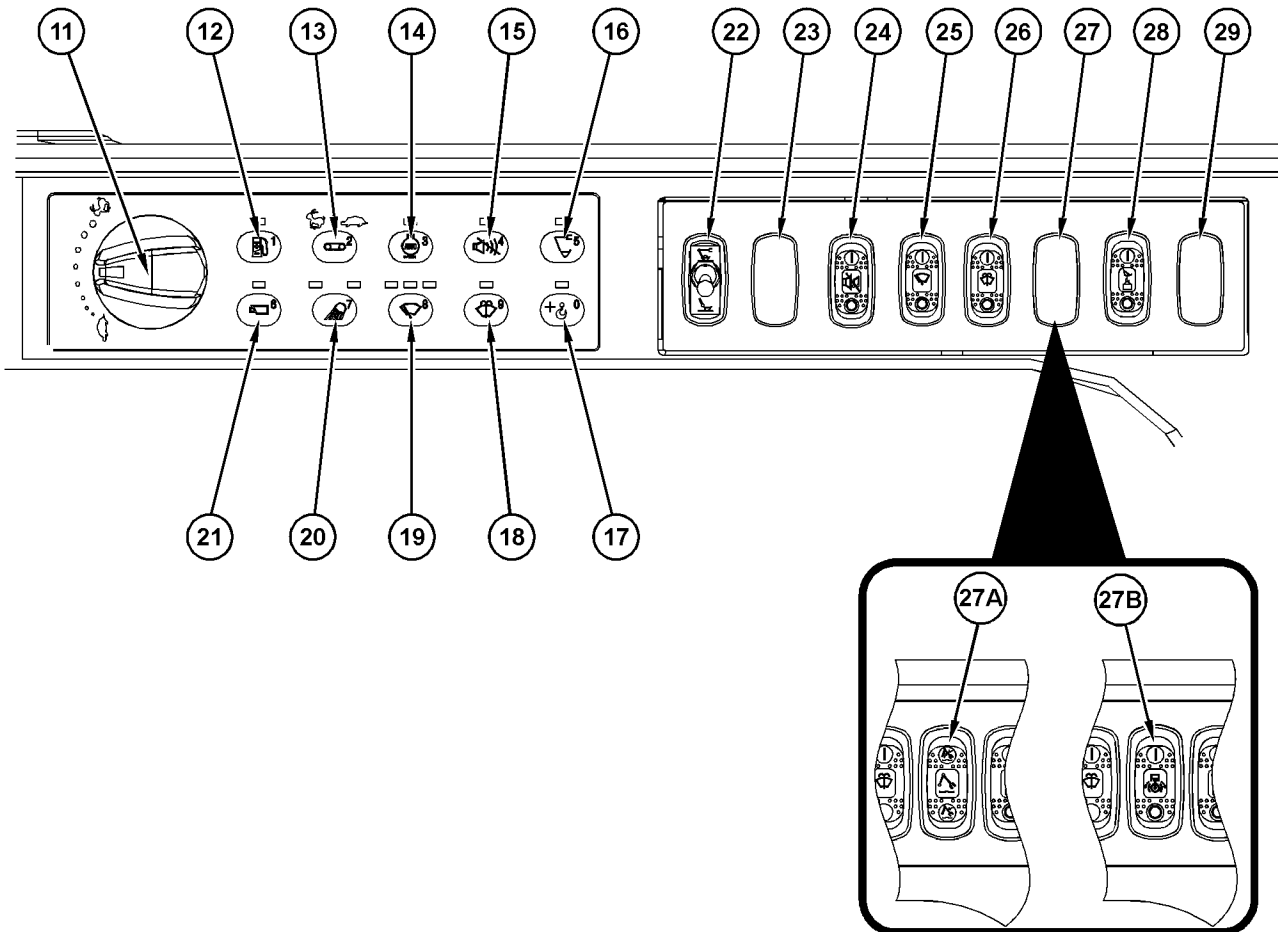


Illustration 125

g03705078

- | | | |
|---|----------------------------|------------------------------|
| (11) Engine speed control | (18) Window washer | (25) Lower window wiper |
| (12) Power mode | (19) Window wiper | (26) Lower window washer |
| (13) Travel speed control | (20) Light switch | (27A) SmartBoom control |
| (14) Automatic engine speed control (AEC) | (21) Rear/Side view camera | (27B) Fine swing control |
| (15) Travel alarm switch | (22) Quick coupler control | (28) Overload warning device |
| (16) Work tool control | (23) Empty | (29) Empty |
| (17) Heavy lift control | (24) Radio mute | |

Hydraulic Lockout Control (1)

The lever for the hydraulic lockout control is located on the left side of the left console.



Locked – Move the travel levers/pedals and move the joysticks to the HOLD (center) position. Move the lever for the

hydraulic lockout control backward to the LOCKED position. All the factory installed hydraulic controls will become inoperable.

Note: Make sure that the lever for the hydraulic lockout control is in the LOCKED position before attempting to start the engine. If the lever is in the UNLOCKED position, the engine start switch will not function.



Unlocked – Move the lever for the hydraulic lockout control forward to the UNLOCKED position. All the factory installed hydraulic controls will become operable.

Travel Control (2)

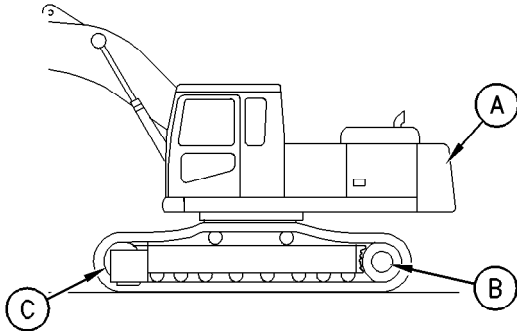


Illustration 126 g00753277

Position for normal travel

- (A) Rear of machine
- (B) Final drive
- (C) Idler

When you travel, make sure that final drive sprockets (B) are under the rear of the machine.

Stop – Release the travel levers/pedals to stop the machine. When you release the travel levers/pedals from any position, the travel levers/pedals will return to the CENTER position. The travel brakes will be applied.

Move both of the travel levers or both of the travel pedals equally in the same direction to travel straight.

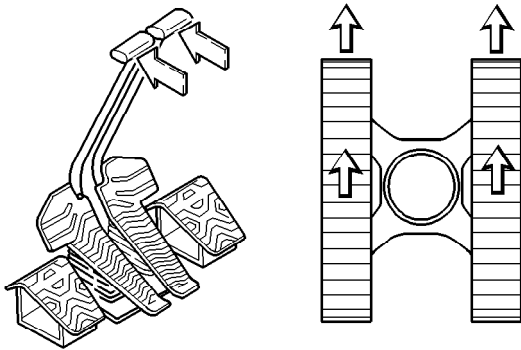


Illustration 127 g00731542

FORWARD travel

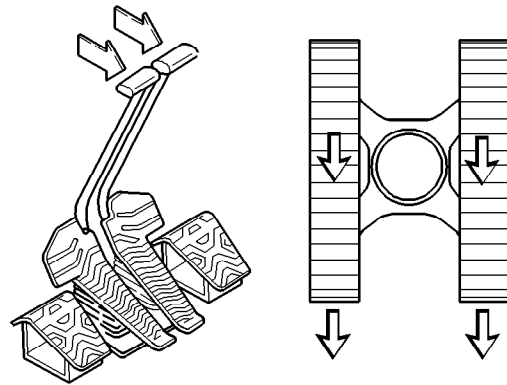


Illustration 128 g00731543

REVERSE travel

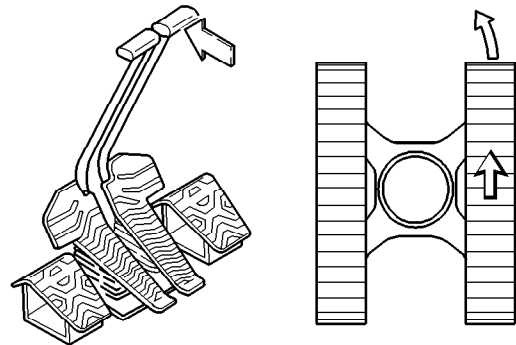


Illustration 129 g00731472

Pivot left turn (FORWARD)

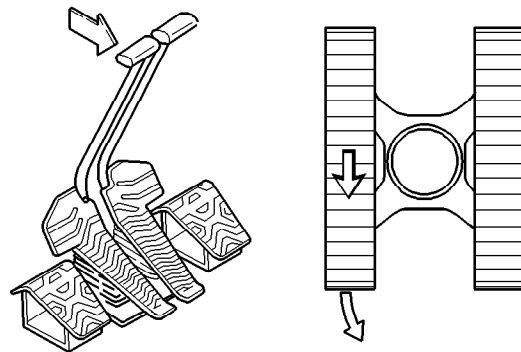


Illustration 130 g00731478

Pivot Left Turn (REVERSE)

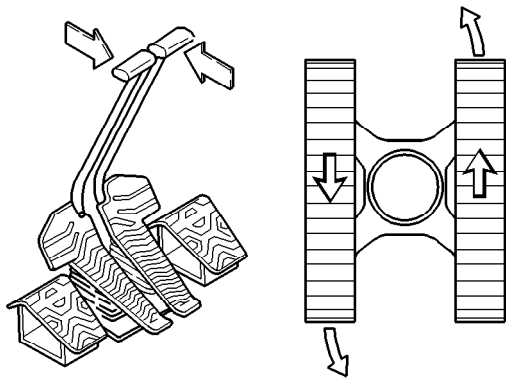


Illustration 131

g00731476

Counterrotate turn (LEFT)

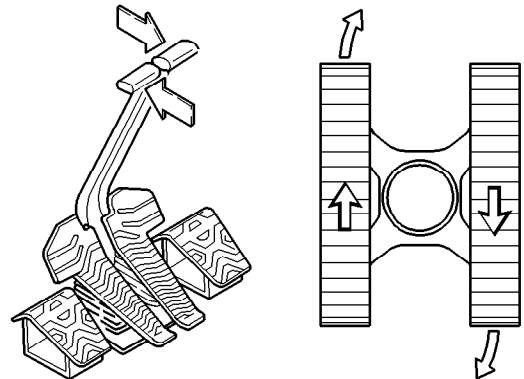


Illustration 134

g00731477

Counterrotate turn (RIGHT)

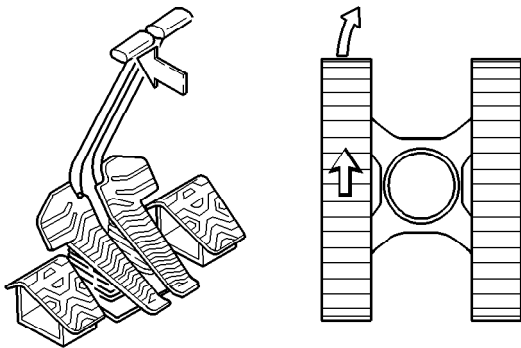


Illustration 132

g00731471

Pivot right turn (FORWARD)

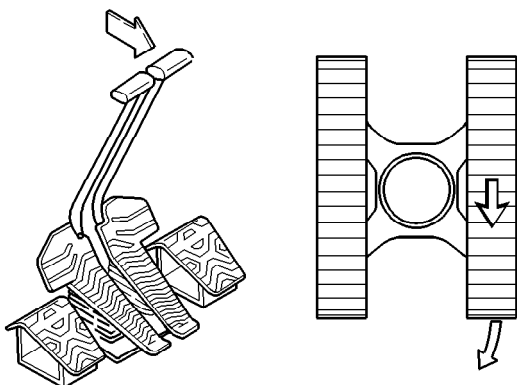


Illustration 133

g00731479

Pivot right turn (REVERSE)

Service Hour Meter (3)



Service Hour Meter – This display indicates the total operating hours of the engine. Use the display to determine the service hour maintenance intervals.

Monitor (4)

The monitor is used to display various operating information of the machine. For more information on the operation of the monitor, refer to Operation and Maintenance Manual, "Monitoring System".

Joystick Controls (5)

The joystick control is used to control certain functions of the machine and work tools. For more information on the individual functions of the joysticks, refer to Operation and Maintenance Manual, "Joystick Controls".

Note: During a boom down function the machine ECM may reduce engine speed. This improves the overall fuel consumption.

Engine Start Switch (6)

NOTICE

The engine start switch must be in the ON position and the engine must be running in order to maintain electrical functions and hydraulic functions. This procedure must be followed in order to prevent serious machine damage.

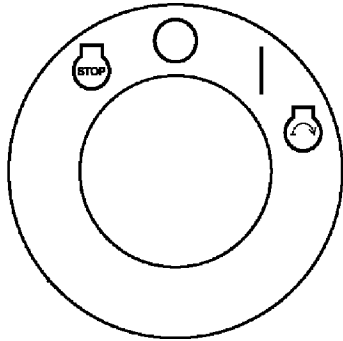


Illustration 135

g02362719



OFF – Insert the engine start switch key only while the start switch is in the OFF position. Remove the engine start switch key only while the engine start switch is in the OFF position. Turn the engine start switch to the OFF position before you attempt to restart the engine. Turn the engine start switch to the OFF position to stop the engine.



ON – To activate the electrical circuits in the cab, turn the key clockwise to the ON position.



START – To start the tractor engine, turn the key clockwise to the START position. After the engine starts, release the key. The key will return to the ON position.

Note: If the engine fails to start, return the engine start switch key to the OFF position. Return the key to the start position before you attempt to start the engine again.

Engine Idle Shutdown

This function shuts down the engine after the operator is not operating the machine for a period of time. This function does not shut down other systems, such as the AC, which can run down the battery after idle shutdown. This function comes disabled from the factory but can be enabled and adjusted in the monitoring system. Refer to Operation and Maintenance Manual, “Monitoring System”.

Note: Engine Idle Shutdown may be required for local regulations.

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

- The control lever is in neutral.
- The engine coolant temperature is greater than 70° C (158° F).
- The battery voltage is greater than 24.5V

- The engine speed is less than 2000 rpm.
- The ambient temperature range is between 0° C (32° F) and 30° C (86° F).
- The Back Pressure Valve (BPV) is not working.

Note: If any service tests or calibrations are running the machine will not enter into engine idle shutdown.



Engine Idle Shut down – The action lamp will illuminate and the monitor will display a message 20 seconds before the engine shuts down. An operator can cancel the shutdown by pressing a button on the monitor or move one of the controls.

Operators Seat (8)

The operator seat and the console have various adjustments to meet a wide range of operators. For more information, refer to Operation and Maintenance Manual, “Seat”.

Air Conditioning and Heating Control (9)

If equipped, the switch for the air conditioning and heating control is on the right console.

The heater/air conditioner provides comfort for the operator that is working under various temperature conditions. For more information on the air conditioning and heater controls, refer to Operation and Maintenance Manual, “Air Conditioning and Heating Control”.

Radio (10)

This machine may be equipped with a radio. For more information, refer to Operation and Maintenance Manual, “Radio”.

Engine Speed Control (11)



Engine Speed – Turn the engine speed dial to control the engine speed (engine rpm). Select the desired position from the ten available positions. The selected position of the engine speed dial is indicated on the electronic monitor panel.



Decrease – Turn the engine speed dial counterclockwise to decrease the engine speed (engine rpm).



Increase – Turn the engine speed dial clockwise to increase the engine speed (engine rpm).

Power Mode (12)



Power Mode – Press this switch to activate the power mode settings. The modes that can be selected are: “ECONOMY”, “STANDARD HYDRAULIC POWER” and “HIGH HYDRAULIC POWER”. For more information, refer to Operation and Maintenance Manual, “Monitoring System”.

Travel Speed Control (13)

WARNING

Do not change the setting of the travel speed control switch while you travel. Machine stability may be adversely affected.

Personal injury can result from sudden changes in machine stability.



Travel Speed Control Switch – Press the travel speed control switch to select automatic travel speed or low travel speed. When the engine start switch is on, the travel speed control switch is always set at the **LOW SPEED** position. Whenever the travel speed control switch is pressed, the travel speed changes.



LOW SPEED – Select the **LOW SPEED** position if you travel on rough surfaces or on soft surfaces or if you require a great drawbar pull. Also, select the **LOW SPEED** position if you are loading a machine onto a trailer or you are unloading a machine from a trailer.



AUTOMATIC – If you travel on a hard, level surface at a fast speed, select the **AUTO** position.

Continuous driving at high speed should be limited to 2 hours. If you need to continue driving at high speed for more than 2 hours, stop the machine for 10 minutes. This process will cool down the travel drives before you resume driving.

Automatic Engine Speed Control (14)

The Automatic Engine Speed Control (AEC) automatically reduces engine speed when the machine is inactive. The AEC system is designed to reduce fuel consumption and noise. Lower engine speeds can also increase engine life.

The engine rpm will recover automatically to the setting of the engine speed dial when any hydraulic function is activated. The AEC system operates in three modes. Refer to Table 11 for a description of each mode.



Automatic Engine Speed Control (AEC) – The Automatic Engine Speed Control switch is activated when the engine start switch is turned to the ON position. The indicator lamp will turn on. When you press the AEC switch, the function of the AEC switch changes from ON to OFF. The operator can choose from three possible modes for automatic engine speed control. Refer to Table 11 for more details.

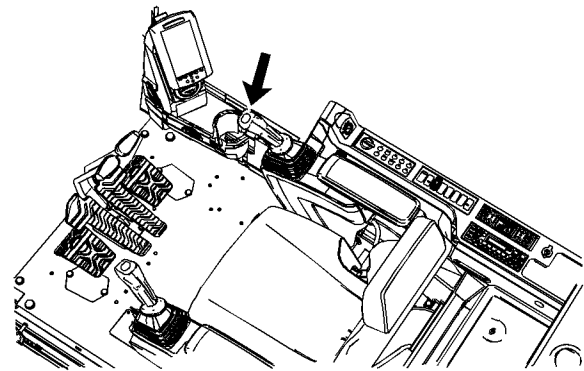


Illustration 136

g02050056

The switch for manual low idle is on the right joystick.

Manual Low Idle – Activate the manual low idle to reduce the engine speed to approximately 1020 rpm. Pressing the switch again will allow the engine speed to return to the original setting of the engine speed dial.

The manual low idle allows the operator to reduce the rpm without touching the engine speed dial. This is useful when the operator wants to reduce the engine speed to talk to someone or while the operator is waiting for a truck.

Operation of the automatic engine speed control depends on the position of the AEC switch and of the switch for manual low idle. The engine rpm will recover automatically to the setting of the engine speed dial when any hydraulic function is activated.

Table 11

AEC Mode	Position of AEC Switch	Setting of Engine Speed Dial	Position of Manual Low Idle Switch	Description of Mode
First stage	OFF	3 to 10	OFF	The electronic controller automatically reduces engine speed by 100 rpm after there has been no hydraulic demand for approximately 3 seconds.
Second stage	ON	3 to 10	OFF	The AEC system in the electronic controller will automatically reduce the engine rpm to approximately 950 rpm after there has been no hydraulic demand for approximately 3 seconds.
Manual low Idle	ON or OFF	3 to 10	ON	The engine speed is reduced to approximately 950 rpm.

Travel Alarm Cancel Switch (15)



Travel Alarm Cancel Switch – This switch is used to stop the travel alarm from sounding. Press the switch to stop the alarm. The indicator lamp will turn on.

Note: The travel alarm is located under the hydraulic tank. The travel alarm will sound when the travel lever or the travel pedal is activated.

Work Tool Control (16)



Work Tool Control (Switch) – Press this switch to display the selected work tool on the monitor display. Press the switch repeatedly to change the selected work tool.

Heavy Lift Control (17)

If equipped, push this switch to activate heavy lift mode. Also push this switch to deactivate heavy lift mode.



Heavy Lift Mode – This work mode increases the relief pressure in the hydraulic circuit, which increases the hydraulic force that is available for lifting operations. The cylinder speed is slower when this mode is selected.

Note: During normal excavation work, the heavy lift control must be in the OFF position.

NOTICE

If this machine is used to lift objects within an area that is controlled by the European Directive “2006/42/EC”, the machine must be equipped with a boom lowering control valve, a stick lowering control valve, and an overload warning device.

Window Wiper and Window Washer (18-19)



Window Washer (18) – Push the switch to activate the window washer. While the switch is depressed, the indicator light will come on and washer fluid will spray from the nozzle. The window wiper will also operate while the switch is depressed. After the switch is released for approximately 3 seconds, the window wiper will stop.



Window Wiper (19) – Push the switch to activate the window wiper. Whenever the switch is depressed, the mode of the window wiper will change according to the indicator light that is illuminated.

6 Second Delay – When the window wiper switch is depressed one time, the first indicator light will turn on. The window wiper will operate intermittently at six second intervals.

3 Second Delay – When the window wiper switch is depressed two times, the second indicator light will turn on. The window wiper will operate intermittently at three second intervals.

Continuous Operation – When the window wiper switch is depressed three times, the first indicator light and the second indicator light will turn on. The window wiper will operate continuously.

OFF – When the window wiper switch is depressed four times, the indicator lights will turn off. The window wiper stops.

NOTICE

If the wiper does not operate with the switch in the ON position, turn the switch off immediately. Check the cause. If the switch remains on, motor failure can result.

NOTICE

If the washer is used continuously for more than 20 seconds or used when no washer solution comes out, motor failure can result.

Light Switch (20)

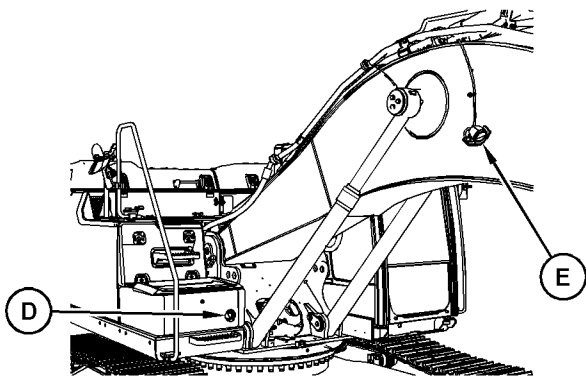


Illustration 137

g02049516

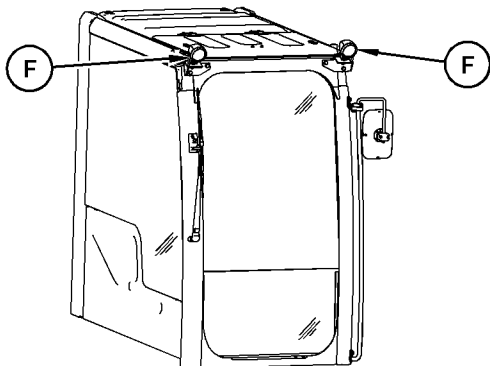


Illustration 138

g02049520



Light Switch – Push the switch to turn on the work lights.

Whenever you push the switch, you change the pattern of the work lights that are turned on. The indicator lights in the cab indicate the pattern of the work lights.

Pattern 1 – When you press the light switch once, the first indicator light turns on. When the first indicator light is on, the following work lights are turned on: work light (D), which is mounted on the

chassis, and work lights (F), which are mounted on the cab.

Pattern 2 – When you press the light switch twice, the first indicator light and the second indicator light turn on. When the first indicator light and the second indicator lights are on, the following work lights are turned on: work light (D), which is mounted on the chassis, work lights (F), which are mounted on the cab and work lights (E), which are mounted on the boom.

OFF – When both of the indicator lights are off, all the work lights are off.

Note: Your machine may be equipped with a lighting system that has a time delay. When this system is installed, cab lights (F) and boom lights (E) will not turn off for a predetermined amount of time after the engine start key has been turned to the OFF position. The time delay can vary from 0 minutes to 5 minutes. For further details, consult your Cat dealer.

Rear/Side View Camera (21)



Rear/Side View Camera – If equipped, push this switch to toggle the images that are shown on the monitor in the cab. For more information, refer to Operation and Maintenance Manual, “Monitoring System”.

Quick Coupler Control (22)

Hydraulic Pin Grabber Quick Coupler

If equipped, the switch for the quick coupler control is on the right console.



LOCKED – Move the switch to this position to engage the quick coupler onto the work tool.



UNLOCKED – Move the switch for the quick coupler to the UNLOCKED position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized when the switch is in this position.

Note: An alarm will sound whenever the switch is in the UNLOCKED or LOCKED position.

For further details, see Operation and Maintenance Manual, “Quick Coupler Operation”.

Quick Coupler



LOCKED – Move the switch to this position to retract the wedge and engage the quick coupler onto the work

tool



UNLOCKED – Move the switch for the quick coupler to the UNLOCKED position to extend the wedge. Use this position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized when the switch is in this position.

Note: An alarm will sound whenever the switch is in the UNLOCKED or LOCKED position.

For further details, see Operation and Maintenance Manual, “Quick Coupler Operation”.

Radio Mute Switch (24)



Radio Mute Switch – If equipped, press the switch to mute the radio. The indicator lamp will turn on.

Lower Window Wiper and Window Washer (25-26) (If Equipped)



Lower Window Wiper (25) – Push down on the top of the switch to turn on the lower window wiper. Push down the bottom portion of the switch to turn off the lower window wiper.



Lower Window Washer (26) – Push down on the top of the switch and keep the switch depressed to activate the lower window washer. While the switch is depressed, the washer fluid will spray from the nozzle.

NOTICE

If the wiper does not operate with the switch in the ON position, turn the switch off immediately. Check the cause. If the switch remains on, motor failure can result.

NOTICE

If the washer is used continuously for more than 20 seconds or used when no washer solution comes out, motor failure can result.

SmartBoom Control (27A)

This machine may be equipped with SmartBoom Control. For more information, refer to Operation and Maintenance Manual, “SmartBoom Control”.

Fine Swing Control (27B)

WARNING

The Fine Swing Control delays the engagement of the swing parking brake.

If the machine is operating on a slope with the Fine Swing Control in the ON position, the swing motion may become uncontrollable which could result in property damage, personal injury or death.

Turn the Fine Swing Control to the OFF position when the machine is operating on a slope.



Fine Swing Control – If equipped, push down on the top of the switch to activate the fine swing control.

When the fine swing control is ON, the swing parking brake is released. Swing control improves during deceleration of a swing because the swing is allowed to drift instead of stopping abruptly.

Push down on the bottom of the switch to turn off the fine swing control. Operate the machine with the fine swing control in the OFF position when the machine is on a slope. Operate the machine with the fine swing control in the OFF position when great swing forces are required. For example, digging on a sidewall requires great swing force. Operate the machine with the fine swing control in the OFF position to control the motion with the swing brake.

Overload Warning Device (28)

If equipped, the switch for the overload warning device is on the right console.



Overload Warning Device – In lifting applications, the overload warning device activates a buzzer when there is an unstable load condition. When the buzzer sounds, the bucket load should be reduced or the stick should be moved inward.



ON – Push the right side of the switch to activate the overload warning device.



OFF – Push the left side of the switch to deactivate the overload warning device.

Service Port

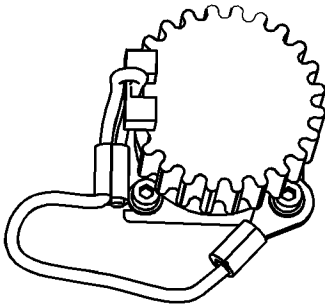


Illustration 139

g03320855

Electronic Technician service port

An Electronic Technician (ET) service port is located inside the cab behind the seat. This service port allows service personnel to connect a laptop computer that is equipped with Electronic Technician. Service personnel can use electronic technician to diagnose machine and engine systems.

Contact your Cat dealer for additional information.

i06750463

Battery Disconnect Switch

SMCS Code: 1411-B11

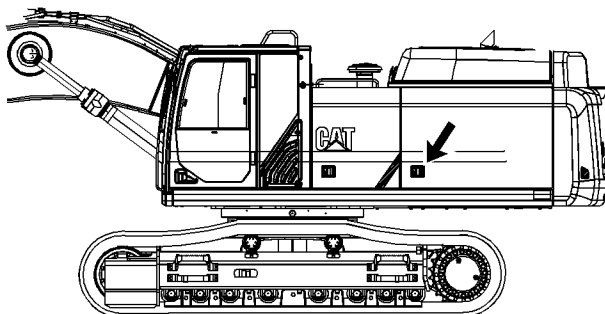


Illustration 140

g02108657

The battery disconnect switch is on the left side of the machine behind the rear access door.

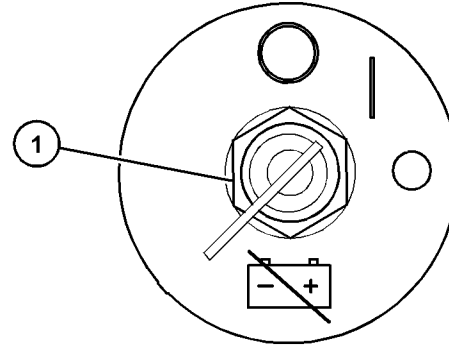


Illustration 141

g06010955

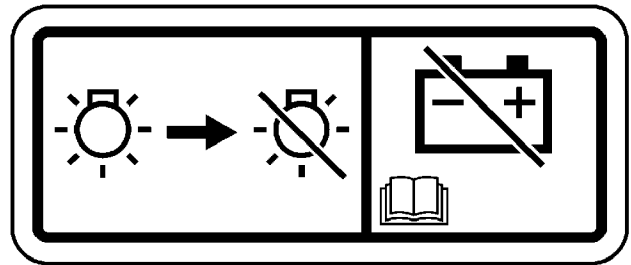


Illustration 142

g03422337

NOTICE

Do not conduct any service procedures on the DEF system until the DEF purge indicator lamp is not illuminated. The indicator lamp may remain illuminated for several minutes, even though the battery disconnect switch is OFF and the engine start switch is OFF. When the indicator lamp is on, the DEF system is still powered.

NOTICE

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



Battery Disconnect Switch (1) – The battery disconnect switch can be used in order to disconnect the battery from the machines electrical system. The key must be inserted into the battery disconnect switch before the battery disconnect switch can be turned.



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



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

The battery disconnect switch and the engine start switch perform different functions. The entire electrical system is disabled when you turn the battery disconnect switch to the OFF position. The battery remains connected to the electrical system when you turn the engine start switch 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. Lock out access to the battery disconnect switch by closing cover (2) and installing a padlock.

Turn the battery disconnect switch to the OFF position and remove the disconnect switch key after you operate the machine. This will prevent the battery from being discharged. The following problems can cause battery discharge:

- short circuits
- current draw via some components
- vandalism

i08001446

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 - PL121, PL321, PL522, and PL523”
- Operation and Maintenance Manual, SEBU8832, “Product Link PLE702, PLE602, PLE601, PL641, PL631, PL542, PL240, PL241, PL243, PL141, PL131, PL161, PL083 and PL042 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, REHS7339, “Installation Procedure for Product Link PLE640 Systems”
- Special Instruction, REHS8850, “Installation Procedure for the Elite Product Link PLE601, PLE641, and PLE631 Systems”
- Special Instruction, SEHS0377, “Installation Procedure for the Product Link PL131, PL141, and PL161 Systems”

- Special Instruction, REHS9111, “Installation Procedure for the Pro Product Link PL641 and PL631 Systems”
- Special Instruction, M0098124, “Installation Procedure for Pro Product Link PL243 Systems”
- Special Instruction, M0109130, “Installation Procedure for Product Link PL683 and PL783 Systems”

i03903396

Power Receptacle (If Equipped)

SMCS Code: 1436; 7451

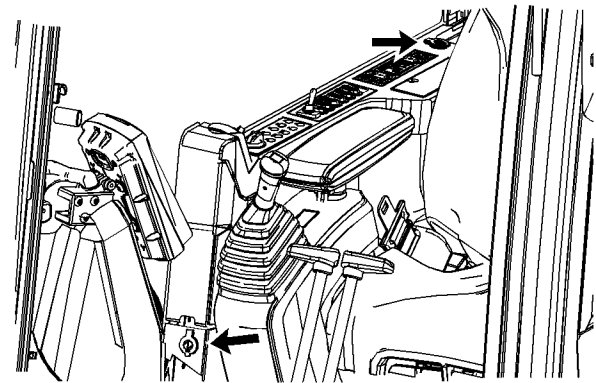


Illustration 143

g02145563

Power Receptacle – Two 12 volt power receptacles are located on the right side console. These power receptacles can be used for powering automotive electrical equipment or accessories. Remove the cap before use.

i07037877

Machine Security System (If Equipped)

SMCS Code: 7631

Operation Section

NOTICE

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



Machine Security System (MSS) – Machines that are equipped with a Caterpillar Machine Security System (MSS) can be identified by a decal in the operator station. The MSS is a theft deterrent and will prevent the unauthorized operation of the machine.

Basic Operation

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

Note: Ensure that you have only one electronic key near the engine start switch when you are attempting to start the machine. If there is more than one electronic key near the engine start switch the MSS may not be able to read the key in the engine start switch and the machine will not start.

When the engine start switch is turned to the ON position, the ECM will read the unique ID that is stored in the electronic key. The ECM will then compare this ID to the list of authorized keys. The status of the key will be displayed on the monitor. If the key is not authorized for the machine, “UNAUTHORIZED KEY” will be displayed on the monitor.

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

Security Management

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

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

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

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

Regulatory Compliance Section

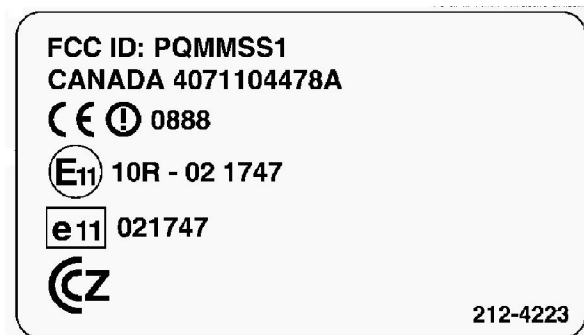


Illustration 144

g00832427

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

Operation Section Camera


CATERPILLAR			
FC DECLARATION OF CONFORMITY IN RESPECT OF TYPE-APPROVED, TYPE-EXAMINED OR SELF-CERTIFICATION CONSTRUCTION PLANT AND EQUIPMENT			
I, the undersigned, Mark Pfeleler, hereby certify that the construction equipment component specified hereunder			
1. Category	C. COMPONENT		
2. Make	CATERPILLAR INC.		
3. Type	MACHINE SECURITY SYSTEM (MSS)		
4. Type-serial number of equipment	B GZ		
5. Year of manufacture	Beginning 2001		
has been manufactured in conformity with			
--EC type-examination (1)			
--EC self-certification (2)			
as shown in the table below			
In the case of EC type-examination/self-examination:			
Directives	No.	Date	Approved Body
99/5/EC	MSS TCF 7-13-01.DOC	2001-05-21	(1) MIRA
73/23/EEC	MSS TCF 7-13-01.DOC	2001-07-13	(2)
89/336/EEC	MSS TCF 7-13-01.DOC	2001-05-29	(1) MIRA
00/02/EC	MSS TCF 7-13-01.DOC	2001-05-29	(1) MIRA
6. Special Provisions...			
Done at Caterpillar Inc. 100 N.E. Adams St. Peoria, IL 61629-AC6130		Signature 	
Date 2001-10-03		Mark Pfeleler Administrative	

Illustration 145

g00822256

i06587362

Camera

SMCS Code: 7347; 7348

Rear View Camera (If Equipped)

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

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

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

Side View Camera (If Equipped)

The side view camera system consists of a camera that is located on the top of the fuel tank and a "VIDEO MODE SETTING" menu on the monitor.

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

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

i06970281

Monitoring System (Monitor with Installed Cat Grade With Assist)

SMCS Code: 7451; 7490

WARNING

Once the system is placed in automatic mode, linkage and swing movement may occur.

Ensure that all personnel are clear of the machine before you place the system in automatic mode.

Personal injury could occur.

If Grade with Assist is installed and Software Enabled Attachment (SEA) is enabled, then a button is added to the Cat® Grade Control screens. This button is used to select manual or auto.

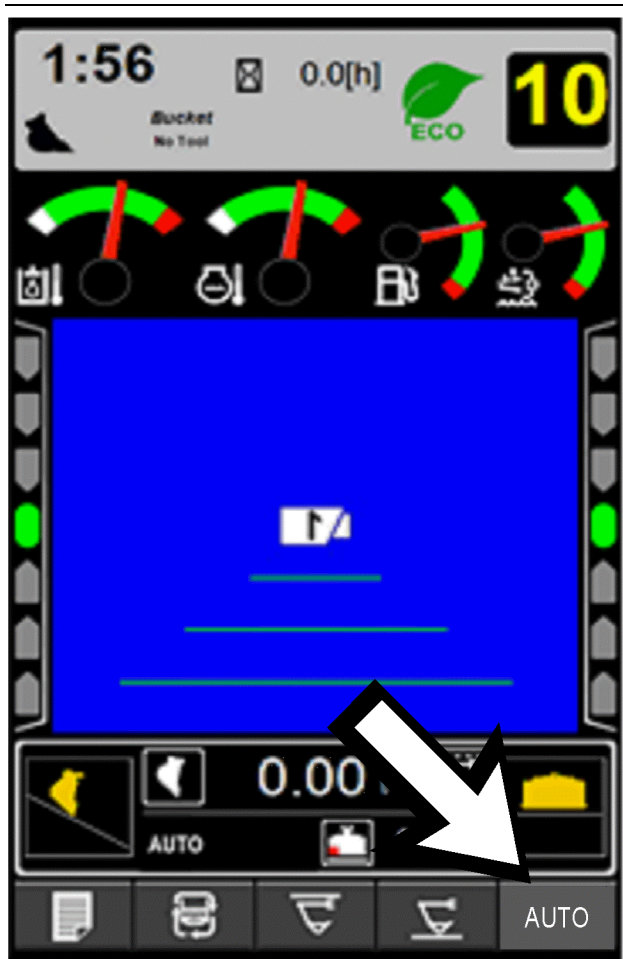


Illustration 146 g03874655
Multi-Information Area with Button to Select Auto Mode



Illustration 148 g03874649
Multi-Information Area with Button to Select Manual Mode

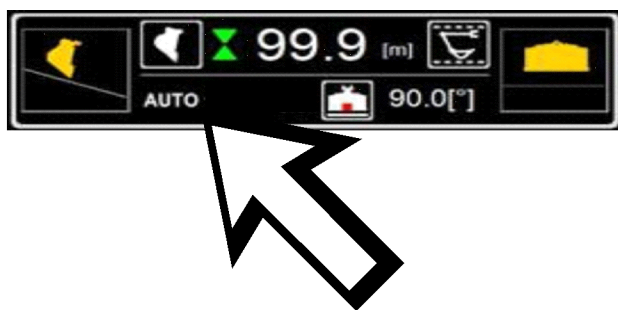


Illustration 147 g03874678
Multi-Information Area with Auto Mode Indicated

When in auto mode, all auto functions are enabled.

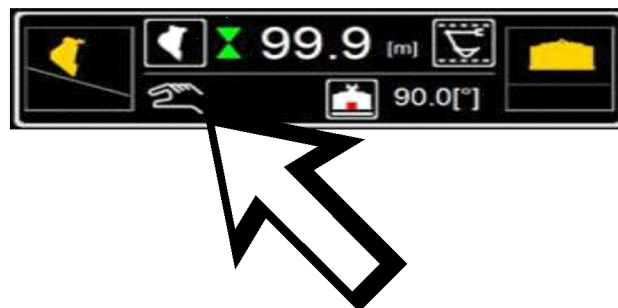


Illustration 149 g03874670
Multi-Information Area Manual Mode Indicated

Note: In auto mode e-ceiling and e-floor are active, and the linkage is stopped when the limit height or depth has been reached.

Operation Section
Monitor with Installed Cat Grade With Assist

When in manual mode no auto functions are enabled except for e-ceiling and e-floor.

Note: In manual mode e-ceiling and e-floor are active, and an alarm is indicated when the linkage limit height or depth has been reached.

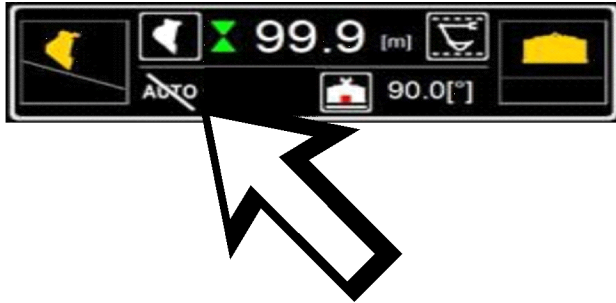


Illustration 150

g03874677

Auto Cancel Mode Indicated

When in auto cancel mode, auto is prohibited due to system condition.

Monitor With Installed Cat Grade With Assist With Tilt (If Equipped)

This is an additional available function to the Cat Grade With Assist. This function uses the tilt bucket and the tilt bucket angle sensor to allow for greater control of the bucket. The bucket focus selections and tilt are available for display on the monitor.

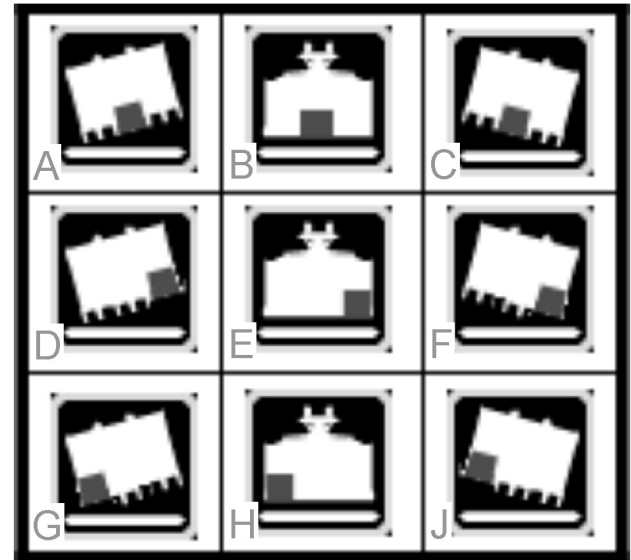


Illustration 151

g06108945

Bucket icon states

- (A) Center focus, left tilt
- (B) Center focus, flat tilt
- (C) Center focus, right tilt
- (D) Right focus, left tilt
- (E) Right focus, flat tilt
- (F) Right focus, right tilt
- (G) Left focus, left tilt
- (H) Left focus, flat tilt
- (J) Left focus, right tilt

Illustration 151 shows the various angle states of the direction of the bucket slope and the bucket focus states for the icon. The square on the bucket indicates the position of the bucket focus.

Note: The default bucket focus position is bucket center.

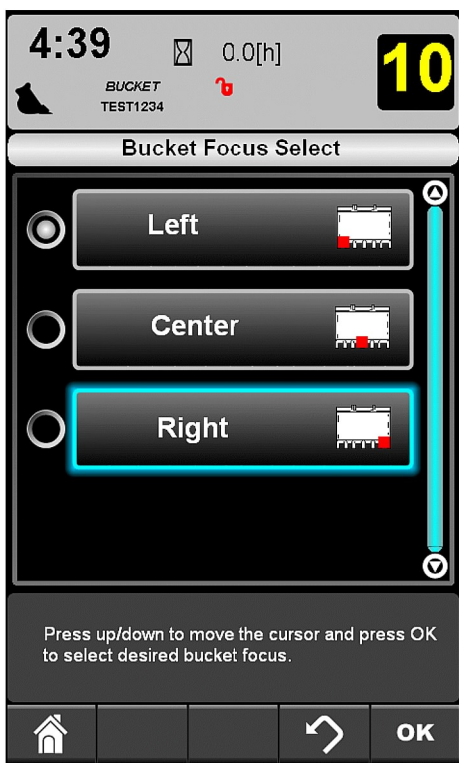


Illustration 152

g06108996

Bucket focus state selection monitor

i07350562

Monitoring System

SMCS Code: 7451; 7490

NOTICE

When the monitor provides a warning, immediately check the monitor and perform the required action or maintenance as indicated by the monitor.

The monitor indicator does not guarantee that the machine is in a good condition. Do not use the monitor panel as the only method of inspection. Maintenance and inspection of the machine must be performed on a regular basis. See the Maintenance Section of this Operation and Maintenance Manual.

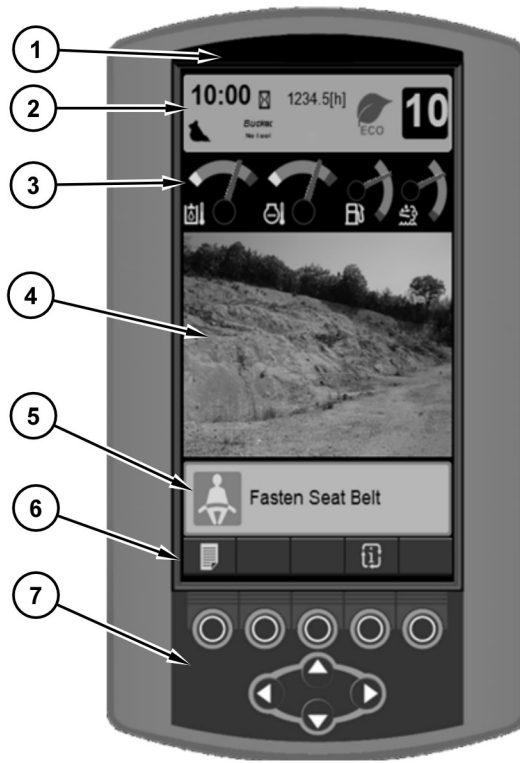


Illustration 153

g03510903

- (1) Alert Lamp
- (2) Clock bar
- (3) Gauges Area
- (4) Camera View
- (5) Warning Display area
- (6) Multi-information area
- (7) Keypad

Action Lamp (1)

This action lamp illuminates to show that a problem has occurred with the machine. The action lamp will flash red when a level 2 warning or level 3 warning is active.

Clock Bar (2)

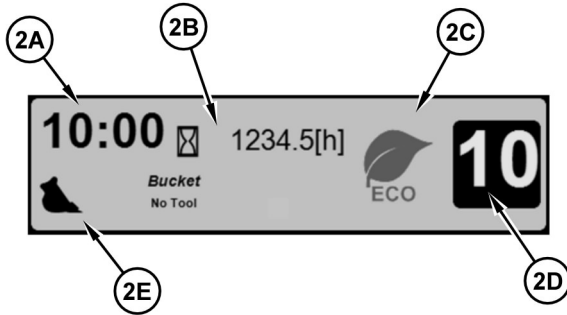


Illustration 154

g03510998

Clock (2A) – The clock function displays the current time.



Service Hour Meter (2B) – This indicator shows the total operating hours of the engine. Use the display to determine the service hour maintenance intervals.



Fuel Consumption Rate (2B) – This indicator shows the rate of fuel consumption.

Fuel Remain Time (2B) – This indicator shows the fuel remaining time.



“ECONOMY MODE SELECTED” (2C) – This indicator shows that the machine is set to operate in the economy mode.

Throttle Dial (2D)

The throttle indicator shows the current position of the throttle dial on the right side panel.

Active Tool (2E)

This indicator shows the current work tool that is selected in the menu.

Gauges (3)



Hydraulic Oil Temperature – This gauge indicates the temperature of the hydraulic oil. The normal operating range is the green range. If the gauge is the white range, the engine and machine warm-up is required. Please refer to Operation and Maintenance Manual, "Engine and Machine warmup". If the gauge reaches the red range, reduce the load on the system. If the gauge stays in the red range, stop the machine and investigate the cause of the problem. White area means Low Temp.



Engine Coolant Temperature – This gauge indicates the temperature of the engine coolant. The normal operating range is the green range. If the gauge is the white range, the engine and machine warm-up is required. Please refer to Operation and Maintenance Manual, "Engine and Machine warmup". If the gauge reaches the red range, stop the machine and investigate the cause of the problem. White area means Low Temp.



Fuel Level – This gauge indicates the amount of fuel that is remaining in the fuel tank. When the fuel gauge indicates that the fuel level is in the red range, add fuel immediately.



Diesel Exhaust Fluid (DEF) Level – This gauge indicates the amount of DEF that is remaining in the DEF tank. When the DEF gauge indicates that the DEF level is in the red range, add DEF immediately.

Camera View (4) (If Equipped)



Illustration 155

g06032090

- (1) Rear View
(2) Side View

This area on the monitor displays the view of the camera. There may be two cameras, a rear view camera mounted on the top of the counterweight and a side view camera mounted on the top of the Fuel tank or Hydraulic oil tank.

If only the rear view camera is equipped, the monitor screen shows a rear view only.

If both rear view camera and side view camera are equipped, the monitor screen is split vertically and displays a rear view (left side on the monitor) and side view (right side on the monitor) simultaneously.

To change the camera view, refer to “Default Screen Preset”

Note: Horizontal guide lines can be enabled/ disabled. Please consult your Cat dealer when you want to change the setting.

Warning Display Area (5)

The Monitoring System is designed to alert the operator to an immediate problem with any of the machine systems that are monitored. The Monitoring System is also designed to alert the operator to an impending problem with any of the machine systems that are monitored. The status of any of those monitored systems will be displayed in this area.

Multi-information Area (6)

This area displays miscellaneous information such as the various work tools or other options such as e-fence that are installed on the machine.

Key Pad (7)

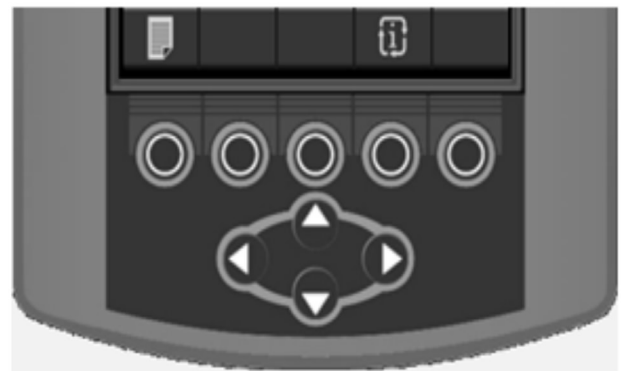


Illustration 156

g03547409

The keypad has nine keys that are used to input information into the electronic monitoring system.



Menu Key – Press the menu key to access the main menu.



Home Key – Press the home key to return to the default display at any time.



Enter Key – Press the enter key to confirm an entry.



Screen Cycle Key – Press the screen cycle key to cycle the different screen views.



OK Key – Press the OK key to select a menu option. Also press the OK key to set values.



Reset Key – Press the reset key to set all counters back to zero.



Back Key – Press the back key to reject a menu option or a setting value. Also, press the back key to return to the previous display.



Up Key – Press the up key to move the cursor upward. Also press the up key to increase values.



Down Key – Press the down key to move the cursor downward. Also press the down key to decrease values.



Left Key – Press the left key to move the cursor to the left. Also press the left key to decrease values.



Right Key – Press the right key to move the cursor to the right. Also press the right key to increase values.

If the fluid level check detects a low fluid level, the appropriate message will be displayed to indicate the fluid level that is low.

Note: If more than one fluid level is low, the symbols for the right key and the left key are indicated in the bottom right area of warning message. Press the right key or the left key to check the other warning message.

Note: The machine cannot perform an accurate fluid level check when the machine is on a slope. Perform the fluid level check on level ground.

The service hours for the filters are checked. The service hours for the fluids are also checked. If a filter or a fluid is over the recommended change interval, "CHECK SERVICE PARTS INFORMATION" appears on the display. Refer to filter and fluid Information located this Operation and Maintenance Manual for more information.

If the engine is started during the prestart checks, the prestart checks are cancelled.

Machine Warnings

Note: All the warnings that are listed may not be applicable to all machine models.

The monitoring system provides three warning categories.

- The first warning category requires only operator awareness. This type of warning will be indicated by a message on the display screen.
- The second warning category requires a change to the machine operation or a change to the maintenance of the machine. This type of warning will be indicated by a message on the display screen and by a blinking of the Action Lamp.
- The third warning category requires immediate shutdown of the engine. This type of warning will be indicated by a message on the display screen, by a blinking of the Action Lamp, and by a buzzer.

If multiple warnings are present in the system, the most important problem is shown first. Press the right key or press the left key to view all the warnings that are present in the machine. If no keys are pressed within 5 seconds, the display will return to the most important problem.

Note: The menu is still functional by pressing the menu key.

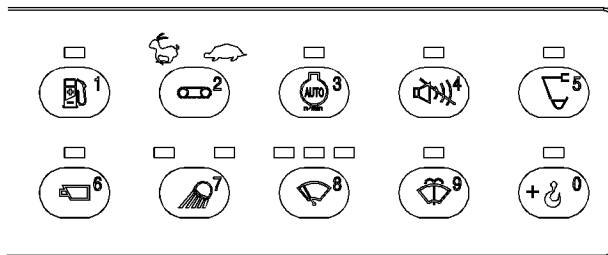


Illustration 157

g03294460

Soft switch panel

Note: The soft switch panel on the right side of the cab can also be used to input numerical values into the monitor.

Prestart Monitoring Function

Turn the engine start switch to the ON position.

After approximately one second, Cat appears in the display and the action lamp turns on.

The pattern for the joystick controls is indicated in the bottom of the display for 3 seconds.

The coolant temperature, the hydraulic oil temperature, the fuel level, and the position of the engine speed dial are now indicated.

The monitoring system checks the level of the engine coolant and the engine oil before the engine starts.

Warning Category 1

In this category, only a warning will be shown in the display screen. This category alerts the operator that the machine system needs attention. Failure of these systems will not endanger the operator. Failure of these systems will not damage the machine components.

Note: The warnings that are listed may not be applicable to all machine models.



“DEF LEVEL LOW” – This warning appears when the DEF level is below the specified level. Add DEF. See this Operation and Maintenance Manual, “Selective Catalytic Reduction Warning System”.



DEF LINES NOT PURGED – Do not turn the battery disconnect switch to the OFF position.



“EMISSION FAULT” – Check for additional warnings. Contact your Cat dealer.



“ENGINE FAULT CHECK ENGINE” – An abnormality has been detected in the engine. Stop the engine and contact your Cat dealer.



“ENGINE OVER SPEED WARNING” – The engine speed is too fast. Change the operating technique. If the situation continues, contact your Cat Dealer.



“ENGINE SHUTDOWN ACTIVE” – An error has occurred with the engine and the engine is shutting down. Contact your Cat Dealer.



“ENGINE SHUTDOWN IDLE TIME EXCEEDED” – The engine is stopped by engine idle shutdown function. Machine shutdown such as air conditioner is pending.



FUEL LEVEL SENSOR FAILURE – The fuel level sensor has failed. Contact your Cat Dealer.



“FUEL PRESSURE HIGH” – The fuel pressure is too high. Contact your Cat Dealer.



“INTAKE AIR FILTER PLUGGED” – The air filter is restricted. Engine output will be decreased. Immediately inspect the air filter. Clean the air filter. Inspect the condition of the air filter. Replace the air filter, if necessary. Perform any necessary repairs. Refer to Operation and Maintenance Manual, “Engine Air Filter Primary Element - Clean/Replace”.



“LOW BATTERY ELEVATED IDLE” – (312F - 320F machine models). The battery voltage is low. Engine idle will be elevated.



“WATER SEPARATOR FULL” – The water separator is full. Drain the water from the water separator as soon as possible. Refer to Operation and Maintenance Manual, “Fuel System Water Separator - Drain”.



“SCR THERMAL MODE REQUIRED” – Stop the operation, place the hydraulic lockout in the LOCKED position and push the start button on the monitor to start cleaning DEF deposit in the SCR system.



“SCR THERMAL MODE ELEVATED IDLE” – Recommend to wait until this message is no longer active. Machine can be operated, but SCR thermal Mode will be needed again. Clean the DEF deposit in the SCR system.

Warning Category 2

Note: The warnings that are listed may not be applicable to all machine models.



“90 % LOAD” – Used with shovel crane applications. The suspended load on the machine is 90% of the rated load. Stop traveling until the machine center of gravity becomes stable or reduce the suspended load. Refer to Operation and Maintenance Manual, “Lifting Capacities” for more information.



“ATTACHMENT FILTER PLUGGED” – The hydraulic filter is restricted. Restriction of the filter will cause hydraulic components to malfunction. Turn the engine start switch to the OFF position and then turn the engine start switch to the ON position. If the warning disappears, the filter is good. Operate the machine on flat ground for at least 10 minutes. If the warning reappears, replace the filter.



“BATTERY VOLTAGE IRREGULAR” – The electrical charging system is malfunctioning. Check the electrical components of the charging circuit immediately. Perform any necessary repairs.



“BOOM OUT OF WORK AREA” – Used with shovel crane applications. The boom cylinder is extended to the point near stroke end. Lower the boom and use a different position for the boom.



“CHECK LINKAGE MEASURE” – There is an abnormality detected in one of the grade control linkage settings. Verify that the linkage settings are correct. Contact your Cat dealer.



“CHECK MACHINE DIMENSION” – There is an abnormality detected in one of the grade control dimension settings. Verify that the machine dimensions are set correctly. Contact your Cat dealer.



“COOLANT TEMP POWER DERATE” – The coolant temperature is too high. The engine will derate until the coolant temperature decreases to the correct level. If the warning stays on during low idle, stop the engine and inspect the cooling system. Perform any necessary repairs as soon as possible.



“CYCLE THE LOCK LEVER” – An error has occurred with the lock lever. Cycle the lock lever.



DEF PURGE ACTIVE – DEF system is purging. Do not turn the battery disconnect switch to the OFF position until the purge is complete.



“E-FENCE SYSTEM INTERFERING” – Used with E-Fence application. The machine is operating at or near the E-fence automatic stop parameters. Operate the machine outside of the E-fence automatic stop parameters.



“EMISSION FAULT” – Check for additional warnings. Contact you Cat dealer.



“ENGINE FAULT CHECK ENGINE” – An abnormality has been detected in the engine. Stop the engine and contact your Cat dealer.



“ENGINE OIL PRESS LOW” – The engine oil pressure is low. Stop the machine and check the engine oil level. If the engine has started in the cold ambient, warm up the machine properly. If the error disappears after warmup, there is no engine oil pressure trouble.



“ENGINE SHUTDOWN PENDING” – The engine idle function will shutdown the engine in 20 seconds. Operator can cancel the shutdown by pressing a button on the monitor or move one of the controls.



“FUEL LEVEL LOW” – The fuel in the tank is low on fuel. Refill the fuel tank.



“GRADE CONTROL CHECK SENSOR” – There is an abnormality detected in one of the grade control sensors. Contact your Cat dealer.



“HOOK INTERFERING” – Used with shovel crane applications. The lifting height is too high. Lower the boom or retract the arm.



“HYD OIL TEMP HIGH (TOOL)” – The hydraulic oil temperature is too high. Stop operating the machine and run the engine at low idle until the hydraulic oil temperature decreases to the correct level. If the warning stays on during low idle, stop the engine. Check the hydraulic oil level and check the hydraulic oil cooler for debris. Perform any necessary repairs as soon as possible.



“HYD OIL TEMP POWER DERATE” – The hydraulic oil temperature is too high. The engine will derate until the hydraulic oil temperature decreases to the correct level. If the warning stays on during low idle, stop the engine. Check the hydraulic oil level and check the hydraulic oil cooler for debris. Perform any necessary repairs as soon as possible.



“HYD RETURN FLTR PLUGGED” – The hydraulic return filter is restricted. Restriction of the filter will cause hydraulic components to malfunction. Turn the engine start switch to the OFF position and then turn the engine start switch to the ON position. If the warning disappears, the filter is good. Operate the machine on flat ground for at least 10 minutes. If the warning reappears, replace the return filter cartridge. Refer to Operation and Maintenance Manual, “Hydraulic System Oil Filter (Return) - Replace”.



“LIFT OVERLOAD WARNING” – The load on the machine is too heavy. The machine is in danger of tipping. Reduce the load immediately. Refer to Operation and Maintenance Manual, “Lifting Capacities” for more information.



“SECURITY SYSTEM ACTIVE” – This machine is equipped with a Machine Security System. The key that is in the ignition switch is not an authorized key. Remove the key and insert an authorized key.



“SERVICE REQUIRED” – The machine has detected a malfunction. Contact your Cat Dealer.



“STICK OUT OF WORK AREA” – Used with shovel crane applications. The stick is retracted from the vertical position. Extend the stick and use a different position for the stick.



“TOOL CONTROL MALFUNCTION” – The work tool has malfunctioned. Stop the machine and inspect the work tool.



“TRAVEL WITH LIFT OUT OF WORK AREA” – Used with shovel crane applications. The machine is traveling with a suspended load that exceeds 70% of the rated capacity. Stop traveling until the machine center of gravity becomes stable or reduce the suspended load.



“WATER SEPARATOR FULL” – The water separator is full. Drain the water from the water separator as soon as possible. Refer to Operation and Maintenance Manual, “Fuel System Water Separator - Drain”.



“REFUELING PUMP STRAINER PLUGGED” – The refueling pump strainer is restricted. Refer to Operation and Maintenance Manual, “Refueling Pump Strainer - Clean”.



“REFUELING PUMP RUNS DRY” – The refueling pump has run dry or plugged. Immediately inspect the fuel transfer pump components, if necessary. Perform any necessary repairs. Refer to Operation and Maintenance Manual, “Fuel Transfer Pump (Refueling)”.



“REFUELING PUMP CONDITION NOT MET” – The fuel transfer pump will not activate and/or stop operating when conditions are not met. Refer to Operation and Maintenance Manual, “Fuel Transfer Pump (Refueling)”.



“SCR THERMAL MODE REQUIRED” – Stop the operation, place the hydraulic lockout in the LOCKED position and push the start button on the monitor immediately.



“EMISSIONS OVERRIDE RENEWAL REQUIRED” – Stop the engine and contact your Cat Dealer.



“100% LOAD” – Used with shovel crane applications. The suspended load 100% of the rated load when traveling. The machine is in danger of tipping. Stop traveling until the machine center of gravity becomes stable or reduce the suspended load. Refer to Operation and Maintenance Manual, “Lifting Capacities” for more information.



“COOLANT TEMP HIGH” – The coolant temperature is too high. Stop the engine immediately. Check the coolant level and check the radiator for debris. Refer to Operation and Maintenance Manual, “Cooling System Coolant Level - Check”. Check the fan drive belts for the water pump. Refer to Operation and Maintenance Manual, “Belts - Inspect/Adjust/Replace”. Make any necessary repairs.



“CRANE SYSTEM MALFUNCTION” – Used with the shovel crane application. An abnormality has been detected in the shovel crane system. Stop the lifting operation immediately. Contact your Cat dealer.



“EMISSION FAULT” – DEF System Failure and Engine will stop in 5 minutes. Stop the engine and contact your Cat dealer.



“ENGINE FAULT SHUTDOWN SAFELY” – An abnormality has been detected in the engine. Stop the engine immediately. Contact your Cat dealer.



“ENGINE OIL PRESSURE POWER DERATE” – The engine will derate until the engine oil pressure is at the correct level. If the warning stays on during low idle, stop the engine and check the engine oil level. Perform any necessary repairs as soon as possible.



“HYD OIL TEMP HIGH” – The hydraulic oil temperature is too high. Stop the engine. Check the hydraulic oil level and check the hydraulic oil cooler for debris. Perform any necessary repairs as soon as possible.



“INLET AIR TEMP POWER DERATE” – Inlet air temperature exceeds threshold. Engine speed is restricted. Stop the engine. Determine the cause of the fault and perform any necessary repairs.



“LIFT OVERLOAD WARNING” – The load on the machine is too heavy. The machine is in danger of tipping. Reduce the load immediately. Refer to Operation and Maintenance Manual, “Lifting Capacities” for more information.

Warning Category 3

Note: The warnings that are listed may not be applicable to all machine models.



“QUICK COUPLER UNLOCK” – The quick coupler is not locked. Lock the quick couple before operating the machine.



“SERVICE REQUIRED” – The machine has detected a malfunction. Contact your Cat Dealer.



“Cancel Auto Stop” – Used with shovel crane, UHD, HCR, and E-Fence applications. The automatic stop function is OFF. Operate the machine with extreme caution. As soon as the need is eliminated, turn the automatic stop function ON.



“E-Fence System Malfunction” – Contact your Cat Dealer. Operate carefully because the E-Fence system does not work.

Other Messages

Prestart

Note: The warnings that are listed may not be applicable to all machine models.



CHECK SERVICE PARTS INFORMATION – One of the machines filters has exceeded the recommended change interval. Replace the filter and reset the hours for the filter.



“COOLANT LEVEL LOW” – The coolant level is too low. Stop the machine immediately. Stop the engine and investigate the cause of the fault.



“ENG OIL LEVEL LOW” – The engine oil level is too low. Stop the machine immediately. Stop the engine and investigate the cause of the fault.



“FASTEN SEAT BELT” – Please fasten your seat belt.

Miscellaneous

Note: The warnings that are listed may not be applicable to all machine models.



“BUCKET IN” – Used with shovel crane applications. Fully retract the bucket.



“COOLANT TEMP LOW ELEVATED IDLE” – The coolant temperature is low. Engine idle will be elevated.



“CRANE SYSTEM OFF” – Used with shovel crane applications. The shovel crane function has been turned off.



“ECONOMY MODE SELECTED” – The economy power mode has been selected.



“GLOW ACTIVE WAIT TO START” – If the engine coolant temperature is too low, the glow plugs will be activated. This indicator will appear in the message display when the engine start switch is in the ON position. The engine can be started after the indicator disappears from the message display



“HIGH POWER MODE SELECTED” – The high-power mode has been selected.



“POWER MODE LOCKING” – Power mode has been locked through the power mode setting menu. Refer to this Operation and Maintenance Manual, “Monitoring System”



“QUICK COUPLER LOCKING” – The quick coupler is locking. See this Operation and Maintenance Manual, “Quick Coupler Control”



“STANDARD POWER MODE SELECTED” – The standard power mode has been selected.



“SYSTEM PROTECTION COMPLETE” – Indicates that the DEF purge is complete. When the temperature of the DEF injector is high, an engine cooldown is executed followed by the DEF purge.



“VERIFY TOOL LOCKING” – The quick couple has been locked. Verify that the quick coupler is securely fixed to the work tool.



“WARM-UP MODE POWER DERATE” – If the joysticks are held for more than 30 seconds, the machine ECM will go into the warm-up mode power derate setting. The machine ECM limits the hydraulic pump torque to 50 percent. Release the joysticks to cancel this setting. Refer to Operation and Maintenance Manual, “Engine and Machine Warm-Up”.



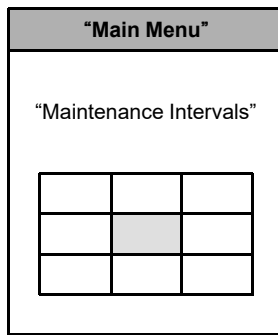
“SCR THERMAL MODE COMPLETED” – SCR Thermal Management (cleaning DEF deposit) ended.

Main Menu

The “Main Menu” allows the operator to view information concerning the machine. This menu also allows the operator to change information concerning the machine.

1. Push the menu key when the default display is active.

Table 12



2. The “Main Menu” will be displayed with menu options that are installed on the machine. The number of choices can vary. For more information on these menus, refer to the respective descriptions below.
3. Press the right key or the left key to highlight the desired menu. Press the OK key to open the desired menu.

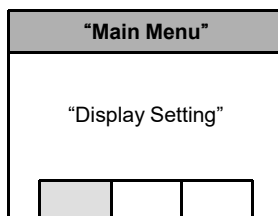
Note: Press the back key or the home key to exit this menu and return to the default display.

Display Setting

The “Display Setting” menu allows the operator to change the various display settings of the monitor.

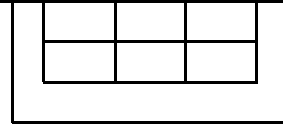
1. Press the menu key.

Table 13



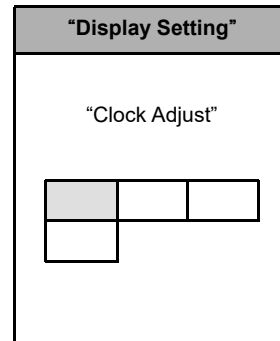
(continued)

(Table 13, contd)



2. Press any of the arrow keys to highlight the “Display Setting” menu. Press the OK key.

Table 14



3. The “Display Setting” menu will be displayed with four new menu options. For more information on these menus, refer to the respective descriptions below.
4. Press any of the arrow keys to highlight the desired menu. Press the OK key to open the desired menu.

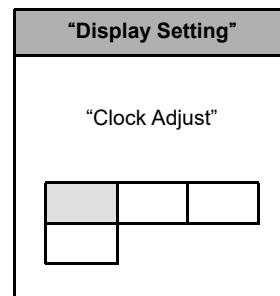
Note: Press the home key to return to the default display.

Adjusting the Clock

The “Clock Adjust” menu allows the operator to change the time on the clock.

1. Press any of the arrow keys to highlight the “Clock Adjust” menu. Press the OK key.

Table 15



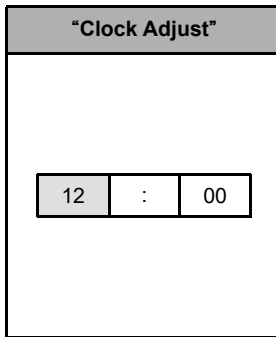
(continued)

(Table 15, contd)



- The "Clock Adjust" menu will be displayed with the current time. Press the left arrow key or the right arrow key to select the hour or the minute. Press the OK key.

Table 16



- The hours or the minutes will be highlighted. Press the up arrow key to increase the value. Press the down arrow key to decrease the value.
- When the clock is set to the desired time, press the OK key to save the new time in memory.

Note: Press the back key to return to the previous display without saving.

Note: Press the home key to return to the default display.

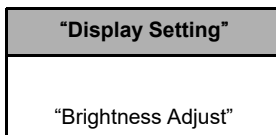
Adjusting the Brightness

The "Brightness Adjust" menu allows the operator to change the brightness of the monitor.

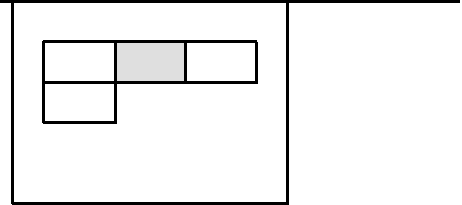
- Press any of the arrow keys to highlight the "Brightness Adjust" menu. Press the OK key.

Note: There are two brightness settings. The first setting is used for machine operation during the day. The second setting is used for machine operation at night.

Table 17

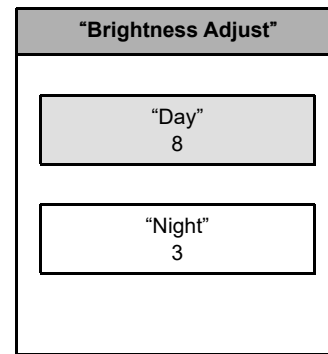


(Table 17, contd)



- Press the up arrow key or the down arrow key to select the "Day" setting or the "Night" setting. Press the OK key.

Table 18



- Press the right key to increase the brightness. Press the left key to decrease the brightness. The brightness can be set between 1 and 10.

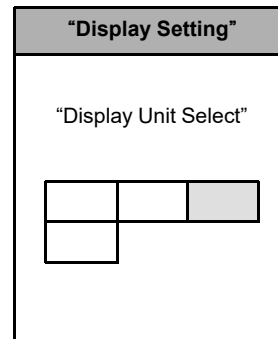
Note: Press the home key to return to the default display.

Display Unit Select

The "Display Unit Select" menu allows the operator to change the display units.

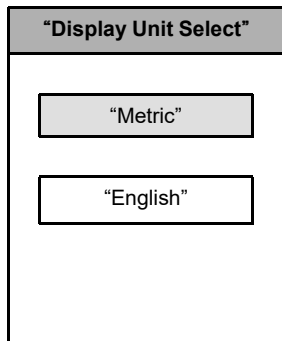
- Press any of the arrow keys to highlight the "Display Unit Select" menu. Press the OK key.

Table 19



- Press the up arrow key or the down arrow key to select the "Metric" setting or the "Imperial" setting. Press the OK key.

Table 20



- Press the "Back" key to return to the previous screen or press the "Home" key to return to the main menu.

Default Screen Preset

The "Default Screen Preset" menu allows the operator to change the default screen image when the monitor is turned on.

Note: This menu function is only available when the machine is equipped with a rear view camera or rear view and side view cameras..

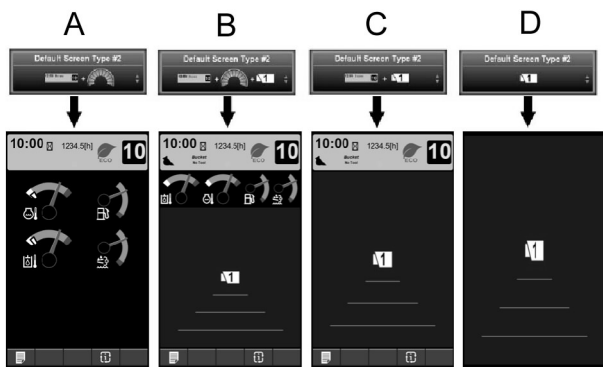


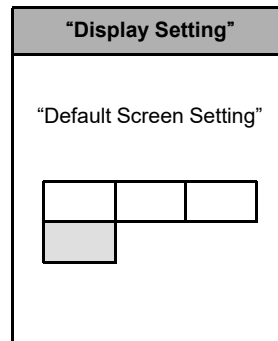
Illustration 158

g03512276

- (Pattern A) Camera view is not displayed, and gauges displayed in large view.
- (Pattern B) Gauges and camera view displayed simultaneously. Pattern B is the default display if the rear view camera or rear view and side view cameras are equipped on the machine.
- (Pattern C) Gauges are not displayed. Large view of rear view camera.
- (Pattern D) Camera view displayed on full monitor screen. Any warnings or events will default to Pattern B.

- Press any of the arrow keys to highlight the "Default Screen Setting" menu. Press the OK key.

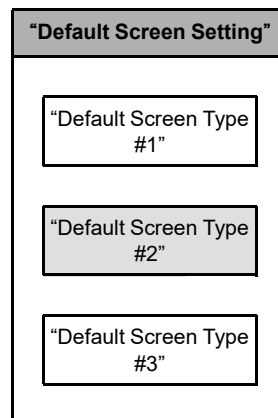
Table 21



- Press the up arrow key or the down arrow key to select the default screen type. Press the OK key to enter the edit mode.

Note: Default screen #1 is preset at the factory and cannot be changed.

Table 22



- Press the up arrow key or the down arrow key to select the default screen type. Press the OK key to highlight default screen type. Press the up arrow key or the down arrow key to set the display pattern.

Note: Press the monitor view key to preview the selected default screen.

- Press the OK key to store the pattern that was selected.

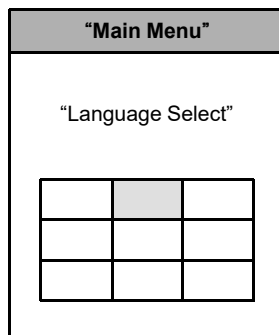
5. Press the “Back” key to return to the previous screen or press the “Home” key to return to the main menu.

Language Selection

The “Language Select” menu allows the operator to change the language settings.

1. Press the menu key.

Table 23



2. Press any of the arrow keys to highlight the “Language Select” menu. Press the OK key.

Table 24



3. The “Language Select” menu will be displayed with a list of available languages. Press the up key or the down key to scroll through the available languages. Press the OK key to select the desired language.

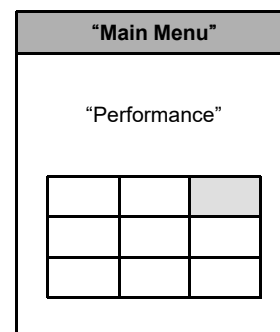
Note: Press the home key to return to the default display.

Performance

The “Performance” menu allows the operator to view measurements of various system components. The following components are a few examples of the components that can be viewed through the “Performance” menu: battery voltage, engine speed, and pump pressure.

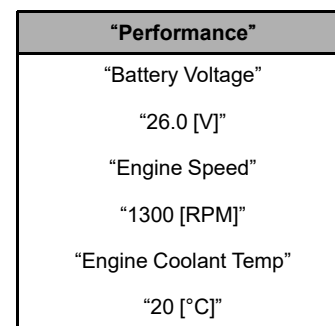
1. Press the menu key.

Table 25



2. Press the right key or the left key to highlight the “Performance” menu. Press the OK key.

Table 26



3. The “Performance” menu will be displayed with a list of system components and measurements. Press the up key or the down key to scroll through the list.

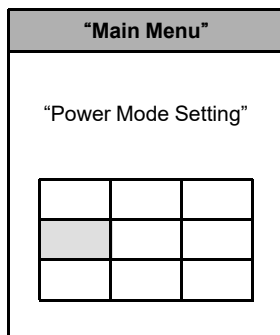
Note: Press the home key to return to the default display.

Power Mode Setting

The “Power Mode Setting” menu allows the operator to change the various operating power modes.

1. Press the menu key.

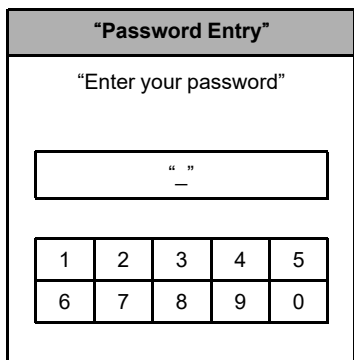
Table 27



2. Press any of the arrow keys to highlight the "Power Mode Setting" menu. Press the OK key.
3. You will be prompted to enter a password. After the password has been entered successfully, the "Power Mode Setting" menu will be displayed.

Note: When the machine leaves the factory, the password is initially set at 1.

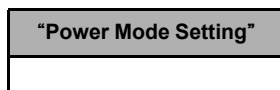
Table 28



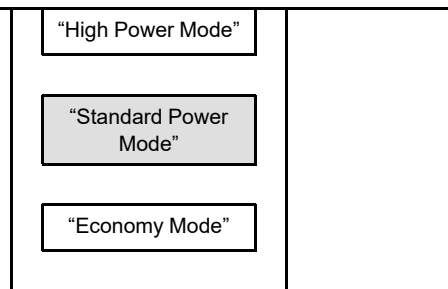
4. Press the up key or the down key to highlight the desired setting. Press the OK key to confirm the desired selection.

Note: Due to country-specific fuel consumption criteria, your machine may not be equipped with all Power Mode options.

Table 29



(Table 29, contd)



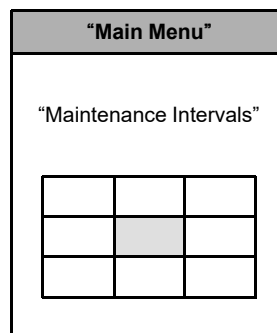
Note: Press the home key to return to the default display.

Maintenance Intervals

The "Maintenance Intervals" menu allows the operator to view the current hours of use and the recommended change intervals for various system components.

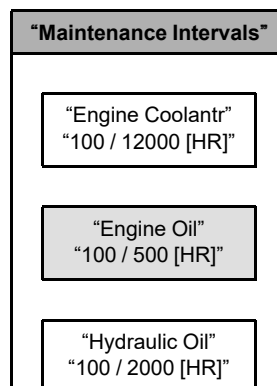
1. Press the menu key.

Table 30



2. Press any of the arrow keys to highlight the "Maintenance Intervals" menu. Press the OK key.

Table 31



(continued)

(continued)

(Table 31, contd)

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3. A list of system components will be displayed. Press the up key or the down key to scroll through the list. For each of the system components, the current hours of use will be displayed. If the component has a recommended change interval, the recommended interval will be displayed.

4. Press the reset key to reset the maintenance hours.

Note: Press the home key to return to the default display.

Selecting the Work Tool

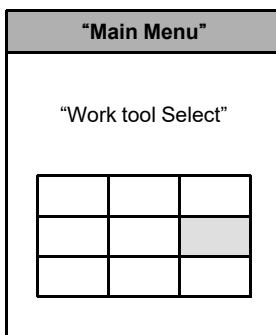
The "Work Tool Select" menu allows the operator to change the settings for the work tool.

Note: Make sure that the hydraulic lockout control is in the LOCKED position before you change the settings for the work tool.

Note: If a bucket is installed on the machine, or no work tool is installed, select "Bucket/No Tool" in the menu.

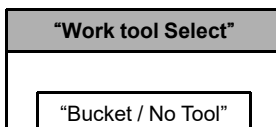
1. Press the menu key.

Table 32



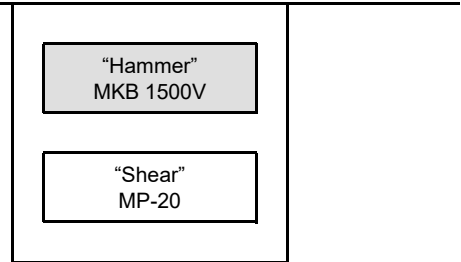
2. Press any of the arrow keys to highlight the "Work Tool Select" menu. Press the OK key.

Table 33



(continued)

(Table 33, contd)



3. Press the up key or the down key to highlight the "Work Tool Select" menu. Press the OK key.

Note: If the work tools have been configured through the Electronic Technician (ET), the names of the work tools will be displayed instead of the numbers.

4. The "Work Tools Select" menu will be displayed with the current options for work tools. Press the up key or the down key to highlight the desired work tool. Press the OK key to select the new work tool.

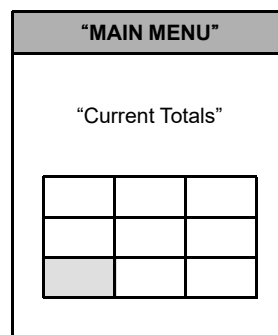
Note: Press the home key to return to the default display.

Current Totals

The "Current Totals" menu allows the operator to view the current totals for the machines systems.

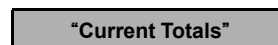
1. Press the menu key.

Table 34



2. Press any of the arrow keys to highlight the "Current Totals" menu. Press the OK key.

Table 35



(continued)

(Table 35, contd)

<p>“Total Operating Hours” “12345.6 [hr]”</p>
<p>“Engine” “12345.6 [hr]”</p>
<p>“Hydraulic Pump” “12345.6 [hr]”</p>

3. A list of system components will be displayed. Press the up key or the down key to scroll through the list.

Note: Press the home key to return to the default display.

Engine Shutdown Setting

The “Engine Shutdown Setting” menu allows the operator to enable, disable, or adjust the engine idle shutdown function.

1. Press the menu key. You will be prompted to enter a password. After the password has been entered successfully, the “Shutdown Delay Timer” menu will be displayed.

Note: The password is initially set at “1” when the machine leaves the factory,

Table 36

“MAIN MENU”		
“Engine Shutdown Setting”		

2. The “Shutdown Delay Timer” will appear on the monitor in “BLUE”. Press the OK key to activate the edit mode.

Note: The “Shutdown Delay Timer” will appear on the monitor in “GREEN” when the edit mode is activated.

Table 37

“Shutdown Delay Timer”
“OFF”
“3-60 [min]”

3. Press the up key or the down key to change the value. You may select “OFF” to disable the engine idle shutdown function, or select a value between 3 minutes and 60 minutes.

4. Press the OK key to confirm your selection.

Note: The “Shutdown Delay Timer” will appear on the monitor in “BLUE” when the selection has been confirmed.

Note: Press the home key to return to the default display.

Changing the Password

The “PASSWORD CHANGE” menu allows the operator to change the password.

Note: The password is initially set at “1” when the machine leaves the factory,

1. Press the menu key.

Table 38

“MAIN MENU”		
“Password Change”		

2. Press any of the arrow keys to highlight the “Password Change” menu. Press the OK key.

Note: You will be prompted to enter a password.

Table 39

"Password Change"					
"Enter your password"					
" "					
1	2	3	4	5	
6	7	8	9	0	

3. After the password has been entered successfully, the "Enter new password" screen will appear.

Table 40

"Password Change"					
"Enter new password"					
" "					
1	2	3	4	5	
6	7	8	9	0	

4. Press any of the arrow keys to select the desired character.

Note: The password is numeric. You may choose from "0" to "9".

5. Press the OK key to enter the character.

Note: Press the back key to delete the last character that was entered.

6. After you enter the password, you will be asked to confirm your selection. Press the "ENTER" key to save the password in memory and return to the "Main Menu" screen. Press the back key to return to the "Password Change" menu without saving the password.

Note: Press the home key to return to the default display.

i04358832

Storage Box

SMCS Code: 7268

Exterior Storage Box

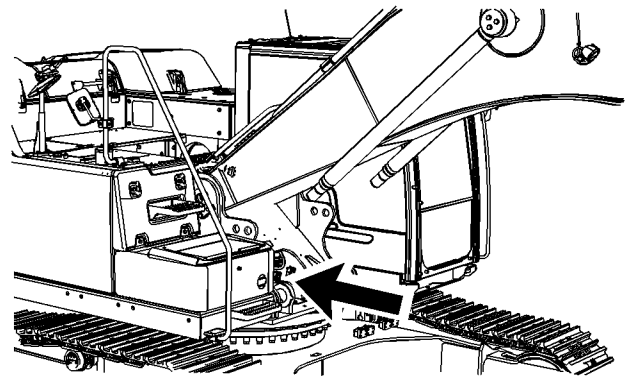


Illustration 159

g02453247

Open the storage box by pressing the push button. The storage box is also used to store miscellaneous tools. The storage box is also used to store the refueling pump (if equipped).

i06721609

Fuel Transfer Pump (Refueling) (If Equipped)

SMCS Code: 1256

Use the following procedure to pump fuel and store hose.

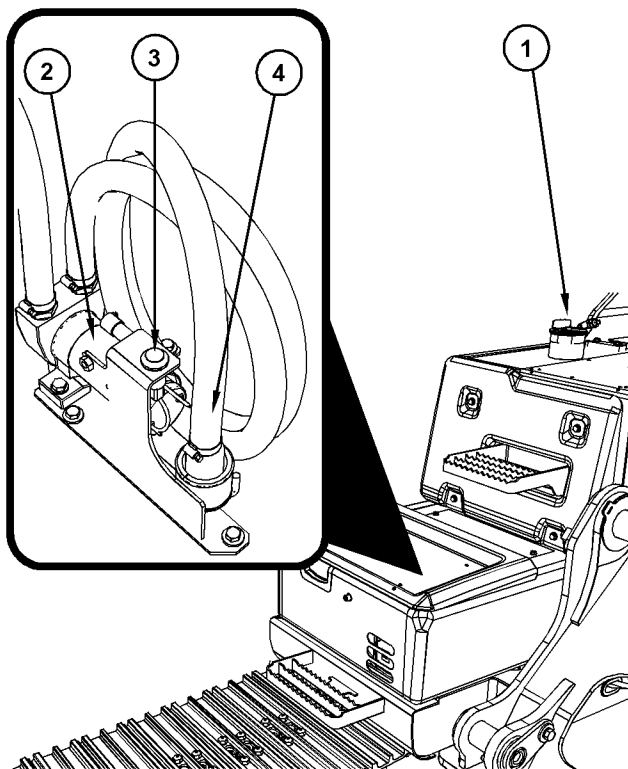


Illustration 160

g03732431

- (1) Fuel tank cap
- (2) Electric refueling pump
- (3) ON/OFF switch.
- (4) Suction hose

Open the cover of the storage box that is located on the right side in front of the fuel tank.

Electric refueling pump (2) pumps fuel into the fuel tank.

NOTICE

Do not continuously operate the refueling pump for more than 30 minutes. Do not operate the refueling pump more than a few seconds without fuel. Pump damage can result.

1. Stop the engine
2. Move the hydraulic lockout control to the LOCKED position. Refer to Operation and Maintenance Manual, "Operator Controls".
3. Remove fuel tank cap (1) from the fuel tank.
4. Properly insert the free end of suction hose (4) into a container of fuel.
5. Push switch (3) in order to supply the fuel to the tank. When the tank is full, the pump stops refueling.

Note: Press the button again in order to turn the pump OFF manually.

6. After refueling, install fuel tank cap (1) to the fuel tank.
7. When you store suction hose (4), wind the hose on the bar. Secure the hose end in place.

NOTICE

To prevent hose damage, do not coil the hose in a tight radius.

8. Close the cover of the storage box.

i03912100

Radio
(If Equipped)

SMCS Code: 7338

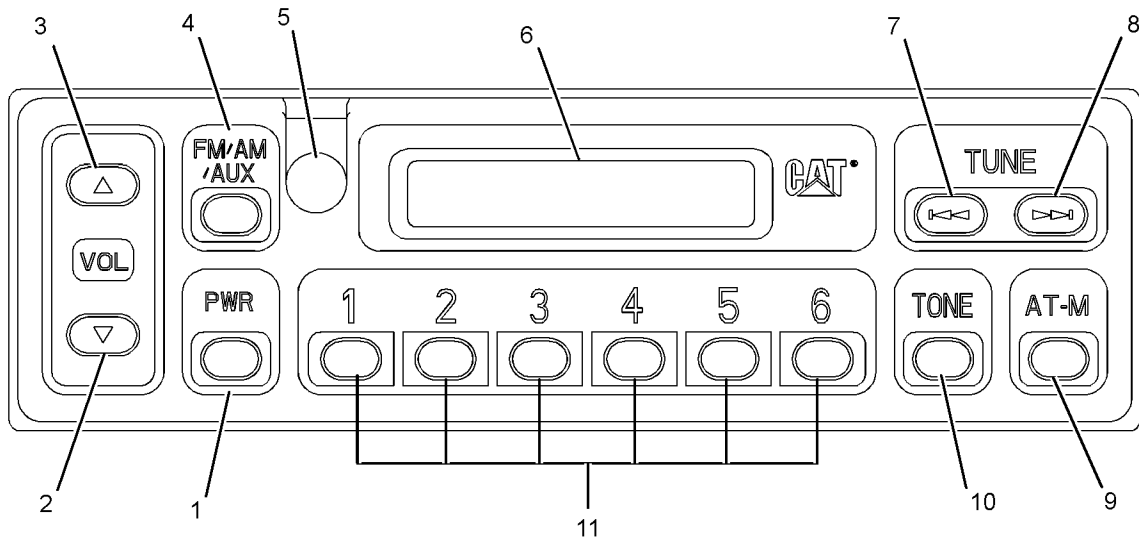


Illustration 161

g02117159

- (1) Power switch
 (2) Volume control
 (3) Volume control
 (4) "AM/FM/AUX" selector

- (5) Auxiliary plug
 (6) Display panel
 (7) "Tune" button
 (8) "Tune" button

- (9) Button for scan and auto memory function
 (10) "Tone" control
 (11) Preset buttons

Note: When the machine is in operation, turn down the volume of the radio.

Note: The radio can be used only when the battery disconnect switch and the engine start switch are in the ON position.

Note: When a button is pushed, a beep will occur.

(1) Power Switch – Push the power switch in order to turn on the radio. Push the power switch again in order to turn off the radio.

(2) and (3) Volume Control – Push the volume control in order to control the volume. Push the upper volume control in order to increase the sound level and push the lower volume control in order to decrease the sound level.

(4) "AM/FM/AUX" Selector – After you push the "AM/FM/AUX" selector, the selected radio band appears on display panel (6). This button is also used to activate the auxiliary function.

(5) Auxiliary Plug – The front auxiliary plug allows for the connection of a portable audio device.

(6) Display – The display shows various functions such as the station frequency, band, and the volume level.

(7) and (8) "Tune" Buttons – Push the "tune" buttons in order to select a radio station. Pressing "tune" button (7) will decrease the frequency. Pressing "tune" button (8) will increase the frequency. Pressing the "tune" button for less than 0.5 seconds changes the radio station one at a time. Pressing the "tune" buttons for more than 0.5 seconds will change the frequency automatically until a radio station is found.

(9) Scan and Auto Memory – Press button (5) for less than 0.5 seconds in order to listen to 5 seconds of each preset radio station. Press button (5) at least 1.5 seconds in order to store the radio stations with the six strongest signals.

(10) Tone Control – Music is optimized by pressing the tone control so that display (C) will show "MUSIC".

(11) Preset Buttons – The circuitry in the memory system allows you to preset six radio stations. To preset any of the "preset" buttons, follow the "Presetting Radio Stations" procedure.

Presetting Radio Stations

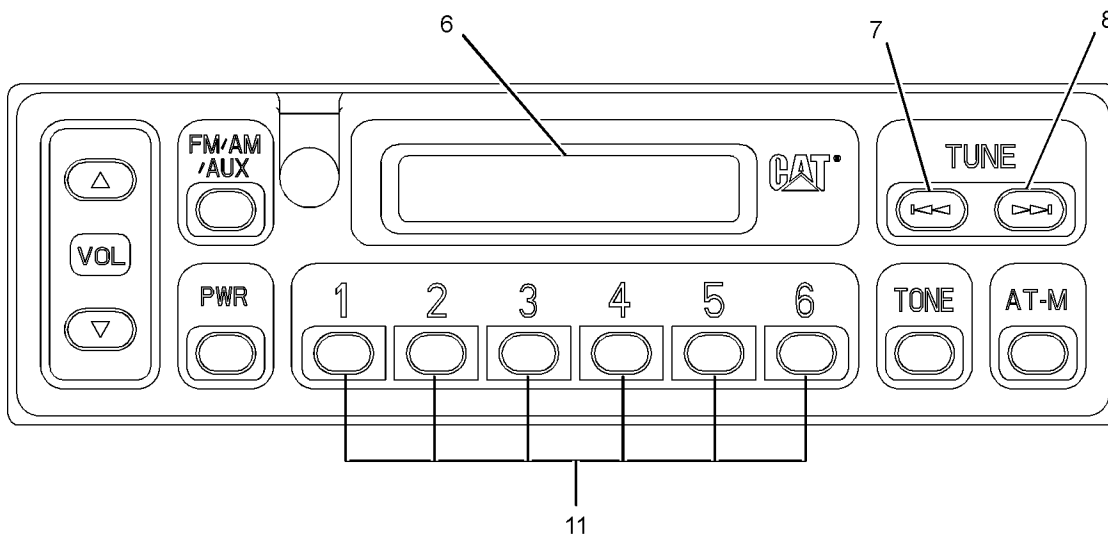


Illustration 162

g02117163

- (6) Display
(7) "Tune" button
(8) "Tune" button
(11) Preset buttons

1. Turn on the radio. Select the AM band or the FM band.
2. Select the first radio station by using tuning switch (7) or tuning switch (8).
3. Depress one of preset buttons (11) for more than 1.5 seconds. The radio station will be stored in the memory for the selected preset.
4. Push preset button (11) in order to tune in the radio station.
5. Repeat the same procedure for the remaining preset switches.

Note: When the preset station is faint, use the “tune” buttons to locate a stronger signal.

Scan and Auto Memory

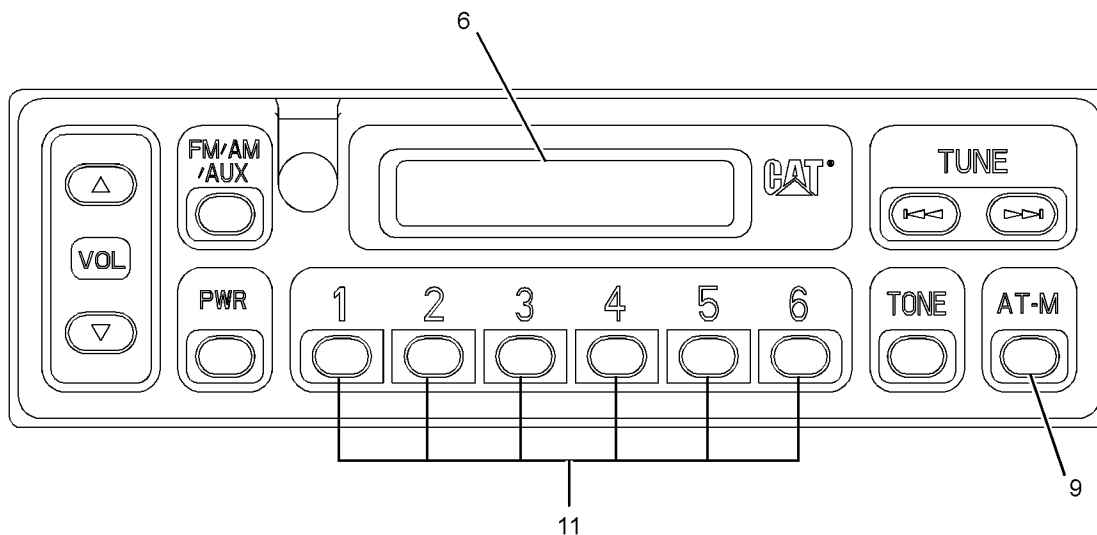


Illustration 163

g02117175

(6) Display (Frequency)

(9) Button for scan and auto memory function

(11) Preset buttons

Scan – Press button (9) for less than 0.5 seconds in order to listen for 5 seconds to each of the preset radio stations. Press button (9) again in order to stop scanning through the preset stations and keep listening to the current station. When this function is used “SCAN” is shown on display (6). The frequency of the radio station is also shown on the display.

Auto Memory – Press button (9) for more than 1.5 seconds in order to store the radio stations that have the strongest signal. The radio stations are stored in the six presets (11). Stations that are already stored in the memory will be erased.

Loss of Memory

The memory system is erased after a few days if the battery is disconnected.

Radio Reception

Note: The radio must be connected to a power source in order to set the area of reception.

Set the area of reception according to the following table:

Table 41

AREA	Display Setting	
	EU	US
North America		X
Central and South America		X
European Union	X	
Asia / Oceania	X	

Use the following procedure in order to set the desired area.

1. Turn off the radio.
2. Press preset button “1” , preset button “4” and button (9) at the same time. Hold until “EU” or “US” is displayed on the display panel.

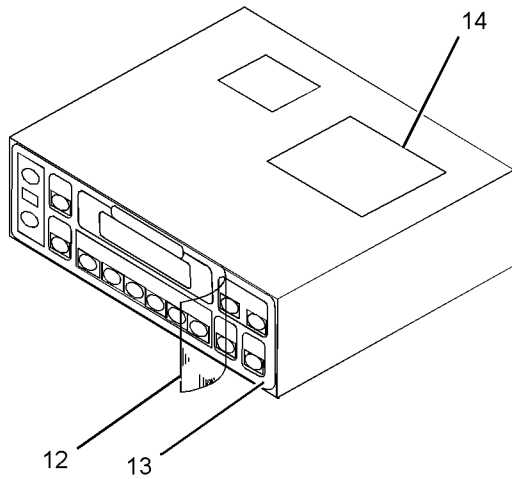


Illustration 164

g02117176

- (12) Protective film
- (13) Control panel
- (14) Method of selection

Note: Remove the film from the radio. Remove the vinyl from the operator seat. The film and vinyl may cause noise interference in the radio.

i06259786

Radio (If Equipped)

SMCS Code: 7338

An AM/FM radio may be installed in the right side instrument panel.

Operation Section
If Equipped

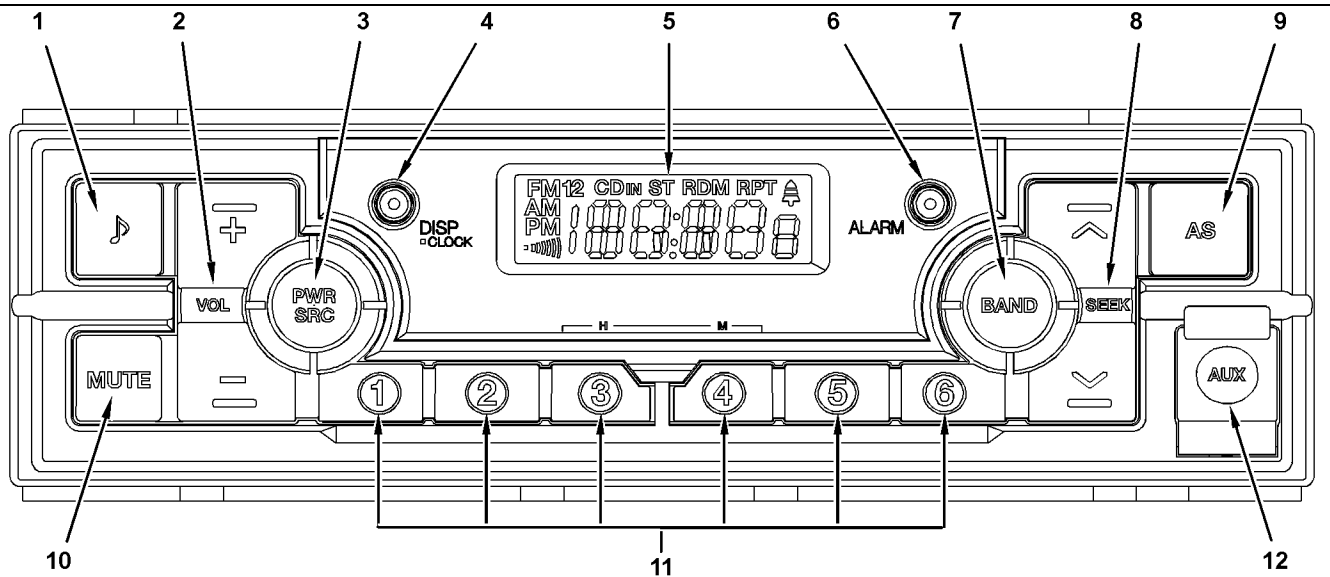


Illustration 165

g02831713

- | | | |
|--------------------------|-----------------------|-----------------------|
| (1) Tone button | (5) Radio display | (9) Auto Store button |
| (2) Volume control | (6) Alarm button | (10) Mute button |
| (3) PWR/SRC button | (7) AM/FM band button | (11) Preset buttons |
| (4) Display/Clock button | (8) Tune button | (12) Auxiliary input |

Note: When the machine is in operation turn down the volume of the radio.

Note: The battery disconnect switch and the engine start switch must be in the ON position in order for the radio to function.

Tone Button (1) – In order to adjust the sound effects and tone, press button (1) and select bass “BA”, treble “TR”, or balance “BA”. Use volume control (2) in order to make adjustments.

Volume Control (2) – Press “+” in order to increase the volume. Press “-” in order to decrease the volume.

PWR/SRC Button (3) – Press the PWR/SRC button in order to turn on the power. Press and hold the PWR/SRC button for 2 seconds in order to turn off the power. With the power on, press the PWR/SRC button in order to change the operation mode to either “RADIO”, “AU1(AUX1)”, or AU2(AUX2).

Display/Clock Button (4) – Press this button once in order to select the desired display in radio display (5). Press and hold this button for 2 seconds in order to switch to the clock setting mode. Use the preset button “3” in order to adjust the hour and preset button “4” in order to adjust the minute. Press the display/clock button again in order to return to the radio display.

Radio Display (5) – Displays information such as the clock, station, and band.

Alarm Button (6) – Press this button once in order to turn the alarm on or off. An alarm indicator will appear in the radio display when the alarm is on.

Press and hold this button for 2 seconds in order to switch to alarm setting mode. Use the preset button “3” in order to adjust the hour and preset button “4” in order to adjust the minute. Press the alarm button again in order to return to the radio display. During the alarm, there will be a beep for 3 minutes, press the alarm button once in order to stop the alarm.

AM/FM Band Button (7) – Press this button in order to switch between FM1, FM2, AM1, or AM2 while in radio mode.

Tune Button (8) – In order to select a radio station manually, press “+” or “-”. In order to select a radio station automatically, press and hold “+” or “-”.

Auto Store Button (9) – Press this button in order to store good reception stations with automatically as one of the 6 preset buttons.

Mute Button (10) – Press this button to turn off the sound immediately. “MUTE” will appear in the radio display. Press this button again in order to return to normal operation.

Preset Buttons (11) – Use tune button (8) in order to select a desired radio station to store. Press and hold one of the preset buttons for 2 seconds in order to store the station in the preset memory.

Auxiliary Input (12) – An external input jack is provided in order to allow playback of sound and music from an external device. Use PWR/SRC button (3) in order to select “AU1”.

Radio Reception Area

This unit is set up to receive the following type of reception area frequencies:

- U.S. Standard
- Other Countries
- Europe Standard

Selecting the Radio Reception Area

Note: All station preset memory will be lost once the reception area is changed.

Press AM/FM band selector (2) and select the desired radio band.

U.S. Standard

While pressing tone button (1), press and hold the number “1” preset button for longer than 2 seconds.

Other Countries

While pressing tone button (1), press and hold the number “2” preset button for longer than 2 seconds.

Europe Standard

While pressing tone button (1), press and hold the number “3” preset button for longer than 2 seconds.

i03767393

Air Conditioning and Heating Control

SMCS Code: 7304; 7320; 7337

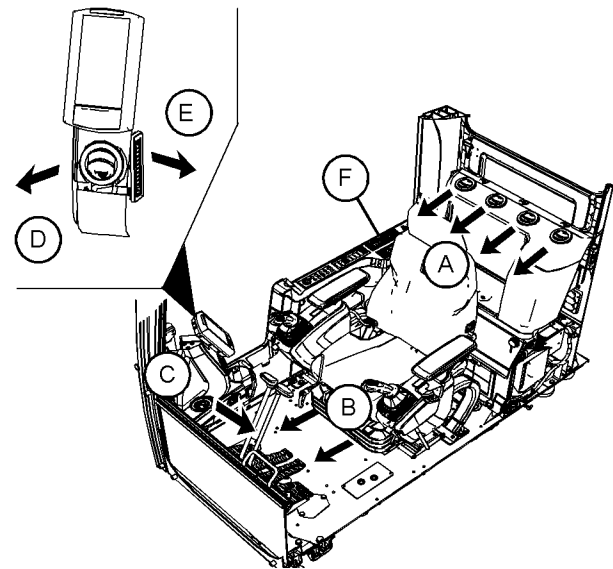


Illustration 166

g02031354

- (A) Vent for upper body
- (B) Floor vent
- (C) Defroster vent
- (D) Defroster Vent
- (E) Vent for upper body
- (F) Control panel

Redirect the louvers for air outlets (A), (C), (D), and (E) by hand to the desired direction. The louvers for air outlet (B) cannot be redirected.

The climate control panel is located under the right window inside the cab:

Operation Section
Air Conditioning and Heating Control

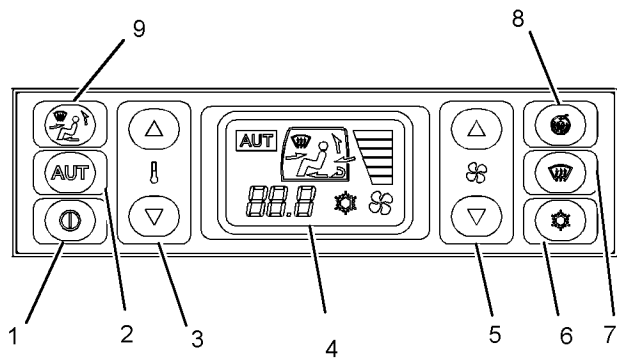




Illustration 167

g02031355


- (1) On/Off switch
- (2) Automatic control switch
- (3) Temperature switch
- (4) LCD panel
- (5) Fan switch
- (6) Compressor switch
- (7) Defrost mode
- (8) Air inlet select switch
- (9) Air outlet select switch


 **Main Power ON/OFF Switch (1) – Push the ON/OFF switch in order to power on the system. Push the switch again in order to power off the system.**


 **Automatic Control Switch (2) – In order to enter the full “AUT” mode for automatic climate control, push this switch. However, if you push the switch again, you cannot turn off the air conditioning. When the system is in full “AUT” mode, you can manually change specific functions by pushing another switch. If you manually change a specific function, “AUT” does not appear in the display, but the unchanged functions will remain in “AUT” mode. Even on a day that is sunny, a climate control system with only a heater can cool the cab in full “AUT” mode if the ambient temperature is no more than 20 °C (68 °F).**


The climate control unit provides excellent operator comfort in the full “AUT” setting. Press the “AUT” switch for full “AUT” mode. Push temperature switch (3) in order to set the desired temperature. The temperature is only shown in metric values. All other functions of climate control will be handled automatically.

In order to take advantage of the full “AUT” setting of the climate control system, always keep the sunlight sensor clean. Do not obstruct the sunlight sensor. If the climate control system is in the full “AUT” setting at engine start-up and the temperature inside the cab is too warm or too cool, the damper for fresh air ventilation may automatically close for a few minutes. This will help to bring the air temperature to the preset temperature more quickly.

 **Temperature Switch (3) – These switches control the temperature of the air that is coming from the air outlets in order to achieve the preset temperature. This preset temperature appears on LCD panel (4). If the heating and air conditioning system is in the automatic mode, pushing these switches changes the preset temperature.**


 **Increase – Push this switch in order to increase the temperature of the air that is coming out of the air outlets or push this switch in order to increase the preset temperature.**


 **Decrease – Push this switch in order to decrease the temperature of the air that is coming out of the air outlets or push this switch in order to decrease the preset temperature.**

 **Fan Switch (5) – The fan switch directly controls the fan speed. If the climate control system is operating in the automatic mode, pushing this switch overrides the automatically selected fan speed.**


 **Increase – Push this switch in order to increase the fan speed.**


 **Decrease – Push this switch in order to decrease the fan speed.**

 **Compressor Switch (6) – Push the switch in order to turn on the compressor or push the switch in order to turn off the compressor. In humid conditions, the compressor may be used to remove moisture from the air in the cab. In cool weather, operate the compressor weekly in order to prevent leakage of the refrigerant gas. This will also help to maintain the compressor in optimum working order.**

 **Defrost (7) – Depressing this switch will defog the windows. The air will also be dehumidified while the compressor is running. This selection directs air flow out of air outlet (C) and air outlet (D).**

Air Inlet Select Switch (8) – This switch selects the position of the air inlet.

 **Recirculate – When this position is selected, the air inlet is closed. The air will recirculate inside the cab.**

 **Fresh Air – When this position is selected, the air inlet is open. Fresh air will circulate into the cab.**

Air Outlet Select Switch (9) – This switch selects the position of each air outlet. Each switch controls a different air outlet.



Upper Body – Selecting this switch will open air outlet (A) and air outlet (D).



Upper Body and Floor – Selecting this switch will open air outlet (A), air outlet (B) and air outlet (D).



Floor – Selecting this switch will open air outlet (B).



Floor and Defroster – Selecting this switch will open air outlet (B) and air outlets (C) and (D).

Consult with your Caterpillar dealer for periodic maintenance of the heating and air conditioning system.

English Versus Metric Toggle

In order to convert the temperature reading from Degrees Celsius to Degrees Fahrenheit, depress both keys of the fan switch at the same time for five seconds. The same action is used for converting the temperature reading from Degrees Fahrenheit to Degrees Celsius.

i06932588

Window (Front)

SMCS Code: 7310-FR

Note: The cab visor (if equipped) must be down before the front window is raised. The front window will not lock in the overhead storage position with the cab visor in the raised position.

To provide full ventilation inside the cab, the upper window and the lower window can be fully opened.

WARNING

When opening or closing the windows, be extra careful to prevent any personal injury. The hydraulic lockout control must be in the LOCKED position in order to prevent any possibility of sudden movement of the machine due to inadvertent contact with the hydraulic control(s).

Do not change the position of the window until the following items have been done:

- Park the machine on a level surface.
- Lower the work tool to the ground.

- Move the hydraulic lockout control to the LOCKED position.
- Stop the engine.

Perform Step 1 through Step 3 to open the upper window.

Note: If equipped, the Cat Grade Control monitor may interfere with the window when opening. Ensure that the monitor is adjusted out of the way before opening the window.

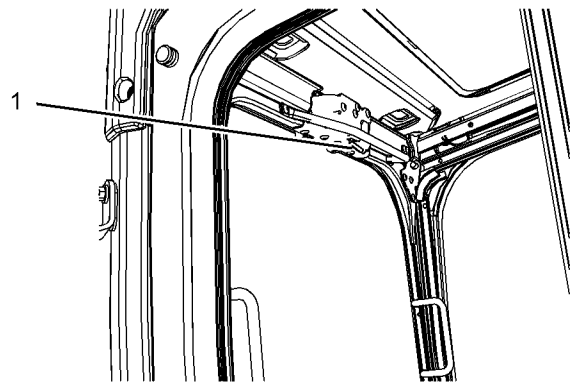


Illustration 168

g02028981

(1) Lever

1. Release the auto-lock latch by moving lever (1) to the right.
2. Hold both grips that are on the window frame. Pull the window upward.

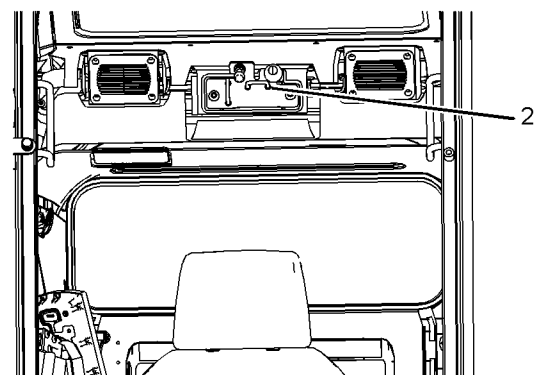


Illustration 169

g02028982

(2) Auto-lock latch

3. Hold both grips that are provided on the window frame and move the window into the STORAGE position until auto-lock latch (2) is engaged.

Perform Steps 4 through 5 to close the upper window.

Note: If equipped, the Cat Grade Control monitor may interfere with the window when closing. Ensure that the monitor is adjusted out of the way before closing the window.

4. Move the lever of the auto-lock latch (1) in the direction of the arrow to release the auto-lock latch.
5. Reverse Steps 1 through 3 to close the upper window.

Perform Steps 6 through 8 to open the lower window and close the lower window.

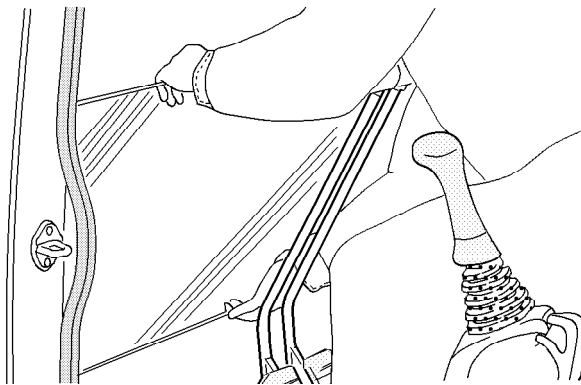


Illustration 170

g00103837

6. Raise the lower window out of the window frame.

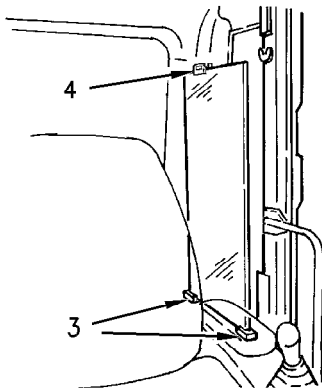


Illustration 171

g00680500

- (3) Brackets
(4) Catch

7. Store the lower window in the holder that is located in the rear of the left side cab frame. To store the lower window, locate one end of the lower window into brackets (3). Secure the opposite end of the lower window with catch (4).

8. To close the lower window, reverse the procedure that is used for opening the lower window.

Note: The lower window is curved. The lower window can only be positioned one way in the holders.

i07141176

Mirror (If Equipped)

SMCS Code: 7319

⚠ WARNING

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

⚠ WARNING

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

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

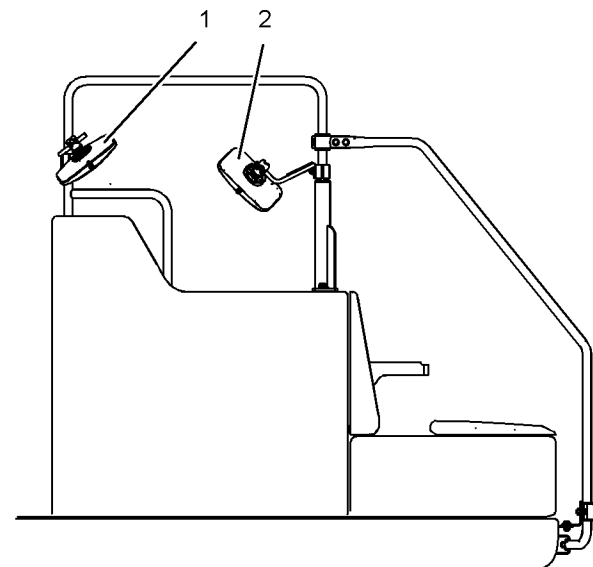


Illustration 172

g03733044

- (1) Rear Mirror on the Tank
(2) Front Mirror on the Tank

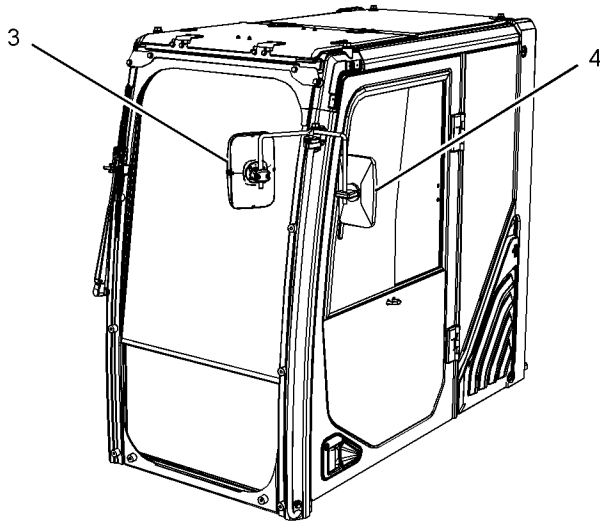


Illustration 173

g02407799

- (3) Right Side View Mirror on the Cab
(4) Left Side View Mirror on the Cab

Mirrors provide more 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.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position. For further details on this procedure, refer to Operation and Maintenance Manual, "Operator Controls".
- Stop the engine.
- Adjust rear view mirrors to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.

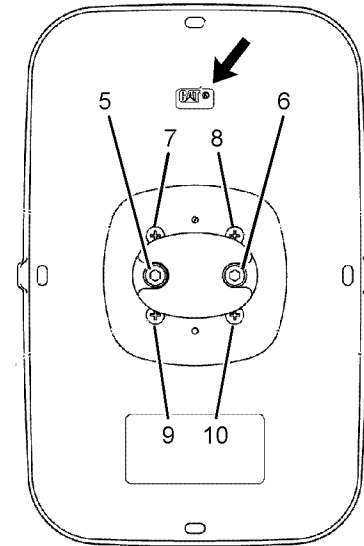


Illustration 174

g02726418

After adjustment of the mirror angle, make sure that the Cat logo is at the top.

Tighten the bolts in sequence of (5) to(6) to $11 \pm 2 \text{ N}\cdot\text{m}$ ($8.1 \pm 1.5 \text{ lb ft}$).

Tighten the bolts in sequence of (7) to(10) to $2 \pm 0.4 \text{ N}\cdot\text{m}$ ($1.5 \pm 0.3 \text{ lb ft}$).

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

Rear Mirror on the Tank (1)

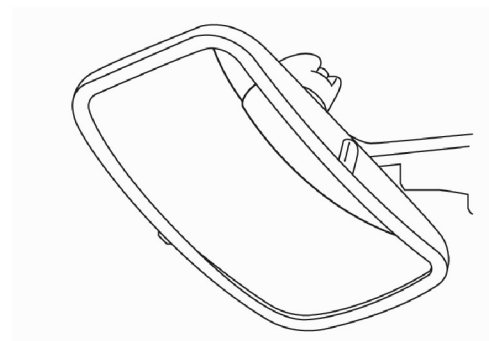


Illustration 175

g02407800

If equipped, adjust rear mirror (1) on the tank, so the right side of fuel tank and the hydraulic tank can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat.

Front Mirror on the Tank (2)

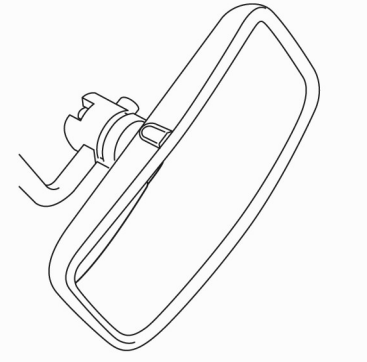


Illustration 176

g02407801

If equipped, adjust front mirror (2) on the tank so the right access door and the counterweight can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat. Also, provide as much visibility to the rear as possible.

Right Side View Mirror on the Cab (3)

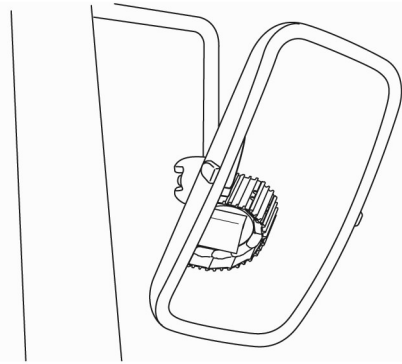


Illustration 177

g02407818

If equipped, adjust right side view mirror (3) on the cab so the front of the right track can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the right front of the machine should be seen from the operator seat.

Left Side View Mirror on the Cab (4)

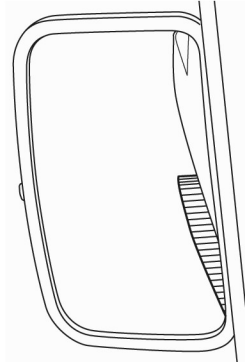


Illustration 178

g02407856

If equipped, adjust left side view mirror (4) on the cab so the left side of the cab, access door, and rear of left track can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat. Also, provide as much visibility to the rear as possible.

Front Mirror on the Tank (2) (If Equipped with VA Boom)

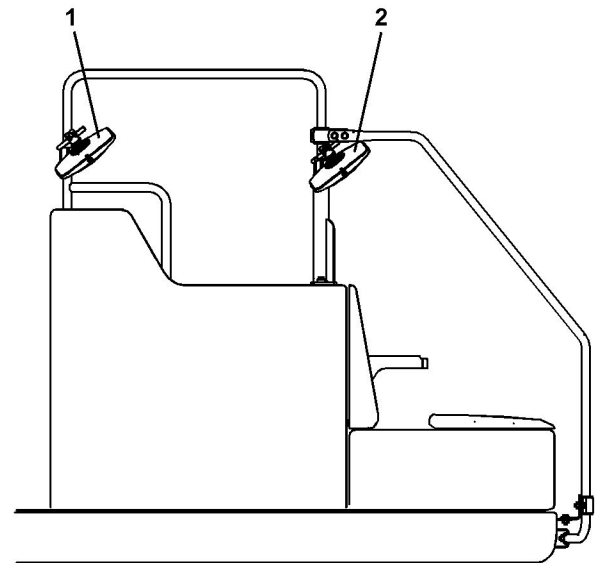


Illustration 179

g06234344

If equipped with VA Boom

- (1) Rear Mirror on the Tank
- (2) Front Mirror on the Tank

i02500596

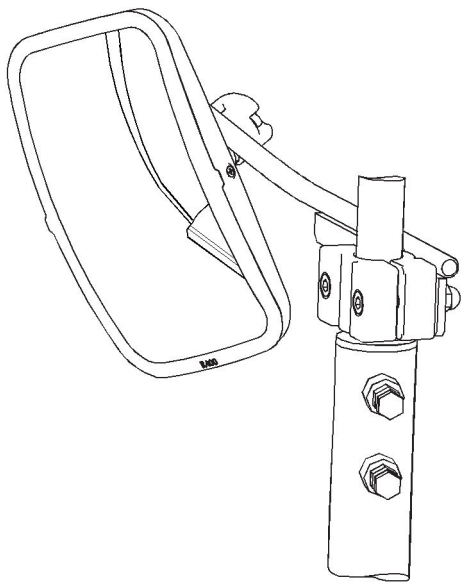


Illustration 180

g06231524

If equipped (with VA Boom), adjust front mirror (2) on the tank so the right front side can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the front of the machine should be seen from the operator seat.

i01523337

Sun Screen (If Equipped)

SMCS Code: 7165-ZZ

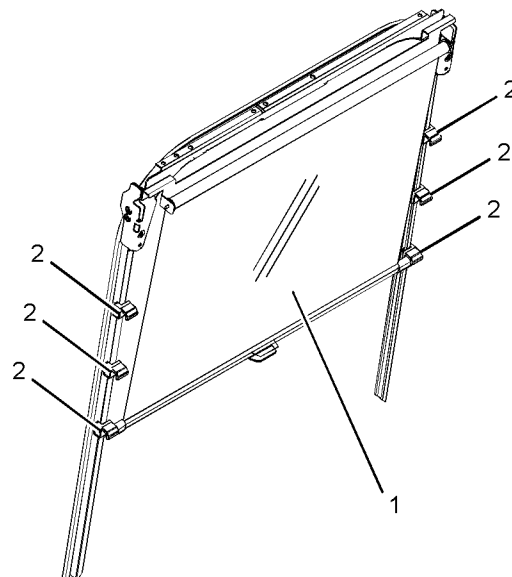


Illustration 182

g01250563

Pull out the sun screen (1). Hook the sun screen to the bracket (2). The sun screen may be positioned in 3 different places.

i01463742

Cab Visor (If Equipped)

SMCS Code: 7301-ZZ

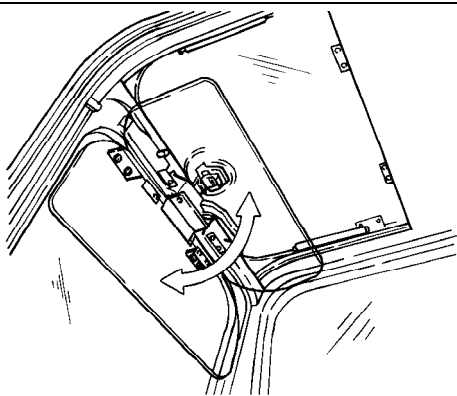


Illustration 181

g00681071

The cab visor is used to shade the sunlight that is coming in through the sun roof or coming in through the front windshields. Attach the cab visor to the top of the front windshield and tilt the cab visor to the desired angle.

Note: The cab visor cannot be attached to a power window.

Roof Hatch

SMCS Code: 7303

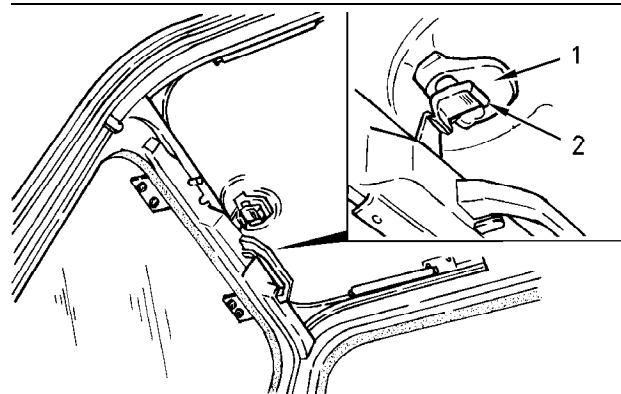


Illustration 183

g00681034

- (1) Grip
- (2) Lock

In order to open the roof hatch, release lock (2). Hold grip (1) and push the roof hatch backward.

To close the roof hatch, hold grip (1) and pull the roof hatch forward. Engage lock (2) securely.

i03781891

Cab Door

SMCS Code: 7308

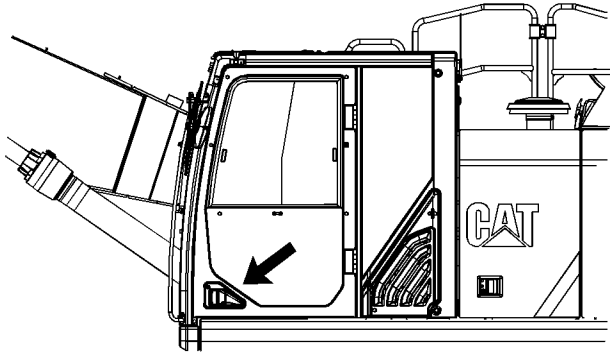


Illustration 184

g02041761

In order to open the cab door from the outside of the cab, pull outward on the door handle.

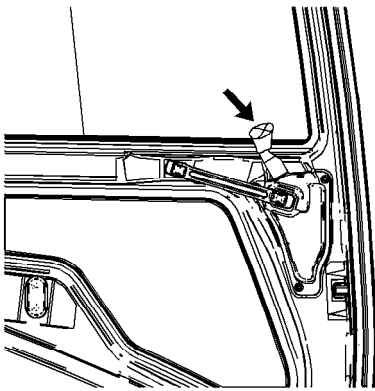


Illustration 185

g01095780

In order to open the cab door from the inside of the cab, push forward on the lever for the cab door latch.

For additional ventilation, open the cab door all the way in order to engage the catch on the exterior wall of the cab.

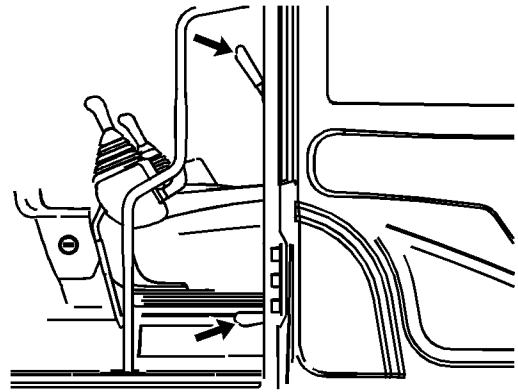


Illustration 186

g01121189

In order to release the cab door from the catch, pull downward on one of the two cab door release levers.

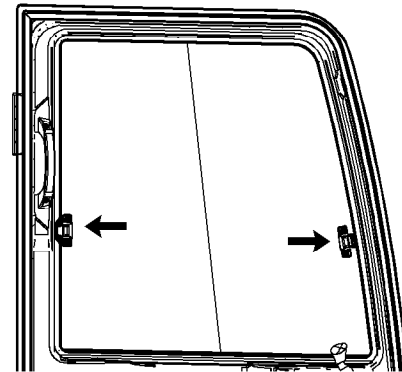


Illustration 187

g01096005

In order to open a window, release the window latch, and then slide the window to the desired position.

i01447292

Travel Control (Straight Travel Pedal (If Equipped))

SMCS Code: 5462

WARNING

With certain attachment combinations, the third pedal can have different functions. Always check for third pedal function before using the third pedal. Improper operation of the third pedal could result in serious injury or death.

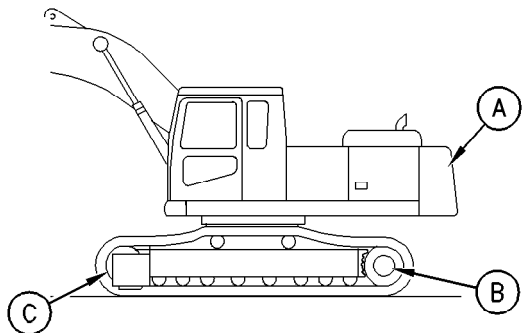


Illustration 188

g00753277

Position for normal travel

- (A) Rear of machine
- (B) Final drive
- (C) Idler

When you travel, make sure that final drive sprockets (B) are under the rear of the machine.

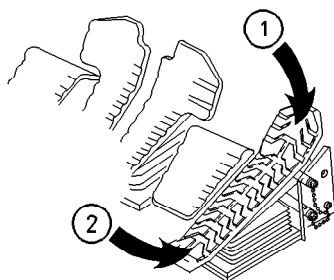


Illustration 189

g00757775

- (1) Forward Travel
- (2) Reverse Travel

The third pedal is to the right of the right travel pedal. The third pedal controls the forward and backward movement of the machine.

Note: If the third pedal is depressed and a travel pedal or a travel lever is operated, the machine will turn accordingly.

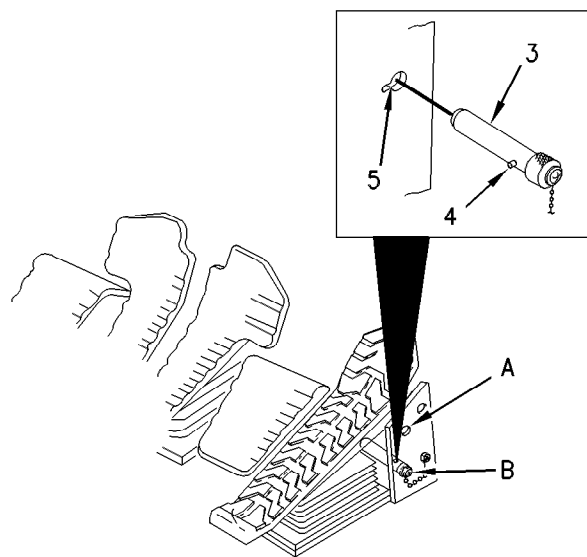


Illustration 190

g00555934

- (3) Lock pin
- (4) Pin
- (5) Notch
- (A) LOCKED position
- (B) UNLOCKED position (STORAGE position)

When the machine is not operated with the third pedal, install lock pin (3) at the LOCKED position in order to prevent accidental operation.

Note: To prevent lock pin (3) from being pulled out, insert pin (4) through notch (5) and turn lock pin (3) counterclockwise by 1/4 turn.

i03764090

Joystick Controls (Medium Pressure (If Equipped))

SMCS Code: 5705

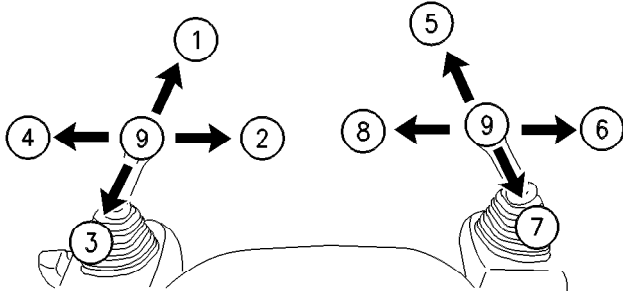


Illustration 191

g00559405

- (1) STICK OUT
- (2) SWING RIGHT
- (3) STICK IN
- (4) SWING LEFT
- (5) BOOM LOWER
- (6) TOOL OPEN
- (7) BOOM RAISE
- (8) TOOL CLOSE
- (9) HOLD

WARNING

The Fine Swing Control delays the engagement of the swing parking brake.

If the machine is operating on a slope with the Fine Swing Control in the ON position, the swing motion may become uncontrollable which could result in property damage, personal injury or death.

Turn the Fine Swing Control to the OFF position when the machine is operating on a slope.

When you release the joysticks from any position, the joysticks will return to HOLD position (9). Movement of the upper structure will stop unless the fine swing control (if equipped) is ON. When the fine swing control is ON, the swing parking brake will not activate until 6.5 seconds after the joystick control for the swing function returns to the HOLD position.

The machine control pattern is initially set at the factory to the SAE system, as shown. The pattern on the left pertains to the left joystick and the pattern on the right joystick.

The machine control pattern can be varied. Refer to Operation and Maintenance Manual, "Joystick Controls Alternate Patterns" for more information.

Two functions may be performed at the same time by moving a joystick diagonally.

Rotating Tool Control

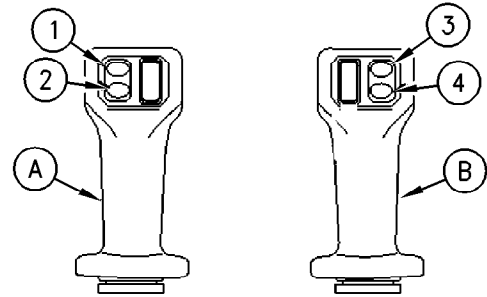


Illustration 192

g00875108

- (A) Left joystick
- (B) Right joystick
- (1) Medium pressure switch
- (2) Horn switch
- (3) Medium pressure switch
- (4) AEC switch



Rotate Clockwise – Press the medium pressure switch (1) on the left joystick in order to rotate the tool clockwise.



Horn – Press the horn switch (2) on the left joystick in order to activate the horn.



Rotate Counterclockwise – Press the medium pressure switch (3) on the right joystick in order to rotate the tool counterclockwise.



AEC Switch – Press the AEC switch (4) on the right joystick in order to activate low engine speed. Press the switch again in order to activate high engine speed.

i04036189

Joystick Controls

SMCS Code: 5705

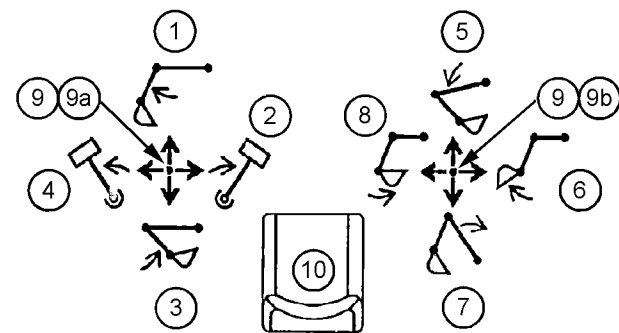


Illustration 193

g02233473

- (1) STICK OUT
- (2) SWING RIGHT
- (3) STICK IN
- (4) SWING LEFT
- (5) BOOM LOWER
- (6) BUCKET DUMP
- (7) BOOM RAISE
- (8) BUCKET CLOSE
- (9) HOLD
- (9a) HORN (IF EQUIPPED)
- (9b) AUTOMATIC ENGINE SPEED CONTROL SWITCH (IF EQUIPPED)
- (10) Seat

! WARNING

The Fine Swing Control delays the engagement of the swing parking brake.

If the machine is operating on a slope with the Fine Swing Control in the ON position, the swing motion may become uncontrollable which could result in property damage, personal injury or death.

Turn the Fine Swing Control to the OFF position when the machine is operating on a slope.

When you release the joysticks from any position, the joysticks will return to HOLD position (9). Movement of the upper structure will stop unless the fine swing control (if equipped) is ON. When the fine swing control is ON, the swing parking brake will not activate until 6.5 seconds after the joystick control for the swing function returns to the HOLD position.

Two functions may be performed at the same time by moving a joystick diagonally.

The machine control pattern is initially set at the factory to the SAE system, as shown. The pattern on the left pertains to the left joystick and the pattern on the right pertains to the right joystick.

The machine control pattern can be varied. Refer to Operation and Maintenance Manual, "Joystick Controls Alternate Patterns" for more information.

i06970265

Joystick Controls (Cat Grade With Assist System)

SMCS Code: 5705

! WARNING

Once the system is placed in automatic mode, linkage and swing movement may occur.

Ensure that all personnel are clear of the machine before you place the system in automatic mode.

Personal injury could occur.

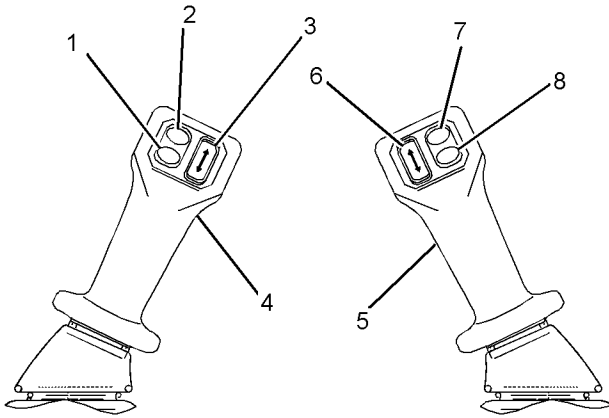


Illustration 194

g03874487

Table 42

Joystick Configurations			
Switch Location	System Configurations		
	Cat Grade Control	Cat Grade With Assist	Cat Grade With Assist, With Tilt (If Equipped)
1	Horn	Horn	
2	Touch Point/Laser	Constant Bucket Angle (Hold/ Store)	Return to Tilt Angle and Stored Bucket Angle Button
3	Adjust Target Depth	Medium Pressure Control	
4	Select Cat Grade Control	Select Cat Grade Control	
5	(N/A)	Assist Feature Setting (ON/OFF)/ Overcut Protection (Cancel)	
6	Adjust Target Slope	High-Pressure Control	
7	Bench Mark (Set/ Clear)	Constant Bucket Angle (Store/ Cancel)	
8	One Touch Low Idle	One Touch Low Idle	

Cat Grade Control System Configuration

Cat Grade Control is designed to calculate bucket tip position and provide visual and audible feedback to the operator. This feedback allows the operator to achieve the desired grade safer, quicker and more accurately than traditional grading techniques.

For more information on Cat Grade Control, refer to Operation and Maintenance Manual, SEBU8358, "Cat Grade Control Depth and Slope for E Series and F Series Excavators".

Horn

When horn switch (1) is depressed, the horn will sound.

Touch Point/Laser

Switch (2) is used with the touch point or laser function.

Adjust Target Depth

Switch (3) is used to adjust target depth.

Select Cat Grade Control

Switch (4) is used to select Cat Grade Control. Press and hold this trigger to activate (2)(3),(6),and (7).

Adjust Target Slope

Switch (6) is used to adjust target slope.

Set/Clear Bench Mark

Switch (7) is used to set and clear the bench mark. Pressing the trigger will set the bench mark. Pressing and holding the trigger will clear the bench mark.

One Touch Low Idle

When one-touch low idle (8) is pressed, the engine rpm is dropped. When a function is moved from the neutral position, one-touch low idle is turned off and the machine resumes the set throttle setting.

Cat Grade With Assist System Configuration

Horn

When horn switch (1) is depressed, the horn will sound.

Hold Store Constant Bucket Angle

Switch (2) will hold or store the constant bucket angle. Hold switches (2) and (7) for 3 seconds to set the bucket angle. Press switch (2) once to return to stored bucket angle. Press and hold switch (2) while operating the joystick for boom, stick, or bucket dump movements to hold bucket angle and keep the bucket angle. To stop holding the constant bucket angle, release switch (2) and return the joystick to neutral.

Select Cat Grade Control

Switch (4) is used to select Cat Grade Control. Press and hold this trigger to activate (2), (3), (6) and (7).

Refer to Cat Grade Control configuration for further details.

Assist Feature Setting (ON/OFF)/ Overcut Protection Cancel

Switch (5) is used to select overcut protection or cancel. If switch (5) is held, then the bucket can go through the target slope.

Store or Cancel Constant Bucket Angle

Switch (7) is used to store and cancel the bucket angle. Hold switch (7) for 3 seconds to clear stored bucket angle.

One Touch Low Idle

When one-touch low idle (8) is pressed, the engine rpm is dropped. When a function is moved from the neutral position, one-touch low idle is turned off and the machine resumes the set throttle setting.

Cat Grade With Assist System Configuration With Tilt (If Equipped)

Note: While performing any function without swing, the tilt assist will function as stated below. If switch (2) is pressed before or during swing special conditions apply.

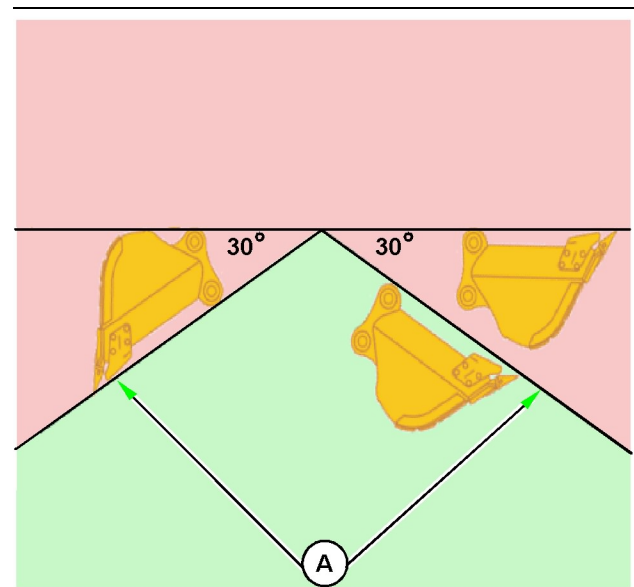


Illustration 195

g06113063

Normal working range for the variable tilt feature

Note: With the bucket at full open and full closed positions the variable tilt feature will be temporarily paused. To re-enable the tilt feature, the bucket must be within the normal working range (A), which is considered to be at least 30 degrees below the horizon from either open (dump) or closed (curled) position. Refer to Illustration 195 .

When Above Grade

Press switch (2) and release to change bucket tilt angle to match the grade. Press and hold switch (2) to change bucket tilt angle to match the grade or restored angle. To stop constant bucket angle, release (2) and return the joystick to neutral.

Note: If the controls are returned to neutral, the tilt assist function will stop.

When Within Grade Window (75 mm (3.0 inch))

If switch (2) is not pressed, the bucket will try to hold the existing angle, but will match the grade. The tilt angle will adjust automatically.

Press switch (2) and release to set the tilt angle to the programmed setting.

Press and hold switch (2) to maintain the tilt angle to the programmed setting.

Note: If the controls are returned to neutral, the tilt assist function will stop.

Special Conditions During Swing

If the tilt assist function button is pressed during swing, the tilt assist will pause while swinging. Once swing has stopped, the tilt assist will no longer be paused, and will continue movement to match grade. If the controls are returned to neutral, the function will stop.

If the tilt assist function button is pressed before swing, the tilt assist will pause once swinging starts. Once swing has stopped, tilt assist will no longer be paused, but will not continue movement.

If the bucket tilt control is adjusted during a swing, the tilt bucket will adjust as commanded, but the tilt assist will not perform any action.

i04560362

**VA Boom Controls
(If Equipped)**

SMCS Code: 5461-VAR

WARNING

With certain attachment combinations, the third pedal can have different functions. Always check for third pedal function before using the third pedal. Improper operation of the third pedal could result in serious injury or death.

The VA boom extends the working range of the machine by hydraulically increasing or reducing the angle of the boom. The VA boom is equipped with a hydraulic check valve to prevent the boom from falling in case a hydraulic line breaks.

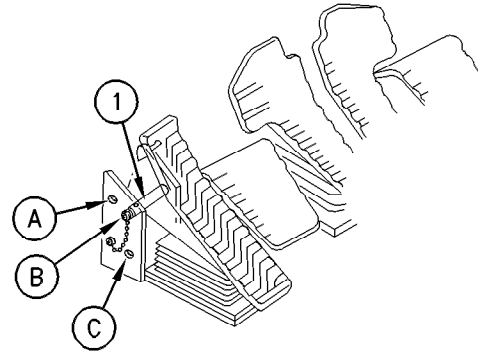


Illustration 196

g00575819

- (1) Lock pin
(A) This position is not used.
(B) LOCKED position
(C) VA BOOM position

The VA boom pedal can be located on the left side or the right side of the travel pedals.



VA Boom EXTEND – Push down on the front of the pedal in order to extend the VA boom.



VA Boom RETRACT – Push down on the rear of the pedal in order to retract the VA boom.

i06836341

**SmartBoom Control
(If Equipped)**

SMCS Code: 5461-ZS; 7332

WARNING

Personal injury or death can result from not following the proper procedures.

To avoid the possibility of injury or death, follow the established procedure.

WARNING

Activating the SmartBoom function and using the work tool joystick control while the front of the machine is elevated could result in unexpected machine motion. Unexpected machine motion could result in serious injury or death. Do not activate the SmartBoom function if the front of the machine is elevated by the front linkage.

! WARNING

Do not elevate or lower the track when in the SmartBoom mode. Follow the operation procedures for the SmartBoom in the Operation and Maintenance Manual. Failure to follow these instructions can result in serious injury or death.

! WARNING

Always make sure that the boom control joystick is in the NEUTRAL position before activating the SmartBoom control. Activating the SmartBoom control with the joystick out of the neutral position could result in unexpected machine motion which could result in serious injury or death.

! WARNING

Do not select any SmartBoom mode, using the SmartBoom selector switch located on the console, while the tracks are elevated. Selecting the SmartBoom mode with the tracks elevated could result in a sudden drop of the machine which could result in serious injury or death.

! WARNING

If any SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground, pressing the disable button that is located on the front of the right hand joystick could cause a sudden boom down motion. This control function could lift the machine upward, with unexpected machine movement that could result in serious injury or death. Do not press the disable button while the SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground.

! WARNING

Do not attempt to lift the tracks of the machine by using the disable button and applying downward force with the boom lowering control while the machine is in any SmartBoom mode. Releasing the disable button will immediately return the machine to the active SmartBoom mode. This action could cause the machine to drop down abruptly which could result in serious injury or death.

The switches for the SmartBoom are on the right side instrument panel and on the right joystick.

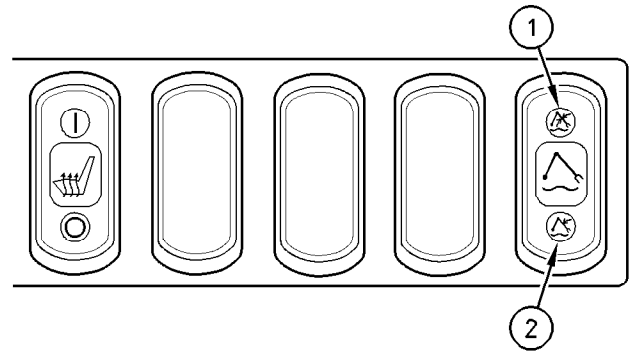


Illustration 197

g00753781

Right side instrument panel



(1) SmartBoom UP AND DOWN – Push down on the top of the rocker switch to activate the SmartBoom UP AND DOWN mode. When the boom control joystick is moved to the BOOM DOWN position, the boom will lower by the weight of the boom. The boom can move upward freely.



(2) SmartBoom DOWN – Push down on the bottom of the rocker switch to activate the SmartBoom DOWN mode. The boom will lower by the weight of the boom when the control lever is moved to the BOOM LOWER position. This mode prevents the boom from moving upward. To move the boom upward, the operator must use the boom control joystick to activate the BOOM UP mode.

Note: When the rocker switch for the SmartBoom is in the CENTER position, the SmartBoom is no longer functional.

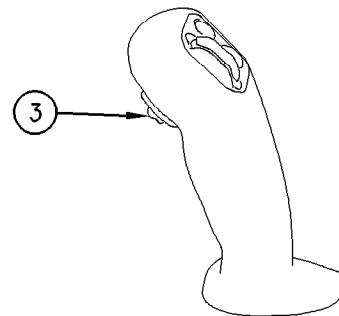


Illustration 198

g00753783

Right Joystick



(3) SmartBoom TEMPORARY DISABLE
– Press the trigger switch on the front of the right joystick to temporarily override the SmartBoom function. Release the trigger switch to return to the selected SmartBoom function.

During operation of the SmartBoom, the operator may wish to apply downward force to the boom. When the rocker switch is in the SmartBoom DOWN position or the rocker switch is in the SmartBoom UP AND DOWN position, the operator can disable the SmartBoom function temporarily with the SmartBoom DISABLE switch. While the trigger switch is pressed, BOOM RAISE and BOOM LOWER will operate in the normal modes.

Note: Smart Boom Control function is deactivated when "Reach Front" is selected at "Boom Configuration" on Monitor menu.

i04477973

Work Tool Control (One-Way Flow)

(If Equipped)

SMCS Code: 6700

The following information pertains to work tools that require hydraulic oil flow in one direction. Hydraulic hammers are an example of work tools that require hydraulic oil flow in one direction.

Note: For information that pertains to work tools that require hydraulic oil flow in two directions, refer to Operation and Maintenance Manual, "Work Tool Control (Two-Way Flow)".

Joystick

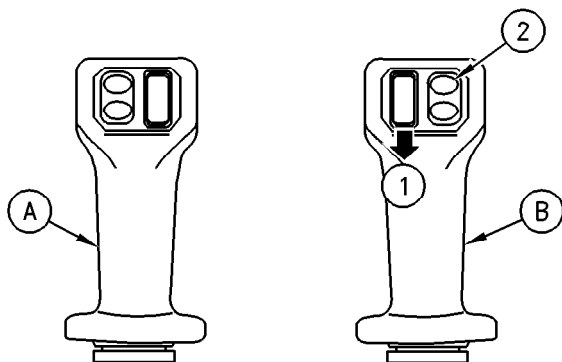


Illustration 199

g00769298

(A) Left joystick
(B) Right joystick



(1) Variable Speed – Move the thumb wheel downward in order to activate the work tool. Move the thumb wheel further in order to increase the speed of the work tool.



(2) On/Off – Push this switch in order to activate the work tool at a constant rate. Push this switch again in order to turn off the work tool.

Work Tool Pedal

WARNING

With certain attachment combinations, the work tool pedal can have different functions. Always check for work tool pedal function before using the work tool pedal. Improper operation of the work tool pedal could result in serious injury or death.

The work tool pedal can be located on either side of the travel pedals. The work tool pedal allows the operator to modulate the speed of the work tool.

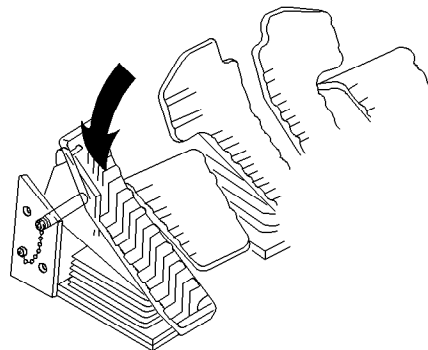


Illustration 200

g00756717



Variable Speed – Push down on the front of the pedal in order to activate the work tool. Move the pedal further in order to increase the speed of the work tool. Release the pedal in order to turn off the work tool.

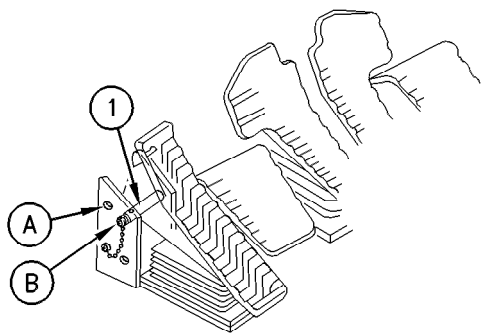


Illustration 201 g00291764

- (1) Lock pin
- (A) UNLOCKED position
- (B) LOCKED position

When you are not using the work tool, put the lock pin (1) in LOCKED position (B). This will lock the work tool pedal in order to prevent any unexpected operation of the work tool.

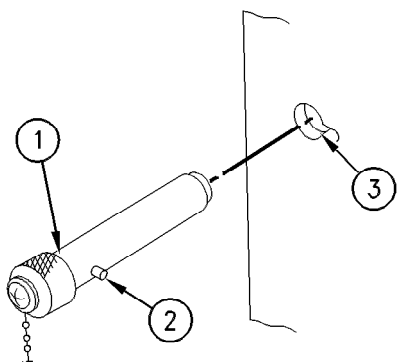


Illustration 202 g00291805

- (1) Lock pin
- (2) Pin
- (3) Notch

Note: To prevent lock pin (1) from being accidentally pulled out, insert pin (2) through notch (3) and turn lock pin (1) counterclockwise by 1/4 turn.

Foot Switch

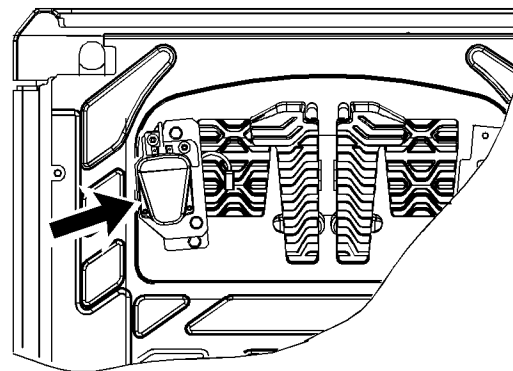


Illustration 203 g02368316

Hydraulic Hammer ON – Push down on the foot switch in order to activate the hydraulic hammer.

Hydraulic Hammer OFF – Release the switch in order to deactivate the hydraulic hammer.

i04477990

Work Tool Control (Two-Way Flow) (If Equipped)

SMCS Code: 6700

The following information pertains to work tools that require hydraulic oil flow in two directions. These work tools can also be equipped with a rotate circuit. Hydraulic shears, pulverizers, crushers, and grapples are examples of work tools that require hydraulic oil flow in two directions.

Note: For information that pertains to hydraulic hammers, refer to Operation and Maintenance Manual, “Work Tool Control (One-Way)”.

Joystick

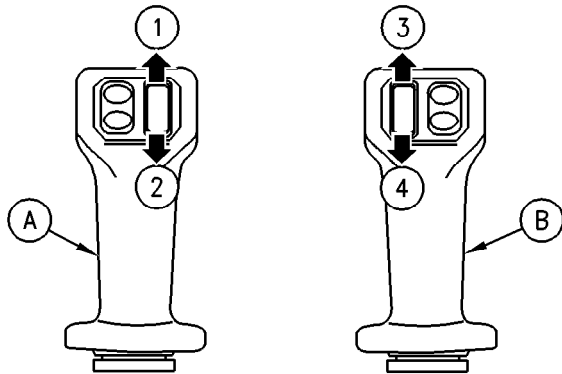


Illustration 204

g00731659

(A) Left joystick
(B) Right joystick



(1) ROTATE CLOCKWISE – Move the thumb wheel upward in order to rotate the work tool clockwise.



(2) ROTATE COUNTERCLOCKWISE – Move the thumb wheel downward in order to rotate the work tool counterclockwise.



(3) CLOSE – Move the thumb wheel upward in order to close the work tool.



(4) OPEN – Move the thumb wheel downward in order to open the work tool.

Work Tool Pedal

WARNING

With certain attachment combinations, the work tool pedal can have different functions. Always check for work tool pedal function before using the work tool pedal. Improper operation of the work tool pedal could result in serious injury or death.

The work tool pedal can be located on either side of the travel pedals. The work tool pedal allows the operator to vary the speed of the work tool.

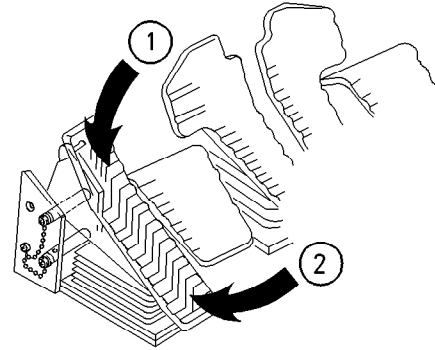


Illustration 205

g00756810



(1) CLOSE – Push down on the front of the pedal in order to close the work tool.



(2) OPEN – Push down on the rear of the pedal in order to open the work tool.

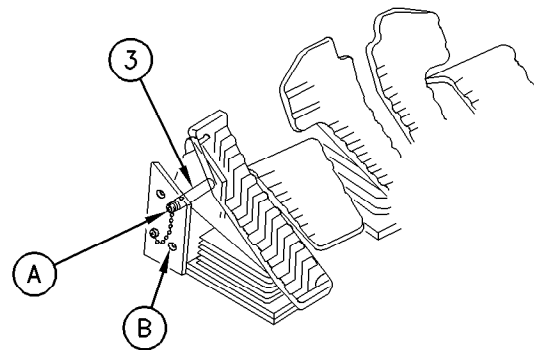


Illustration 206

g00756813

(3) Lock pin
(A) LOCKED position
(B) UNLOCKED position

When you are not using the work tool, put the lock pin (3) in LOCKED position (A). This will lock the work tool pedal in order to prevent any unexpected operation of the work tool.

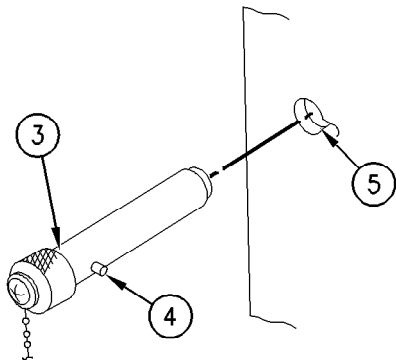


Illustration 207

g00756811

- (3) Lock pin
- (4) Pin
- (5) Notch

Note: To prevent lock pin (3) from being accidentally pulled out, insert pin (4) through notch (5) and turn lock pin (3) by 1/4 turn.

i04561876

Joystick Controls Alternate Patterns

SMCS Code: 5059; 5137

Changing Machine Control Pattern By Four-Way Valve (If Equipped)

WARNING

Whenever a change is made to the machine control pattern, also exchange the pattern card in the cab to match the new pattern.

Check the machine control pattern for conformance to the pattern on the card in the cab. If the pattern does not match, change the card to match the machine control pattern before you operate the machine. Failure to do so could result in personal injury.

If the machine is equipped with a four-way valve, the machine control pattern can easily be changed. The machine control pattern can be changed to the SAE pattern, MHI pattern, KOB pattern, or the former SCM pattern by changing the four-way valve position. To change the four-way valve position, use the following procedure.

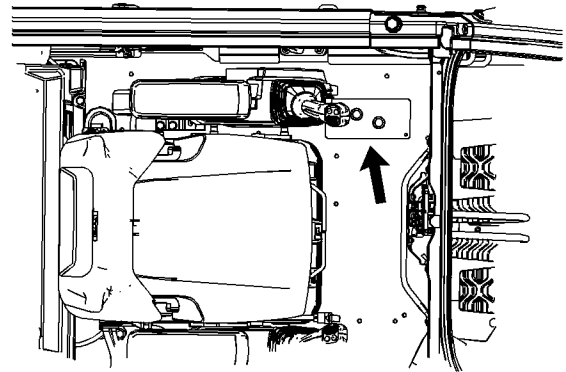


Illustration 208

g02042113

The four-way valve (if equipped) is located underneath the cab floor.

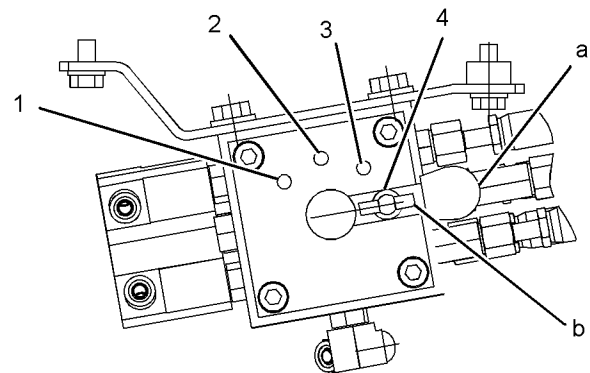


Illustration 209

g02042133

- (a) Lever
- (b) Bolt
- (1) MHI machine control pattern
- (2) CJL machine control pattern
- (3) KOB machine control pattern
- (4) SAE machine control pattern

1. Open the access cover in the floor of the cab.
2. Loosen bolt (b) and move lever (a) to the desired position. The lever can be moved to position (1), (2), (3), or (4).

Position (1) will change the machine control pattern to the MHI pattern. Position (2) will change the machine control pattern to the CJL pattern. Position (3) will change the machine control pattern to the KOB pattern. Position (4) will change the machine control pattern to the SAE pattern.

3. After the pattern is set, tighten the bolt in order to secure the lever.

Operation Section
Joystick Controls Alternate Patterns

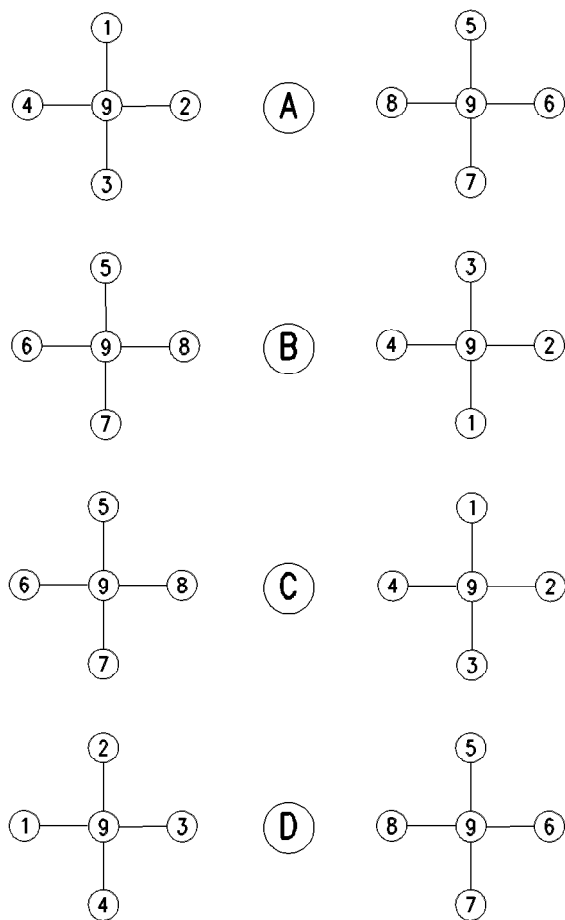


Illustration 210

g00102959

- (A) SAE machine control pattern
(B) MHI machine control pattern
(C) KOB machine control pattern
(D) Former SCM machine control pattern

The patterns on the left side of the illustration show the possible configurations for the left control lever. The patterns on the right side of the illustration show the possible configurations for the right control lever.



STICK OUT (1) – Move the control lever to this position in order to move the stick outward.



SWING RIGHT (2) – Move the control lever to this position in order to swing the upper structure to the right.



STICK IN (3) – Move the control lever to this position in order to move the stick inward.



SWING LEFT (4) – Move the control lever to this position in order to swing the upper structure to the left.



BOOM LOWER (5) – Move the control lever to this position in order to lower the boom.



BUCKET DUMP (6) – Move the control lever to this position in order to dump the bucket.



BOOM RAISE (7) – Move the control lever to this position in order to raise the boom.



BUCKET CLOSE (8) – Move the control lever to this position in order to close the bucket.

HOLD (9) – When the control lever is released from any position, the control lever will return to the HOLD position. Movement of the upper structure will stop.

Two functions may be performed at the same time by moving a control lever diagonally.

If the machine is equipped with a hydraulic hammer, the function of position (6) and of position (8) is different.

HYDRAULIC HAMMER RAISE (6) – Move the control lever to this position in order to raise the hydraulic hammer.

HYDRAULIC HAMMER LOWER (8) – Move the control lever to this position in order to lower the hydraulic hammer.

Changing Machine Control Pattern by Two-Way Valve (If Equipped)

WARNING

Whenever a change is made to the machine control pattern, also exchange the pattern card in the cab to match the new pattern.

Check the machine control pattern for conformance to the pattern on the card in the cab. If the pattern does not match, change the card to match the machine control pattern before you operate the machine. Failure to do so could result in personal injury.

The machine control pattern can easily be changed to the SAE pattern or to the standard backhoe loader hydraulic pattern (BHL) by changing the position of the two-way valve (if equipped). Use the following procedure to change the position of the two-way valve.

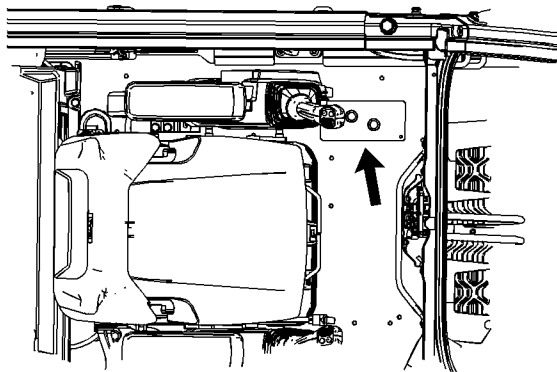


Illustration 211

g02042113

The two-way valve is located underneath the cab floor.

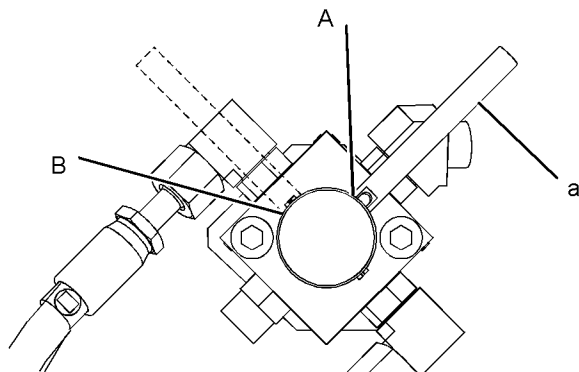


Illustration 212

g02042557

- (a) Lever
- (A) SAE machine control pattern
- (B) BHL machine control pattern

1. Open the access cover in the floor of the cab.
2. Pull up on lever (a) and turn the lever to the SAE position or to the BHL position.

Note: Illustration 212 shows that the two-way valve is in the SAE position.

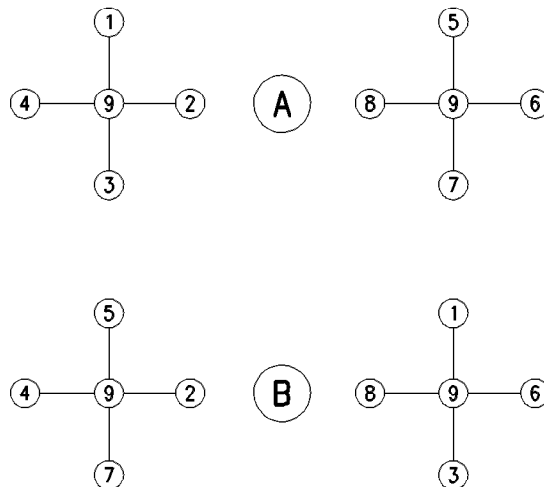










Illustration 213

g00102966

- (A) SAE machine control pattern
- (B) BHL machine control pattern for standard backhoe

The patterns on the left side of the illustration show the possible configurations for the left control lever. The patterns on the right side of the illustration show the possible configurations for the right control lever.

-  **STICK OUT (1)** – Move the control lever to this position in order to move the stick outward.
-  **SWING RIGHT (2)** – Move the control lever to this position in order to swing the upper structure to the right.
-  **STICK IN (3)** – Move the control lever to this position in order to move the stick inward.
-  **SWING LEFT (4)** – Move the control lever to this position in order to swing the upper structure to the left.
-  **BOOM LOWER (5)** – Move the control lever to this position in order to lower the boom.
-  **BUCKET DUMP (6)** – Move the control lever to this position in order to dump the bucket.
-  **BOOM RAISE (7)** – Move the control lever to this position in order to raise the boom.
-  **BUCKET CLOSE (8)** – Move the control lever to this position in order to close the bucket.

HOLD (9) – When the control lever is released from any position, the control lever will return to the HOLD position. Movement of the upper structure will stop.

Two functions may be performed at the same time by moving a control lever diagonally.

If the machine is equipped with a hydraulic hammer, the function of position (6) and of position (8) is different.

HYDRAULIC HAMMER RAISE (6) – Move the control lever to this position in order to raise the hydraulic hammer.

HYDRAULIC HAMMER LOWER (8) – Move the control lever to this position in order to lower the hydraulic hammer.

fuel supply, turn the fuel shutoff valve counterclockwise.

Note: For more detailed information that pertains to draining the water and sediment from the fuel tank, refer to Operation and Maintenance Manual, “Fuel Tank Water and Sediment - Drain”.

i04291349

Fuel Tank Shutoff and Drain Control

SMCS Code: 1273

The fuel tank drain valve and the fuel shutoff valve are located behind the right access door.

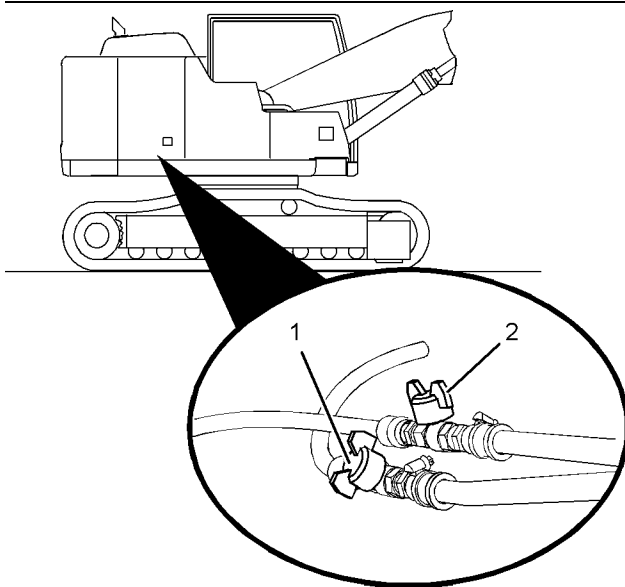


Illustration 214

g02457717

- (1) Fuel Tank Drain Valve
- (2) Fuel Shutoff Valve

Fuel Tank Drain Valve (1) – To drain the water and sediment from the fuel tank, turn the fuel drain valve counterclockwise. To close the fuel tank drain valve, turn the drain valve clockwise.

Fuel Shutoff Valve (2) – To shut off the fuel supply, turn the fuel shutoff valve clockwise. To turn on the

Engine Starting

i05380957

Engine Starting

SMCS Code: 1000; 1090; 1456; 7000

NOTICE

The engine start switch must be in the ON position and the engine must be running in order to maintain electrical functions and hydraulic functions. This procedure must be followed in order to prevent serious machine damage.

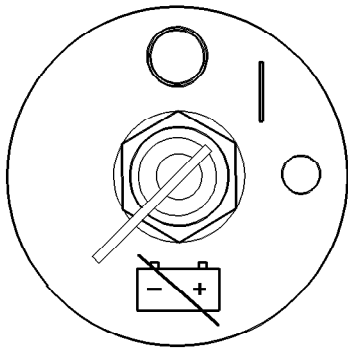


Illustration 215

g00406959

1. Turn the battery disconnect switch to the ON position.
2. Make sure that the reset button for the circuit breaker remains depressed. Refer to Operation and Maintenance Manual, "Circuit Breakers - Reset".
3. Move the hydraulic lockout control to the LOCKED position.

This machine is equipped with an engine neutral start system. The system only allows the engine to start when the lever for the hydraulic lockout control is in the LOCKED position.

4. Move the joysticks to the HOLD position.
5. Before you start the engine, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the horn before you start the engine.

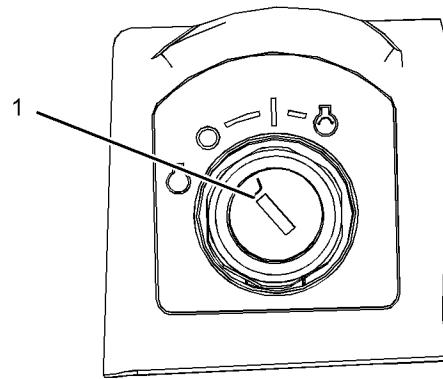


Illustration 216

g03426006

6. Turn engine start switch (1) to the ON position. The monitoring system will start and an indicator message will appear on the monitor display screen for the glow plugs.

Note: Leave the engine start switch in the ON position until the glow plug indicator disappears.

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

7. If the engine start switch is placed in the ON position for 2 seconds or more, the prestart check of the monitoring system will be activated. If any fluid levels are low, the low fluid level will be shown on the message display. Refer to Operation and Maintenance Manual, "Monitoring System" for more information on the prestart monitoring function.

If the fluid level is too low, add the corresponding fluid to the specified level. Add the fluid before you start the engine.

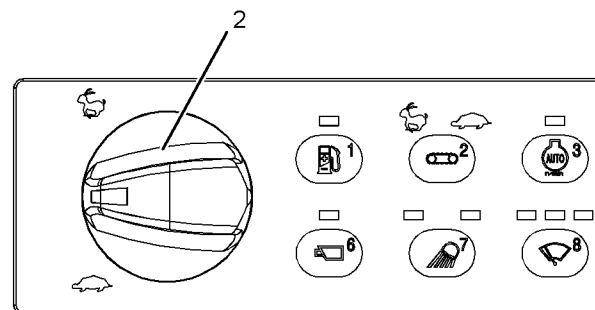


Illustration 217

g02204433

8. Turn engine speed dial (2) to speed position "1".

NOTICE

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

9. Once the glow plug indicator has disappeared from the monitor display screen, you may start the engine. Turn the engine start switch to the START position.

Note: The operating period of the glow plug indicator will change due to the temperature of the engine.

10. Release the engine start switch after the engine starts.

This machine's engine with standard specifications can start in areas that have temperatures as low as -18°C (0°F). For areas that are cooler, a starting kit for cold weather is available.

i06970773

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

NOTICE

Keep engine speed low and do not operate until the message "Warm-Up Mode Power Derate" on the monitor goes out. If it does not go out within thirty seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

NOTICE

Always run the engine at low idle for at least ten minutes before performing any other operations in cold conditions or each time the engine oil and oil filter are changed in order to protect your engine and hydraulic components.

NOTICE

Depending on the ambient temperature, in order to prevent the machine operation with high speed without sufficient lubrication at the turbo bearing, the engine speed may be set to low speed and the hydraulic power minimized for a pre-determined time after the engine starts. Refer to turbo protection feature.

The engine may automatically change speeds when the machine is stationary and idling in cold ambient temperature for an extended time. This is to:

- Maintain desired coolant temperature.
- Maintain desired operation of engine systems.

During extended idling in cold ambient conditions, engine speed may operate between 900 rpm and 1000 rpm. Operation at 1000 rpm is minimal and will only last for up to 20 minutes.

Hydraulic System

 **WARNING**

When you cycle the machine controls, the machine can move suddenly. Contact between the machine and external objects or ground personnel can result in serious injury or death. Before you cycle the machine controls, the machine should be located in an unobstructed, hazard-free work area that is away from external objects and ground personnel.

1. Make sure that the area is clear of personnel and equipment.

Note: The hydraulic lockout control must be in the UNLOCKED position before the hydraulic controls will function.

2. Allow the engine to warm up at low idle for at least 5 minutes. Engage the work tool controls and disengage the work tool controls. This will speed up the warm-up of the hydraulic components.

When you idle the machine for warm-up, observe the following recommendations:

- If the temperature is greater than 0°C (32°F), warm up the engine for approximately 15 minutes.
 - If the temperature is less than 0°C (32°F), warm up the engine for approximately 30 minutes.
 - If the temperature is less than -18°C (0°F) or if hydraulic functions are sluggish, additional time may be required.
-

NOTICE

The hydraulic oil temperature should be higher than 25°C (77°F) before performing work with the machine. Make sure that the warm-up procedure is performed.

If the hydraulic oil temperature is less than 25°C (77°F) and the machine is operated abruptly, serious damage to the hydraulic components may occur.

Note: The recommended operating temperature of the hydraulic fluid for this machine is 55°C (131°F).

3. To warm up the hydraulic oil, turn the engine speed dial to the medium engine speed.
4. Run the engine for approximately 5 minutes and move the joystick intermittently from the BUCKET DUMP position to the HOLD position. Do not hold the joystick in the BUCKET DUMP position with the bucket cylinder fully extended for more than 10 seconds.

This allows the oil to attain relief pressure, which causes the oil to warm up more rapidly.

5. Turn the engine speed dial to the maximum engine speed and repeat Step 4.
6. Cycle all controls to circulate warm oil through all hydraulic cylinders and all hydraulic lines, and through the swing motor and travel motors.
7. Observe the gauges and the indicators frequently during the operation.



Turbo Protection Power Derate – After an engine start, the engine speed will be set to low speed and the hydraulic power limited for a time period . During this period, the monitor displays the message "Warm-Up Mode Power Derate". (Maximum is around 30 seconds). After the turbo bearing lubrication is sufficient, the engine speed goes to the setting dial speed and the monitor stops to display the message.

Improve Cold Weather Performance

Covers installed over the vents in the radiator compartment door will help to control overcooling in ambient temperatures below -15°C (5°F).

The materials used for the covers and the method used to install the covers is at the installers discretion.

Install the covers if overcooling is observed while the machine is idling in ambient temperatures below -15°C (5°F).

Stop the machine, and remove the covers under the following conditions:

- The ambient temperature is above -15°C (5°F).
- The engine temperature gauge indicates overheating.
- The hydraulic oil temperature gauge indicates overheating.

Installation

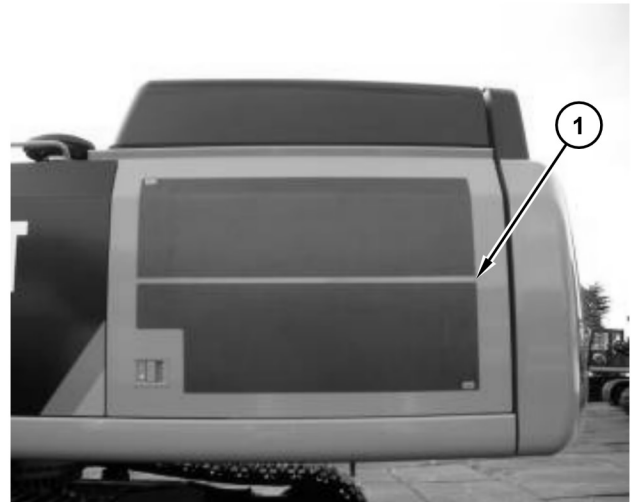


Illustration 218

g03707408

Typical example of cover location on the radiator compartment door

(1) Covers

1. Clean the surface of the radiator compartment door.
2. Install the covers in the location shown in Illustration 218 . The covers should fully cover the door vents.

Operation

i06231546

Operation Information

SMCS Code: 7000

Note: Operating Temperature Range for the Machine The machine must function satisfactorily in the anticipated ambient temperature limits that are encountered during operation. The standard machine configuration is intended for use within an ambient temperature range of $-18\text{ }^{\circ}\text{C}$ ($0\text{ }^{\circ}\text{F}$) to $43\text{ }^{\circ}\text{C}$ ($109\text{ }^{\circ}\text{F}$). Special configurations for different ambient temperatures may be available. Consult your Caterpillar dealer for additional information on special configurations of your machine.

Make sure that no personnel are on the machine or near the machine in order to prevent any personal injury. Keep the machine under control at all times in order to prevent injury.

Sound the horn and allow adequate time for bystanders to clear the area before moving the machine into a restricted visibility area. Follow local practices for your machine application. For more information refer to Operation and Maintenance Manual, "Restricted Visibility".

Reduce the engine speed when you maneuver the machine in tight quarters and when you drive over an incline.

Select the necessary travel speed range before you drive downgrade. Do not change the travel speed range while you drive downhill.

Use the same travel speed on a downgrade and on an upgrade.

When you travel for any distance, keep the stick inward and carry the boom in a low position.

When you drive up a steep grade, keep the boom as close to the ground as possible.

When you travel uphill or you travel downhill, keep the boom on the uphill side of the machine.

1. Adjust the operator seat.
2. Fasten the seat belt.

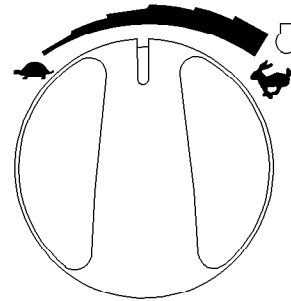


Illustration 219

g00732198

3. Turn the engine speed dial to the operating range.
4. Move the hydraulic lockout control to the UNLOCKED position.

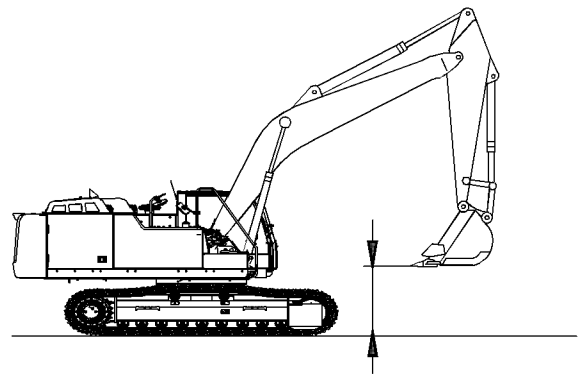


Illustration 220

g02145475

5. Raise the boom enough in order to provide sufficient ground clearance.

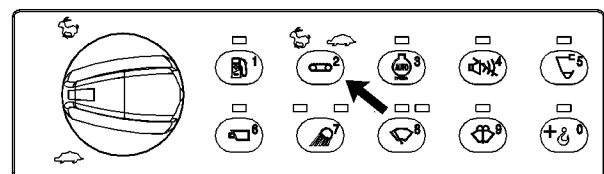


Illustration 221

g03262356

6. Select the desired travel speed by operating the travel speed control switch.

7. Make sure that the position of the upper structure and of the undercarriage is known before you move the machine. The drive sprockets should be at the rear of the machine.

Note: The directional steering controls will operate normally if the drive sprockets are at the rear of the machine and the idlers are at the front of the machine and under the cab. When the sprockets are under the cab, the travel controls will operate backward.

8. Turn the engine speed dial in order to increase the engine speed (rpm) to the desired speed.
9. Push both travel levers forward at the same time in order to travel forward. If both travel levers are pushed farther, the travel speed at the selected engine speed (rpm) will be faster.

Note: If the machine does not operate or if the machine does not travel in a straight line, consult your Caterpillar dealer.

10. See Operation and Maintenance Manual, "Operator Controls" for information about spot turning and about pivot turns.
11. When you make turns in soft material, travel in a forward direction occasionally in order to clear the tracks.
12. Slowly move both of the travel levers or both of the travel pedals to the CENTER position in order to stop the machine.

Lifting Objects

If the machine is equipped with the CE plate per requirements for the European Union, used to lift objects, then the machine must be equipped with the optional boom lowering control valve and an overload warning device.

A fit for purpose test was completed in order to confirm that a properly equipped machine meets the requirements of the European Union Machinery Directive "2006/42/EC" for lifting objects.

The overload warning device (if equipped) must be adjusted for the bucket linkage and bucket size that is installed on the machine. Adjust the overload warning device for proper operation.

The setting for the overload warning device (if equipped) should be checked by an authorized dealer.

i00059294

Frozen Ground Conditions

SMCS Code: 7000

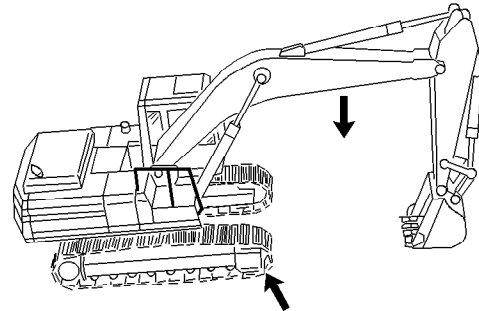


Illustration 222

g00101468

To free the tracks from frozen ground, swing the boom to the front of the machine. Use boom down pressure to free the idler end of the machine.

Swing the boom to the rear of the machine. Use boom down pressure to free the sprocket end of the machine.

i07144840

Equipment Lowering with Engine Stopped

SMCS Code: 7000

To lower the boom, place the hydraulic lockout control in the UNLOCKED position. Move the joystick to the BOOM LOWER position. If the accumulator is still charged, the boom will lower.

If the boom does not lower, the accumulator is empty. Use one of the following procedures to lower the boom.

Machines Equipped with a Boom Lowering Control Valve

WARNING

Boom load may cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing possible injury or death.

To avoid possible injury or death, be sure no one is under or near the work tool before manually lowering the boom.

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

If the engine is shut down or the hydraulic system is disabled, the operator can still lower the boom.

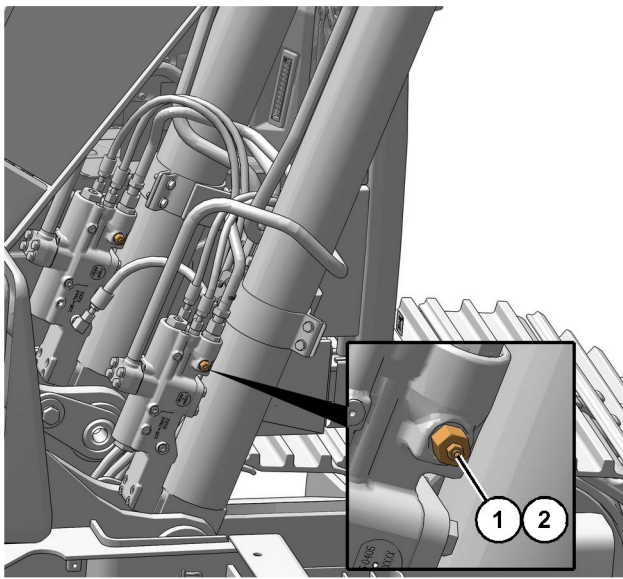


Illustration 223

g06235792

- (1) Locknut
(2) Check valve

The boom lowering control valve is located at the base of the boom cylinder. The boom lowering control valve allows the operator to manually lower the boom if the engine is stopped.

1. Loosen locknut (1) of the boom lowering check valve.
2. Slowly turn check valve (2) counterclockwise until the check valve stops. The boom will lower to the ground.
3. Make sure that the work tool has been lowered onto the ground.

4. Tighten check valve (2) to a torque of $2.25 \pm 0.25 \text{ N}\cdot\text{m}$ ($20.0 \pm 2.21 \text{ lb in.}$).

Tighten locknut (1) to a torque of $4.0 \pm 0.5 \text{ N}\cdot\text{m}$ ($35.4 \pm 4.4 \text{ lb in.}$).

5. Before operating the machine, make any necessary repairs.

For additional information, consult your Cat dealer.

Machines without a Boom Lowering Control Valve

WARNING

Be sure no one is under or near the work tools before manually lowering the boom. Keep all personnel away from the boom drop area when lowering the boom with the engine stopped in order to avoid possible personal injury.

When you must manually lower the boom due to engine shutdown, use the following procedure.

Relieve the pressure in the hydraulic system before manually lowering the boom. Move the hydraulic lockout lever to the UNLOCKED position. Move the travel levers/pedals forward and backward to relieve the pressure.

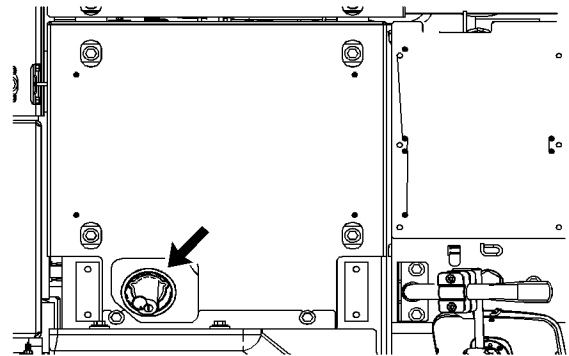


Illustration 224

g02024028

Hydraulic tank filler cap location

WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

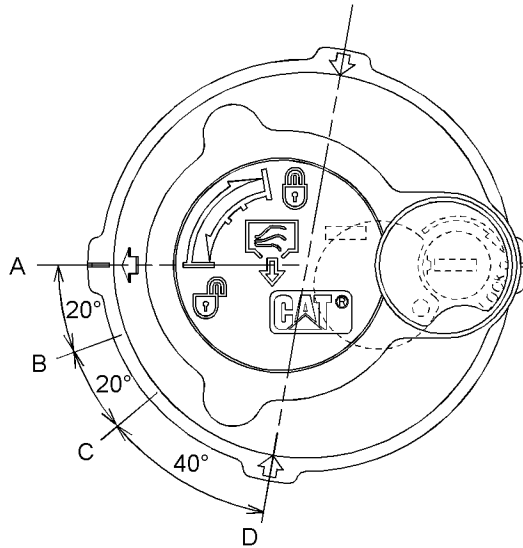


Illustration 225

g02275615

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

1. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 225 for filler cap positions.
 - a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
 - b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Push down the filler cap and move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, remove the filler cap.
2. Open the engine hood.

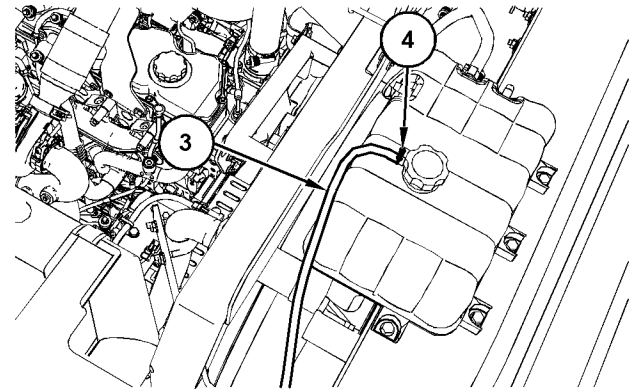


Illustration 226

g02522057

- (3) Hose
- (4) Clamp

3. Loosen clamp (4) and disconnect hose (3) from the radiator.

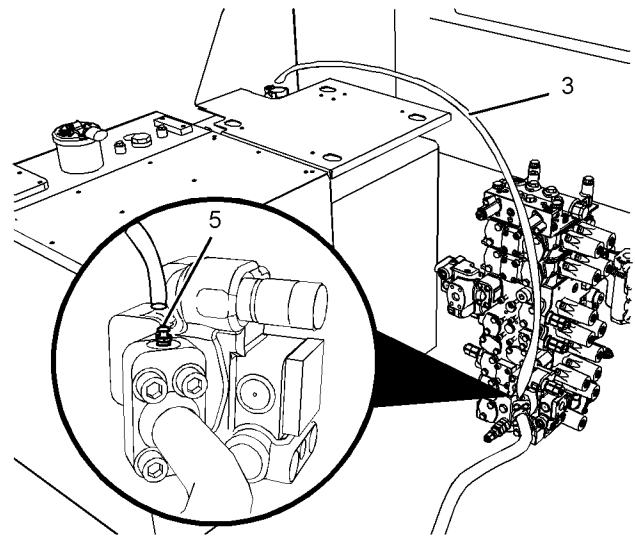


Illustration 227

g02522056

- (3) Hose
- (5) Screw

4. Connect one end of hose (3) to screw (5). Put the other end of hose (3) into the filler plug opening.
5. Slowly loosen screw (5) by a maximum of 1/2 turn. Loosening the screw allows the hydraulic oil in the boom circuit to drain into the hydraulic tank. The boom will now start to lower.
6. Make sure that the work tool has lowered all the way to the ground. Tighten screw (5) to a torque of $13 \pm 2 \text{ N}\cdot\text{m}$ ($9 \pm 1 \text{ lb ft}$).

7. Disconnect hose (3) from screw (5). Do not allow the oil that is contained in hose (3) to spill. Drain the oil into a suitable container.
8. Connect hose (3) to the original position on the radiator and install hydraulic tank filler cap.
9. Close the engine hood.

After completion of the manual boom lowering, make necessary repairs before you operate the machine again.

Pressure Release of Auxiliary Lines

WARNING

Personal injury can result from hot oil spray and raised work tools.

Make sure all the work tools have been lowered, the oil is cool and the pressure has been released from the hydraulic system before removing any components or lines.

Do not allow hot oil or components to contact skin.

Note: Refer to Operation and Maintenance, “General Hazard Information” for information on containing fluid spillage.

Refer to the procedure below before any of the following conditions.

- The work tool is changed.
 - The position of the ball valve is changed.
1. Turn the engine start switch to the OFF position.
 2. Place the hydraulic lockout lever to ON position.
 3. Release the pressure in the auxiliary lines by pressing the auxiliary control buttons or the auxiliary control pedal three times.
 4. Place the hydraulic lockout lever in the OFF position.
 5. Change the work tool.

Note: There should be movement in the auxiliary hydraulic lines as the pressure is released. If there is no movement in the auxiliary hydraulic lines, start the engine and run the engine for 20 seconds. Repeat steps 1 to 5.

For additional information, consult your Cat dealer.

Operating Techniques

i05125989

Operating Technique Information

SMCS Code: 7000

WARNING

Know the maximum height and the maximum reach of your machine. Serious injury or death by electrocution can occur if the machine or the work tools are not kept a safe distance from electrical power lines. Keep a distance of at least 3000 mm (118 inch) plus an additional 10 mm (0.4 inch) for each 1000 volts over 50000 volts.

For safety, one of the following may require a greater distance:

- Local codes
- State codes
- Requirements of the job site

NOTICE

When swinging into a ditch, do not use the ditch to stop the swinging motion. Inspect the machine for damage if the boom is swung into a bank or an object.

Repeated stopping by an object can cause structural damage if the boom is swung into a bank or an object.

With certain boom-stick-bucket combinations, the bucket or worktool can hit the cab and/or the front structure of the machine. Always check for interference when first operating a new bucket or a new work tool. Keep the bucket or work tool away from the cab and away from the front structure during operation.

Whenever the tracks of the machine raise off the ground while digging, lower the machine back to the ground smoothly. **DO NOT DROP OR CATCH IT WITH THE HYDRAULICS.** Damage to the machine can result.

With certain combinations of work tools, the third pedal can have different functions. Always check the function of the third pedal before you use the third pedal.

Know the location of any buried cables. Mark the locations clearly before you dig.

Consult your Caterpillar dealer for special work tool tips that are available for use in severe applications.

Move the machine whenever the position for operating the machine is not efficient. The machine can be moved forward or backward during the operating cycle.

When you operate the machine in close places, utilize the bucket or the other work tool in order to perform the following functions:

- Pushing the machine
- Pulling the machine
- Lifting the tracks

Use a comfortable travel speed while you operate the machine.

Operating efficiency can be increased by using more than one machine control to perform a task.

Never swing a load over a truck cab or workers.

Position the truck so that material can be loaded from the rear of the truck or from the side of the truck. Load the truck evenly so that the rear axles are not overloaded.

An oversize bucket or a bucket that is equipped with side cutters should not be used in rocky material. These types of buckets slow down the cycle. Damage to the bucket and to other machine components could result.

Restricted Operation

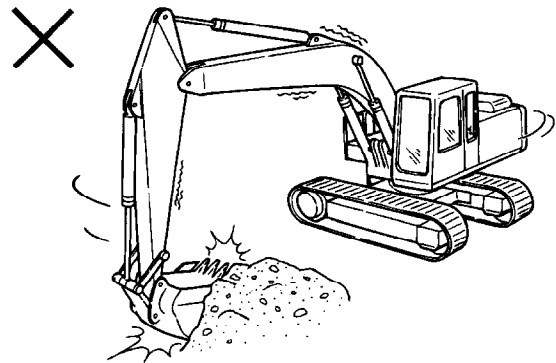


Illustration 228

g00529436

Do not use the swing force to perform the following operations:

- Soil compaction
- Ground breaking
- Demolition

Do not swing the machine while the bucket tips are in the soil.

Operation Section
Operating Technique Information

These operations will damage the boom, the stick, and the work tool and the operations will reduce the life of the equipment.

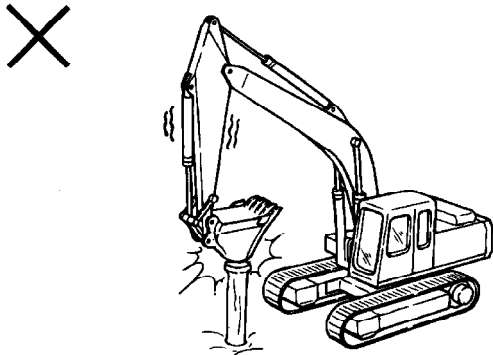


Illustration 229

g00529457

Do not use the dropping force of the bucket or work tool as a hammer. This will bring excessive force on the rear of the machine. Possible damage to the machine could result.

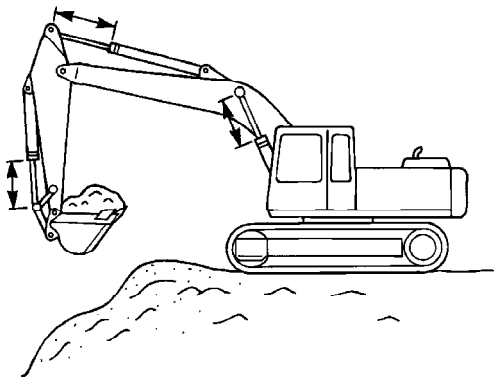


Illustration 230

g00529458

If the cylinder is operated at the end of the stroke during operations, excessive force will occur on the stopper on the inside of the cylinder. This will reduce the life of the cylinder and structures. To avoid this problem, always leave a small margin of play when the cylinder is operated.

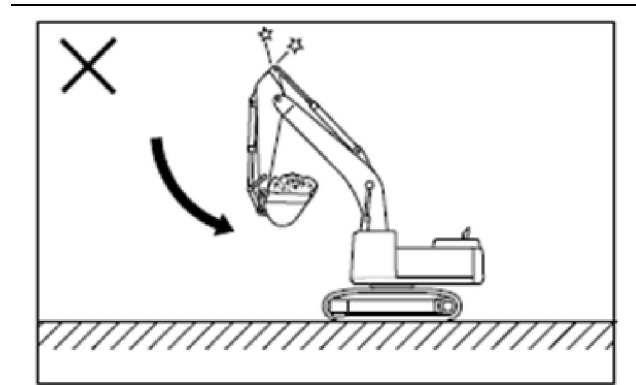


Illustration 231

g03286378

If the stick IN function is operated at full speed with a fully loaded bucket or heavy work tool attachment to the end of the cylinder stroke, excessive force will occur inside the stick cylinder. This action will reduce the life of the stick cylinder. To avoid this problem, always operate a stick IN function with moderate speed towards the end of cylinder stroke.

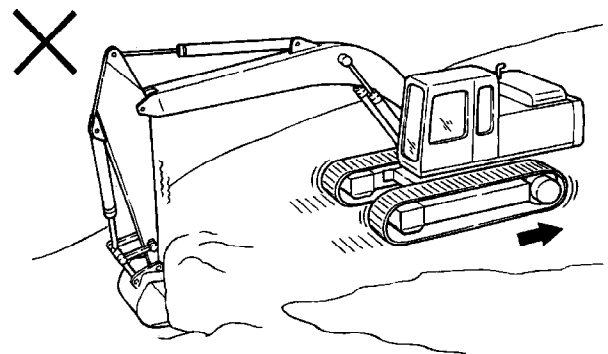


Illustration 232

g00529459

While the bucket is in the ground, do not use the travel force for any excavation. This operation will cause excessive force on the rear of the machine.

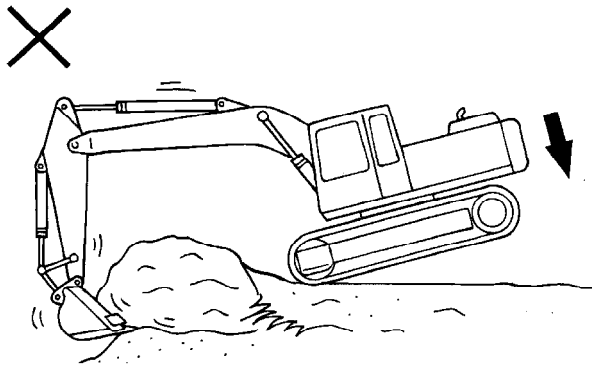


Illustration 233

g00529460

Do not use the dropping force of the rear of the machine for excavation. This operation will damage the machine.

Operating Precaution

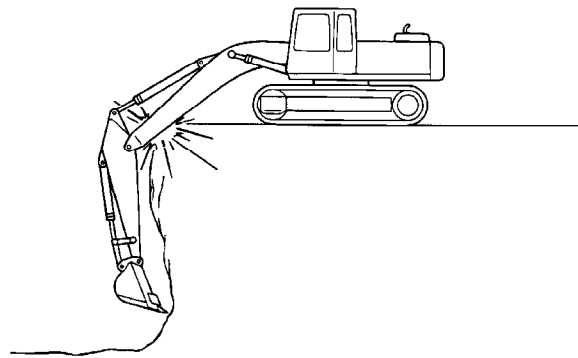


Illustration 235

g00529462

When deep holes are dug, do not lower the boom so that the bottom side of the boom touches the ground.

When deep holes are dug, do not allow the boom to interfere with the tracks.

i05032265

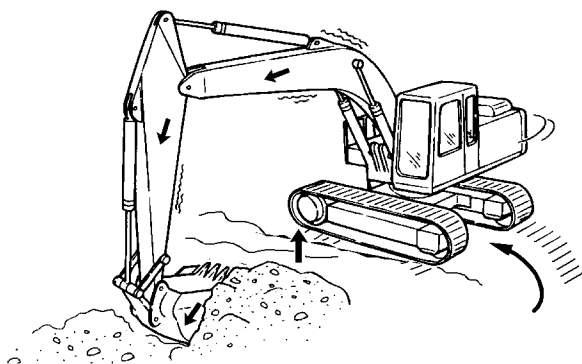


Illustration 234

g01250228

NOTICE

Do not allow the machine to swing from the force of traveling when you use the bucket, the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.

Do not use the force of the bucket, the stick, or the boom to assist in turning the machine while the machine is traveling. This technique is referred to as "jump steering". This technique will damage the swing motor and the swing brake.

Travel in Water and Mud

SMCS Code: 7000-V6

NOTICE

When working in or around any body of water, around a stream or river, or in conditions of heavy mud, be careful that the swing bearing, the swing drive gear, and the swivel joint do not dip into water, mud, sand, or gravel. If the swing bearing dips into water, mud, sand, or gravel, immediately grease the swing bearing until the used grease leaks from the outer circle of the swing bearing. Failure to carry out this procedure may cause premature wear in the swing bearing.

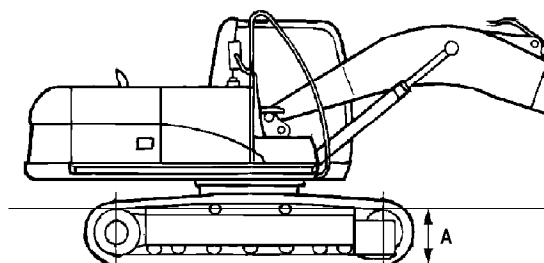


Illustration 236

g00807842

Depth of water to the center of the track carrier roller

The following guidelines pertain to travel across water and travel through mud, sand, or gravel.

Operation Section
Travel in Water and Mud

The machine can travel across a river only under the following conditions:

- The bed of the river is flat.
- The flow of the river is slow.
- The machine dips into the water only to the center of the track carrier roller (dimension A).

NOTICE

Do not allow the fan on the engine to contact the water while the machine travels through the water. Do not allow the fan on the engine to contact the water during a swing while the machine is in the water. Damage to the fan may occur if the fan contacts the water.

While you cross the river, carefully confirm the depth of the water with the bucket. Do not move the machine into an area that has a water depth that is greater than Dimension A.

The machine may sink gradually on soft ground. Therefore, you should frequently check the height of the undercarriage from ground level and the depth of water on the ground.

Check the swing gear by looking through the port for inspection that is on the upper frame. If there is water in the swing gear, contact your Cat dealer for the required maintenance on the swing gear.

After you travel through water, carefully clean the machine in order to remove any salt, sand, or other foreign matter.

Procedure for Removing the Machine from Water or Mud

NOTICE

Do not allow the machine to swing from the force of traveling when you use the bucket, the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.

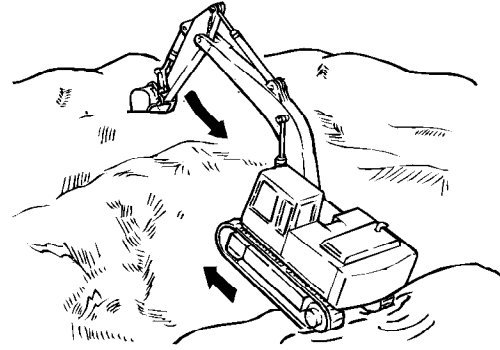


Illustration 237

g00808148

1. You may not be able to move the machine by using the travel controls only. In this case use both the travel control levers/pedals and the stick to pull the machine out of the water or ground.

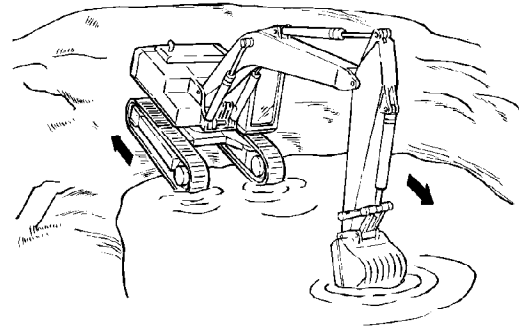


Illustration 238

g00808151

2. The machine may slip because of a steep slope. The procedure in Step 1 may not work. In this case, first rotate the upper structure by 180°. Then use both the travel control levers/pedals and the stick to move the machine up the slope.

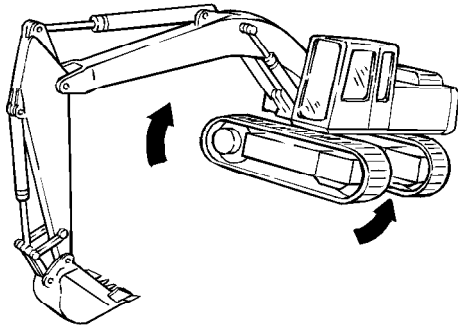


Illustration 239

g00808152

3. It may be impossible to travel because the bottom of the frame comes into contact with the ground or the undercarriage is clogged with mud or gravel. In this case, operate the boom and the stick together. Raise the track and rotate the track forward and backward in order to remove the mud and the gravel.

i05150572

Boom, Stick and Bucket Operation

SMCS Code: 7000

Digging

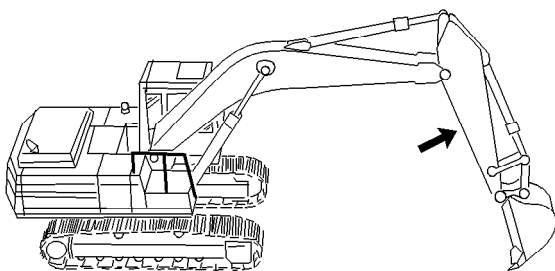


Illustration 240

g00101523

1. Position the stick at a 70 degree angle to the ground.

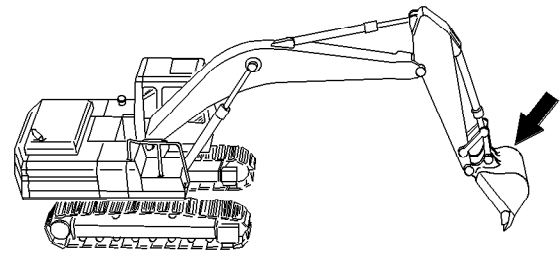


Illustration 241

g00101525

2. Position the bucket cutting edge at a 120 degree angle to the ground. Maximum breakout force can now be exerted with the bucket.

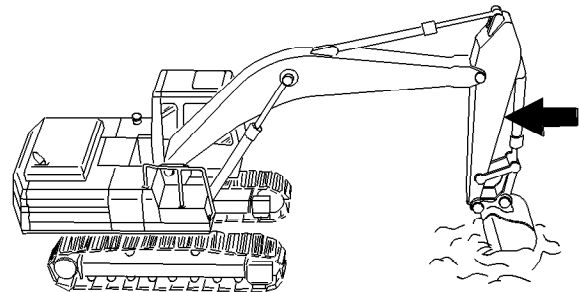


Illustration 242

g00101526

3. Move the stick toward the cab and keep the bucket parallel to the ground.

Operation Section
Boom, Stick and Bucket Operation

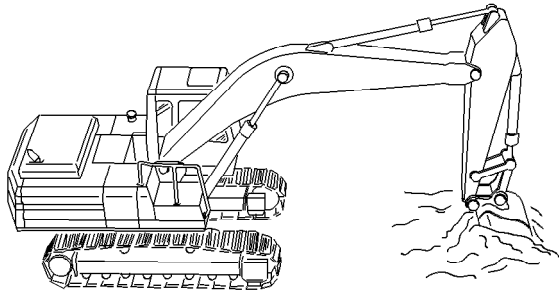


Illustration 243

g00101527

4. If the stick stops due to the load, raise the boom and/or perform a curl in order to adjust the depth of the cut.
5. To apply the greatest force at the cutting edge, decrease the down pressure as you move the stick toward the cab.
6. Maintain a bucket attitude that ensures a continuous flow of material into the bucket.
7. Continue the pass in a horizontal direction so that material peels into the bucket.

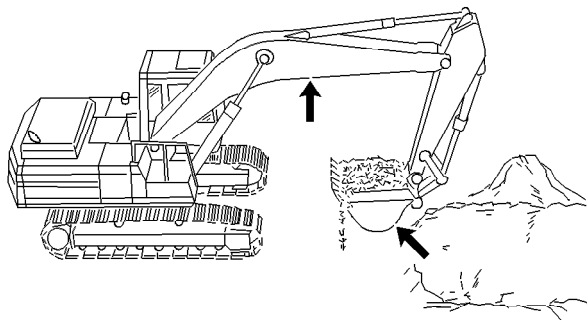


Illustration 244

g00101528

8. Close the bucket and raise the boom when the pass has been completed.

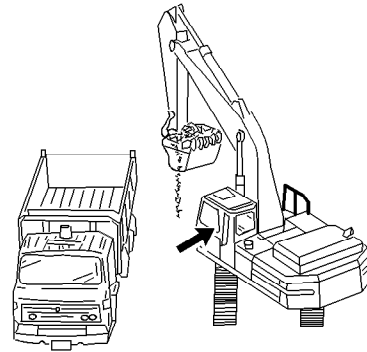


Illustration 245

g00101529

9. Engage the swing control when the bucket is clear of the excavation.

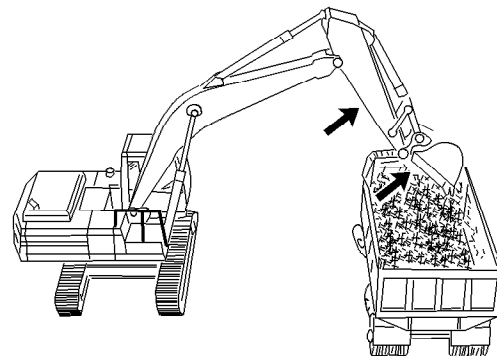


Illustration 246

g00101530

10. To dump a load, move the stick outward and open the bucket in a smooth motion.

Lifting Objects

WARNING

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on level ground, load capacities will vary.

NOTICE

Damage to bucket cylinder, bucket or linkage could result if slings are placed incorrectly.

There may be local regulations and/or government regulations that govern the use of machines which lift heavy objects. Obey all local and government regulations.

If this machine is used to lift objects within an area that is controlled by the European Directive "2006/42/EC", the machine must be equipped with a boom lowering control valve, a stick lowering control valve, and an overload warning device.

Japan regulations require some machines to use a shovel crane configuration in order to lift certain objects.

Contact your Cat dealer for additional information.

Short slings will prevent excessive load swing.

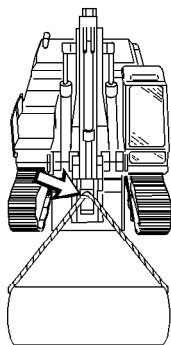


Illustration 247

g00101531

Use the lifting eye that is provided on the linkage to lift objects.

If the lifting eye is used, the connection must be made with a sling or with a shackle.

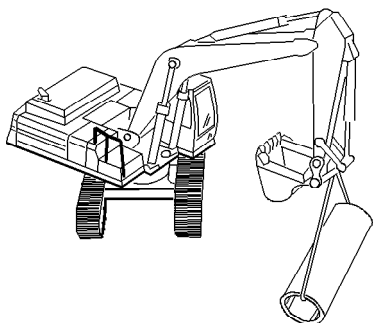


Illustration 248

g00101532

An unstable condition can exist if a load exceeds the machine load rating or if a heavy load is swung over an end or over a side.

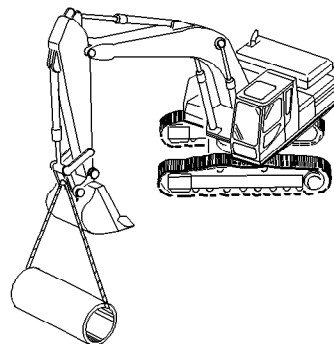


Illustration 249

g00101533

The most stable lifting position is over a corner of the machine.

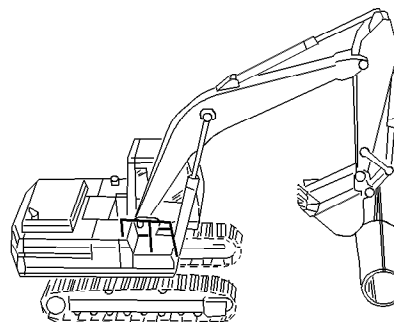


Illustration 250

g00101534

For the best stability, carry a load close to the machine and to the ground.

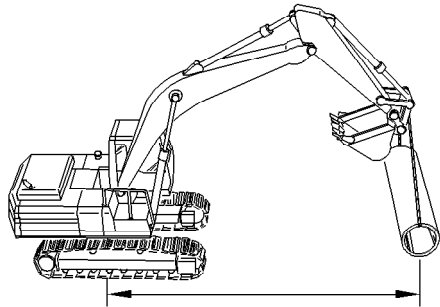


Illustration 251

g00101535

Lift capacity decreases as the distance from the swing centerline is increased.

Machines that are Equipped with a Long Reach Configuration

Machines with a long reach configuration require larger swing drift than standard machines when stopping, because inertial force in time of swing is large. Taking this into account, adjustments are made in timing for applying the swing brakes and speed of swinging.

Machines with a long reach configuration could be damaged and stability of the machine would be adversely affected if a control was suddenly operated, because inertial force of work tool is large.

i03875131

SmartBoom Operation (If Equipped)

SMCS Code: 5461-ZS; 7332

! WARNING

Personal injury or death can result from not following the proper procedures.

To avoid the possibility of injury or death, follow the established procedure.

! WARNING

Activating the SmartBoom function and using the work tool joystick control while the front of the machine is elevated could result in unexpected machine motion. Unexpected machine motion could result in serious injury or death. Do not activate the SmartBoom function if the front of the machine is elevated by the front linkage.

! WARNING

Do not elevate or lower the track when in the SmartBoom mode. Follow the operation procedures for the SmartBoom in the Operation and Maintenance Manual. Failure to follow these instructions can result in serious injury or death.

! WARNING

Always make sure that the boom control joystick is in the NEUTRAL position before activating the SmartBoom control. Activating the SmartBoom control with the joystick out of the neutral position could result in unexpected machine motion which could result in serious injury or death.

! WARNING

Do not select any SmartBoom mode, using the SmartBoom selector switch located on the console, while the tracks are elevated. Selecting the SmartBoom mode with the tracks elevated could result in a sudden drop of the machine which could result in serious injury or death.

! WARNING

If any SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground, pressing the disable button that is located on the front of the right hand joystick could cause a sudden boom down motion. This control function could lift the machine upward, with unexpected machine movement that could result in serious injury or death. Do not press the disable button while the SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground.

! WARNING

Do not attempt to lift the tracks of the machine by using the disable button and applying downward force with the boom lowering control while the machine is in any SmartBoom mode. Releasing the disable button will immediately return the machine to the active SmartBoom mode. This action could cause the machine to drop down abruptly which could result in serious injury or death.

The Caterpillar SmartBoom provides significant advantages in the following operations:

Excavation and Loading

The operator should select the SmartBoom UP AND DOWN mode for excavating operations and for loading operations. This mode is effective during the return cycle. The BOOM DOWN movement is assisted by gravity, and the pump flow that is normally required for the boom circuit is available for faster STICK OUT and SWING functions. More work is performed for the amount of hydraulic oil flow that is provided by the pumps. This results in faster cycle times and improved fuel efficiency.

When the SmartBoom UP AND DOWN mode is active, no downward hydraulic force is applied to the boom. The operator can intermittently apply downward hydraulic force when the force is required for bucket penetration. A button on the right joystick enables the operator to override the SmartBoom mode.

Hammering

The operator should select the SmartBoom DOWN mode for hammering operations. In the SmartBoom DOWN mode, the weight of the hammer plus the boom and the stick provides sufficient downward force for effective hammering. This mode prevents the hammer from rebounding. The boom follows the hammer downward freely as the tool penetrates the rock. This mode also reduces strain on the machine structures.

Advantages

In hammering, the SmartBoom provides the following advantages:

- The mode reduces shock in the cab.
- The mode reduces strain on machine structures.
- The mode prevents blank shots.
- The mode maintains optimum frequency.

In rock cleaning, the SmartBoom provides the following advantages:

- The mode reduces strain on machine structures.
- The mode reduces wear on the bucket and the teeth.
- The mode maintains optimum frequency.

In a leveling operation, the SmartBoom eases the operation. Only STICK IN actuation and bucket actuation are required to level the surface.

In material handling, the SmartBoom reduces the chance of damage below the material.

i05068589

Quick Coupler Operation (Hydraulic Pin Grabber Quick Coupler (If Equipped))

SMCS Code: 6129; 6522; 7000

NOTICE

The Caterpillar Quick Coupler (Hydraulic Pin Grabber) is not designed to be used in applications where there is long exposure to excessive vibration. The vibration caused by extensive use of a hydraulic hammer as well as the added weight of certain demolition tools such as shears, crushers, and pulverizers may cause premature wear and decreased service life of the coupler.

Be sure to carefully inspect the coupler daily for cracks, bent components, wear, distressed welds, etc. when operating with any of the above work tools.

General Operation

The quick coupler is used to change work tools while the operator remains in the cab. The quick coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins in order for the quick coupler to work properly.

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a check valve in the hydraulic cylinder traps oil in the cylinder. In addition to the check valve, a blocking bar locks the work tools to the quick coupler. Ensure that the hydraulic system and the blocking bar are working properly before using the quick coupler.

A lifting eye is included on the quick coupler. Release the work tool from the quick coupler in order to use the lifting eye to pick up loads. In order to lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

NOTICE

Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the “Quick Coupler Installation and Removal” section of the quick coupler Operation and Maintenance Manual for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

NOTICE

Inspection of the Center-Lock coupler is required after a failure of the primary engaging system or a miscoupling of the tool, causing the work tool to swing by the secondary lock. Contact your Cat dealer.

Refer to Special Instruction, REHS5676, “The Inspection Procedure for the Center-Lock Coupler” for the proper procedure.

Note: Machines operating hydromechanical work tools equipped with a Center-Lock Pin Grabber Coupler, the addition of a Hydromechanical Conversion Kit may also be required. Refer to the Operation and Maintenance Manual for the quick coupler for more information or consult your Cat dealer.

Quick Coupler Operation

Description of the Instruction Film

An instruction film is included with the quick coupler. The instruction film illustrates the operation of the quick coupler.

Note: For detailed instructions on the operation of the quick coupler, refer to “Coupling the Work Tool” and “Uncoupling the Work Tool”.

The instruction film should be legible at all times. Clean the film or replace the film if the film is not legible. When you clean the film, use a cloth, water, and soap. Do not use solvent, gasoline, or harsh chemicals to clean the film. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the film. Loose adhesive will allow the film to fall. If the film is damaged or the film is missing, replace the film. For more information, consult your Cat dealer.

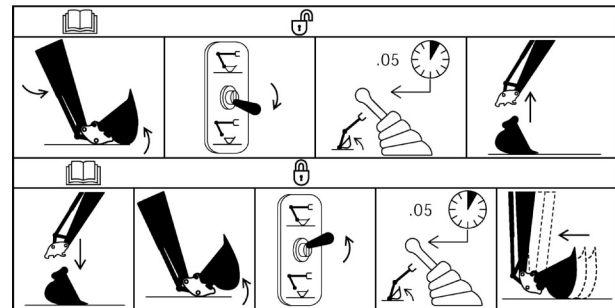


Illustration 252

g01231702

Instruction film

Description of the Top Frame on the Film (Uncoupling the Work Tool)

1. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.
2. Move the electric switch to the UNLOCK position.
3. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked.
4. Place the work tool in the storage position close to the ground. Retract the bucket cylinder until the tool is disengaged from the quick coupler.

Description of the Bottom Frame on the Film (Coupling the Work Tool)

1. Engage the quick coupler onto the work tool.
2. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.
3. Move the electric switch to the LOCK position.
4. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked.
5. Make sure that the quick coupler pins are engaged. Retract the bucket cylinder and drag the attachment on the ground. This method will ensure that the quick coupler pins are engaged.

WARNING

Crush injury. Could cause serious injury or death. Always confirm that the quick coupler is engaged onto the pins. Read the Operator's Manual.

NOTICE

Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

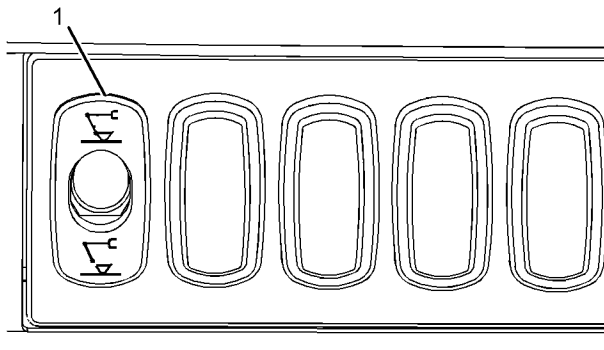
Electric Switch Operation

Illustration 253

g01354192

The electric switch (1) is located inside the cab. The electric switch has two positions that are used for coupling the work tool and uncoupling the work tool. Examples of the early switch type and the later switch type have been shown above. Refer to this Operation and Maintenance Manual, "Operator Controls" for the location of the electric switch.



UNLOCK – In order to unlock the coupler, extend the stick cylinder and extend the bucket

cylinder until the bucket is fully curled under the stick. Pull the switch outward and move the switch toward the UNLOCK position. A buzzer will sound. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked. The switch must remain in the UNLOCK position until another work tool is attached. The switch must remain in the UNLOCK position in order to prevent the blocking bar from jamming.



LOCK – In order to lock the coupler, engage the quick coupler onto the work tool.

Extend the stick cylinder and extend the bucket cylinder until the bucket is fully curled under the stick. Pull the switch outward and move the switch toward the LOCK position. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked. Make sure that the quick coupler is engaged onto the pins. Retract the bucket cylinder and drag the attachment on the ground. This method will ensure that the quick coupler is engaged onto the pins.

Coupling the Work Tool**⚠ WARNING**

Place the work tool or bucket in a safe position before engaging the quick coupler. Ensure that the work tool or bucket is not carrying a load.

Serious injury or death may result from engaging the work tool or bucket when it is in an unstable position or carrying a load.

⚠ WARNING

Inspect the quick coupler engagement before operating the machine.

Serious injury or death may result from improperly engaged coupler.

⚠ WARNING

Crush injury. Could cause serious injury or death. Always confirm that the quick coupler is engaged onto the pins. Read the Operator's Manual.

⚠ WARNING

The buzzer will not sound when the switch is in the lock position. The position of the switch does not confirm the coupler pins are engaged. A physical test is required by dragging the attachment on the ground to confirm the coupler pins are engaged.

NOTICE

With certain work tool combinations, including quick couplers, the work tool can hit the cab or the front of the machine. Always check for interference when first operating a new work tool.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

1. Position the bucket or the work tool on a level surface.
2. Make sure that the pins are in the bucket or the work tool. Make sure that the pin keepers are installed correctly.

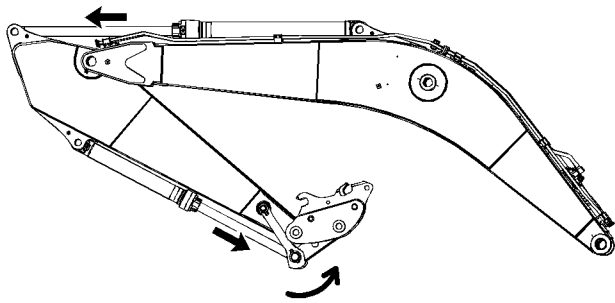


Illustration 254

g01231266

3. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the LOCK position to the UNLOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.
4. Pull the switch outward and move the switch to the UNLOCK position. A buzzer will sound.

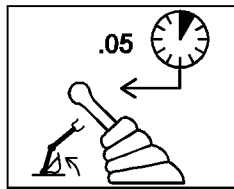


Illustration 255

g01231447

5. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked. The switch must remain in the UNLOCK position until the work tool is attached in order to prevent the blocking bar from jamming. The buzzer will continue to sound until the switch is moved to the LOCK position.

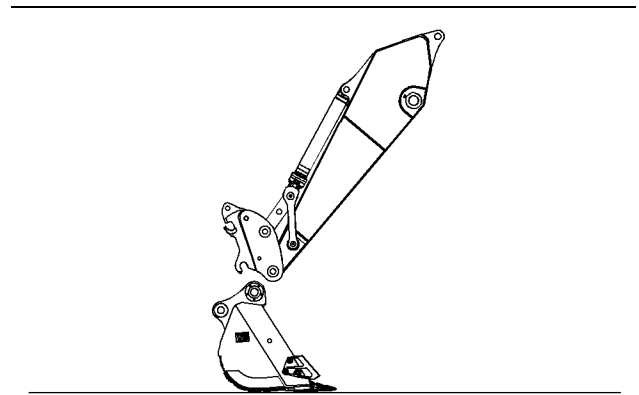


Illustration 256

g01231316

6. Align the quick coupler with the work tool.

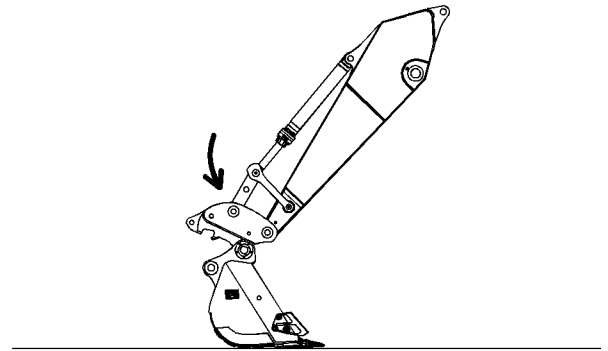


Illustration 257

g01231317

7. Rotate the quick coupler in order to grab the top pin.

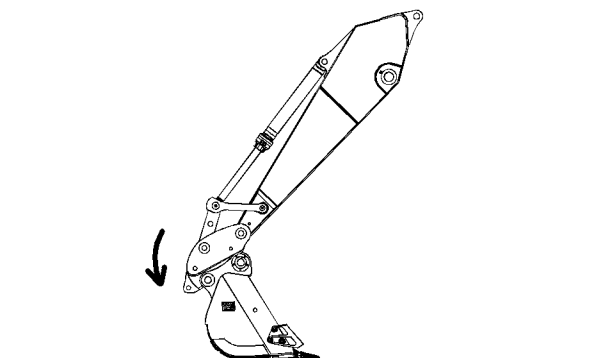


Illustration 258

g01231320

8. Rotate the quick coupler downward in order to grab the bottom pin.

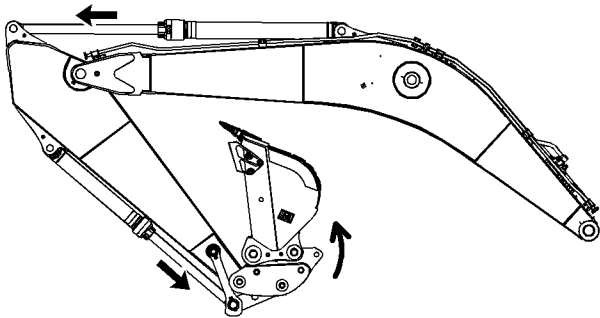


Illustration 259

g01231322

9. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position. This must be performed before you move the switch from the UNLOCK position to the LOCK position.

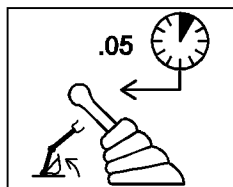


Illustration 260

g01231447

NOTICE

Hold the bucket cylinder control lever in the EXTEND position while the switch is moved into the LOCK position. Failure to do so may result in unwanted movement of the worktool.

10. Move the switch to the LOCK position. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds in order to lock the hook.
11. The “Work Tool Select” menu will be displayed on the monitor system. Scroll through the menu in order to select the desired work tool. Refer to this Operation and Maintenance Manual, “Monitoring System” for more information.

WARNING

Crush injury. Could cause serious injury or death. Always confirm that the quick coupler is engaged onto the pins. Read the Operator's Manual.

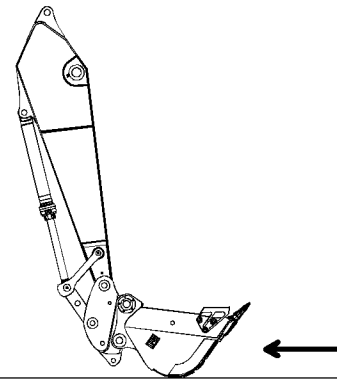


Illustration 261

g01231327

WARNING

Inspect the quick coupler engagement before operating the machine.

Verify that the quick coupler is engaged per the procedure in the Operation and Maintenance Manual. Verify prior to operating the machine, after every engine start, and after an extended time of inactivity.

Serious injury or death may result from improperly engaged coupler.

12. Verify that the quick coupler and the work tool are locked together.
- Retract the bucket cylinder and place the work tool on the ground.
 - Apply pressure to the work tool against the ground.
 - Drag the work tool backward.

NOTICE

Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

Uncoupling the Work Tool

WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

Serious injury or death may result from disengaging the work tool or bucket when it is in an unstable position or carrying a load.

NOTICE

Auxiliary hoses for work tools must be disconnected before the quick coupler is disengaged.

Pulling the work tool with the auxiliary hoses could result in damage to the host machine or the work tool.

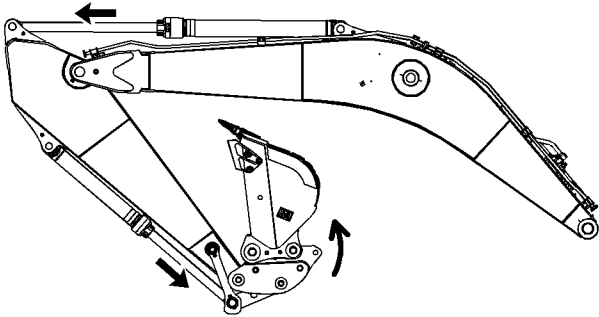


Illustration 262

g01231322

1. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position. This must be performed before you move the switch from the LOCK position to the UNLOCK position.
2. Pull the switch outward and move the switch to the UNLOCK position.

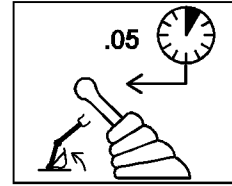


Illustration 263

g01231447

3. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds in order to unlock the hook. A buzzer will sound until the switch is moved to the LOCK position. In order to lift objects with the lifting eye of the quick coupler, refer to "Coupler Lifting Eye Operation without Bucket".

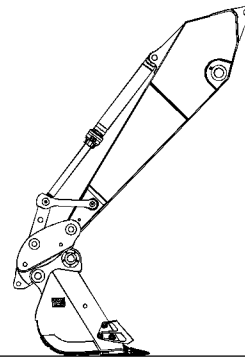


Illustration 264

g01231426

4. Move the boom and the stick until the tool or the bucket is in the storage position. Keep the tool close to the ground.

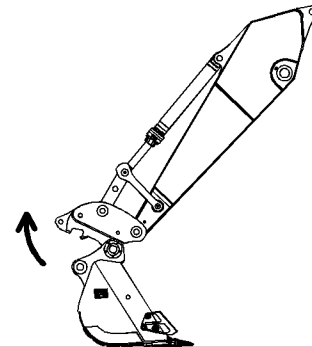


Illustration 265

g01231430

5. Rotate the quick coupler upward in order to release the bottom pin.

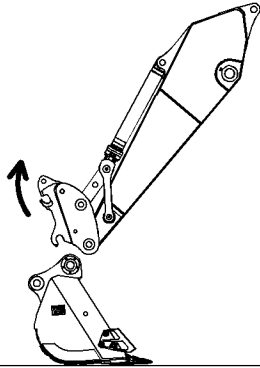


Illustration 266

g01231432

6. Continue to rotate the quick coupler upward in order to release the top pin and completely release the work tool from the quick coupler.
7. Move the stick to a position that is clear of the work tool.

Note: In order to lift objects with the lifting eye of the quick coupler, refer to “Coupler Lifting Eye Operation without Bucket”.

Coupling a Bucket that is Reversed

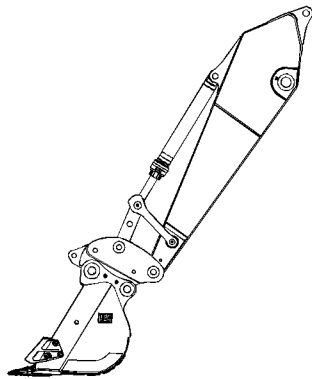


Illustration 267

g01231682

1. When you use a hydraulic pin grabber quick coupler, you can connect to a bucket that is in a reversed position. Refer to Illustration 267 for an example of connecting to a bucket that is in a reversed position.

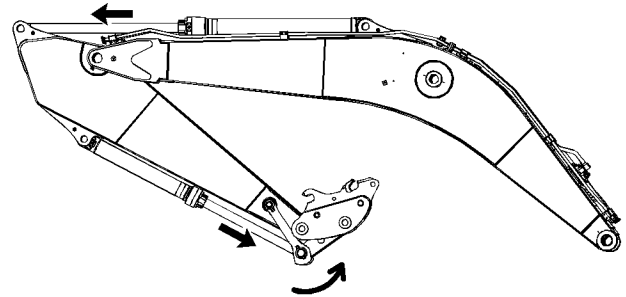


Illustration 268

g01231266

2. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the LOCK position to the UNLOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.
3. Follow the same steps for coupling the work tool in order to couple the host machine to a bucket that is reversed. Refer to “Coupling the Work Tool” for the proper procedure.

NOTICE

When some Caterpillar buckets are used in the reverse position, it can be more difficult to couple the bucket and uncouple the bucket than in the normal position.

Care must be taken to ensure that the position of the boom, stick, and bucket are aligned to ensure smooth coupling. The coupler must be in position between the bucket bosses.

If the bucket is not fully engaged in the jaw of the coupler, the quick coupler can become snagged on the bucket bosses. The full weight of the bucket is then carried by the quick coupler sideplates, which can cause damage to the quick coupler.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

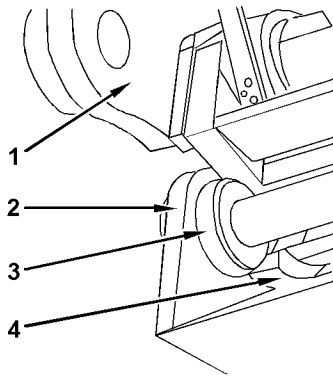


Illustration 269

g01231689

- (1) Quick coupler
- (2) Bucket
- (3) Boss
- (4) Hook

Coupler Lifting Eye Operation without Bucket

1. Remove the work tool. Refer to "Uncoupling the Work Tool" for the proper procedure.

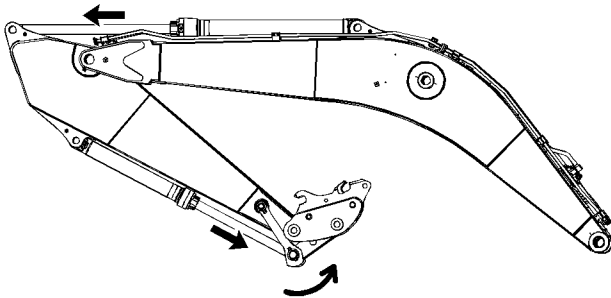


Illustration 270

g01231266

2. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the UNLOCK position to the LOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.
3. Pull the switch outward and move the switch to the LOCK position. The buzzer will no longer sound.

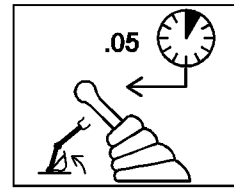


Illustration 271

g01231447

4. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked.

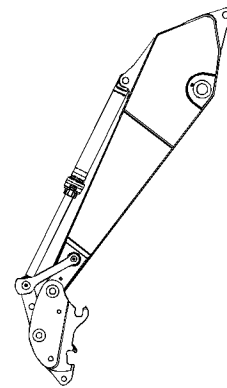


Illustration 272

g01231666

5. Rotate the quick coupler downward and move the stick to a position that is clear of the work tool.

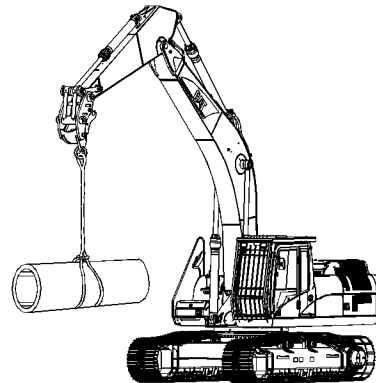


Illustration 273

g01187716

6. Use the lifting eye of the quick coupler, as needed.

- In order to reinstall the bucket or the work tool, refer to "Coupling the Work Tool" for the proper procedure.

i05944562

Quick Coupler Operation (Circuit for Universal Coupler (If Equipped))

SMCS Code: 6129; 6522; 7000

Operation

This procedure describes the use of the hydraulic circuit with a Caterpillar dedicated quick coupler. If a different quick coupler is used, please contact your Caterpillar dealer for pressure adjustment and consult the documentation for the quick coupler for proper operation.

- The engine start switch is on.
- The engine is running.
- The hydraulic lockout control must be in the UNLOCKED position in order to operate the quick coupler controls.
- During the operation, the alarm will sound.

When the above conditions are achieved, the system will perform the desired operation. A warning alarm will sound if the switch for the quick coupler is turned to the LOCKED position or the UNLOCKED position as long as the hydraulic lockout control is in the UNLOCKED position.

Resetting the Quick Coupler Controls

Operation of the quick coupler may be interrupted by deactivating the hydraulic lockout control. The quick coupler controls will be disabled. Use the following procedure to reset the quick coupler control.

- Return the quick coupler switch to the LOCKED position.
- Turn the engine start switch to the OFF position and then turn the engine start switch to the ON position.

- Move the hydraulic lockout control to the LOCKED position.

Securing the Work Tool

⚠ WARNING

Inspect the coupler wedge engagement before you operate the excavator.

Serious injury or death may result from an improperly engaged coupler.

Inspect coupler wedge engagement from the cab by rotating the bucket or the work tool inward. Extend the bucket cylinder to bring the coupler actuator into view and bring the stick in until the wedges are visible.

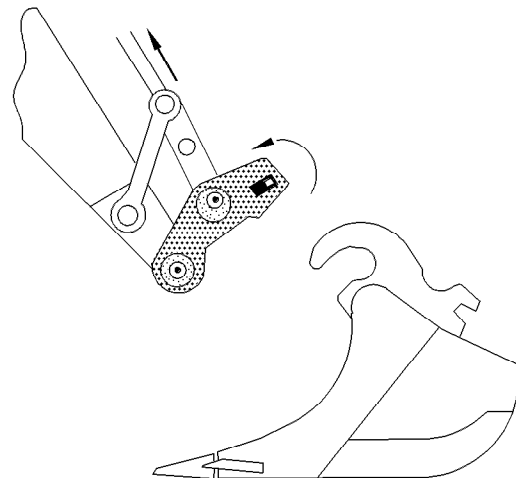


Illustration 274

g00104707

- Position the work tool on a level surface.
- Retract the bucket cylinder. Position the quick coupler in alignment between the hinges of the work tool.

Operation Section
Circuit for Universal Coupler (If Equipped)

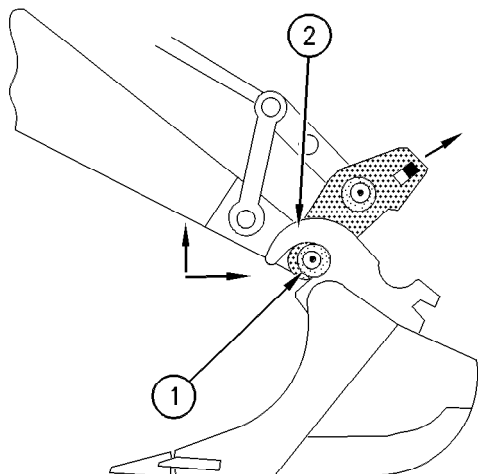


Illustration 275

g00104708

- (1) Lower bosses
(2) Hinges

- 3.** Move the stick forward and raise the stick until the lower bosses (1) engage the hinges (2) of the work tool.

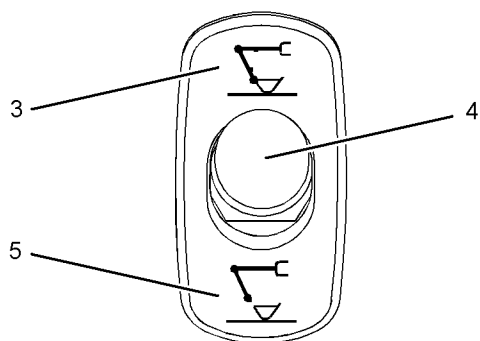


Illustration 276

g03733058

- (3) Locked
(4) Quick coupler switch
(5) Unlocked

- 4.** Move the switch for the quick coupler to the UNLOCKED position in order to extend the wedge. Use this position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

Note: Whenever the switch is on the UNLOCKED position, a warning alarm will sound.

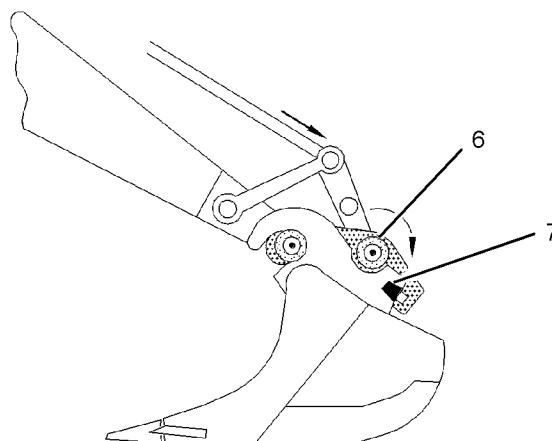


Illustration 277

g01620262

- (6) Center bosses
(7) Locking area

- 5.** Extend the bucket cylinder in order to rotate the quick coupler toward the work tool.

Center bosses (6) must engage with the cutout of the hinge.

- 6.** Move the switch for the quick coupler to the LOCKED position in order to retract the wedge. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

The springs in the quick coupler will move the wedge into the locking area (7).

Note: The warning alarm will sound for 10 seconds.

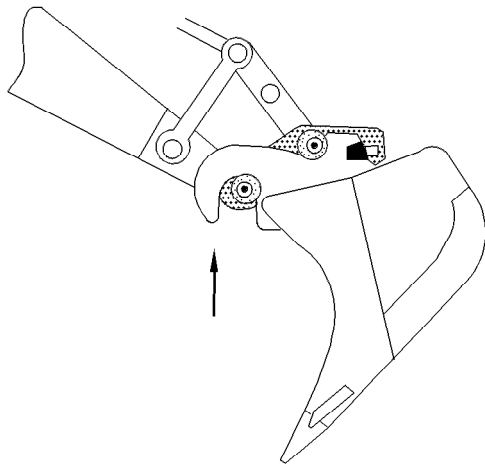


Illustration 278

g00104710

7. Raise the boom or raise the stick. Retract the bucket cylinder in order to confirm that the wedge is fully engaged. If the wedge is fully engaged, the work tool is locked in place. The work tool is ready to use.

Releasing the Work Tool

WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

Serious injury or death may result from disengaging the work tool or bucket when it is in an unstable position or carrying a load.

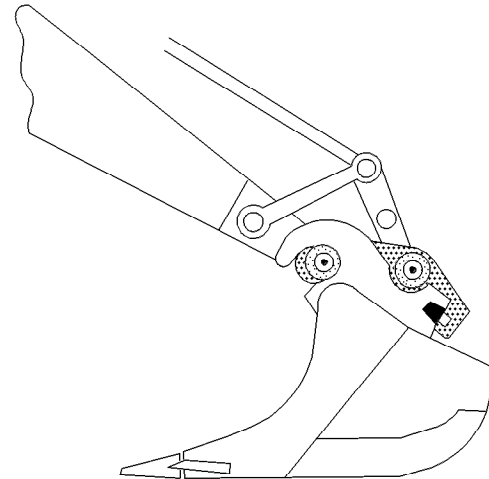


Illustration 279

g00104711

1. Level the bucket or level the work tool on the ground.
2. Move the switch for the quick coupler to the UNLOCKED position in order to extend the wedge. Use this position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

Note: The warning alarm will sound.

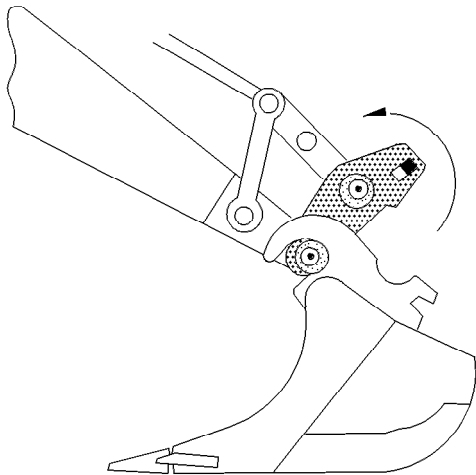


Illustration 280

g00104713

3. Retract the bucket cylinder in order to move the quick coupler toward the machine.
4. Move the switch for the quick coupler to the LOCKED position in order to retract the wedge.

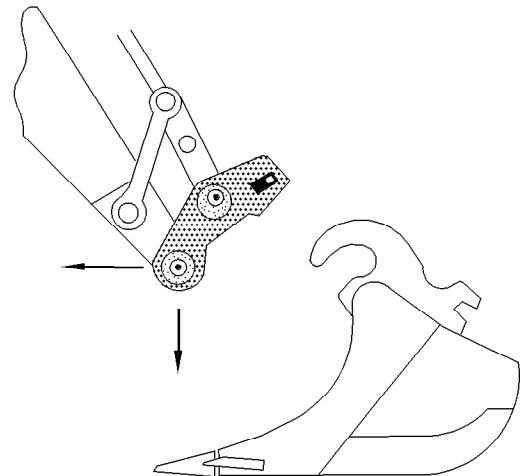


Illustration 281

g00104714

5. Lower the stick and move the stick toward the machine in order to disengage the quick coupler.

i04067162

Bucket - Remove and Install

SMCS Code: 6001-012; 6001-011; 6001; 6101; 6102; 6523

Captured Flag

WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- Confirm the verbal communication and the hand signals that will be used during the installation.
- Be alert for sudden movement of the front linkage and the work tool.
- Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.

NOTICE

To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

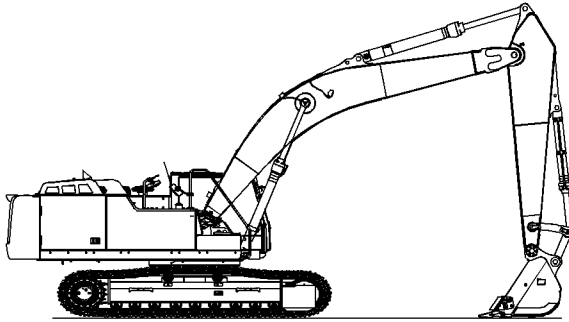


Illustration 282

g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

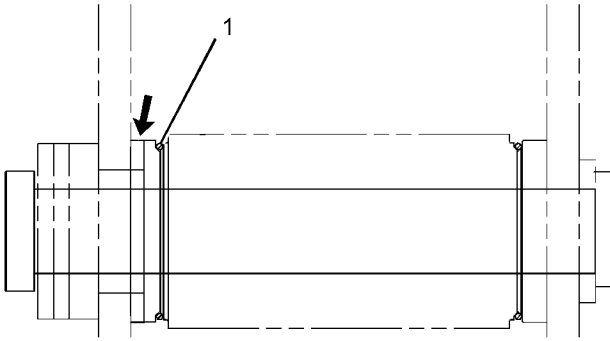


Illustration 283

g01303452

2. Slide O-ring seals (1) off the pin joints and onto the flanges of the bucket.

WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

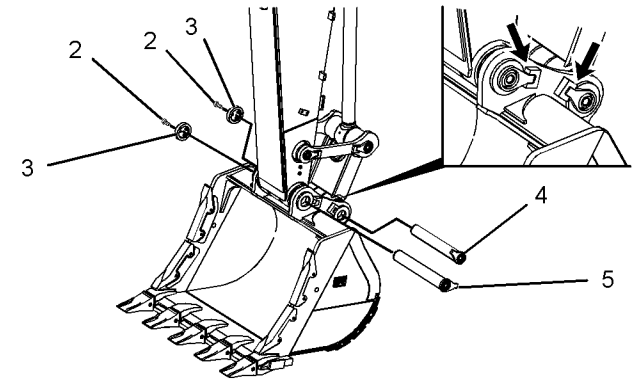


Illustration 284

g01303433

3. Remove bolts (2) and retaining plates (3). Then remove support pin (4) and support pin (5).
4. Start the engine and raise the stick out of the bucket.
5. Remove the O-ring seals (1) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

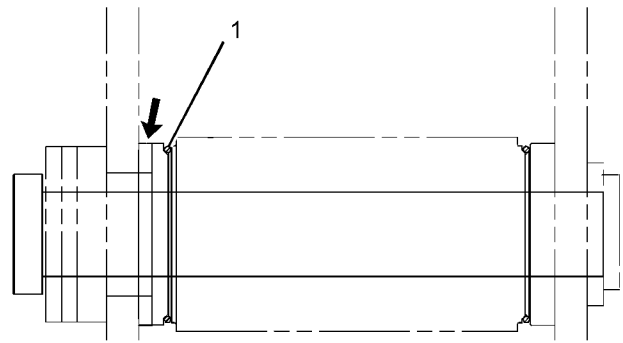


Illustration 285

g01303452

2. Position the O-ring seals (1) onto the flanges of the bucket.
3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

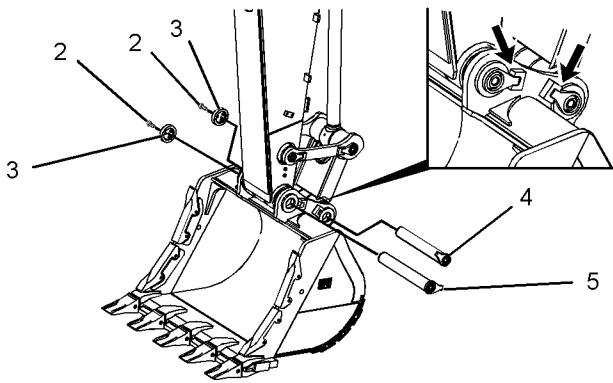


Illustration 286

g01303433

4. Insert support pin (5) into the pin bore. Make sure that the flange of the support pin rest inside the support on the side of the bucket.
5. Refer to Operation and Maintenance Manual, "Bucket Linkage - Inspect/Adjust" in order to adjust the bucket clearance.
6. Install retaining plate (3). Install bolts (2). Tighten bolts (2) evenly.
7. Slide O-ring seals (1) in position over the pin joints between the bucket and the stick.
8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.
9. Insert support pin (4) into the pin bore. Make sure that the flange of the support pin rest inside the support on the side of the bucket.
10. Install retaining plate (3). Install bolts (2). Tighten bolts (2) evenly.
11. Slide the O-ring seals (1) over the pin joints between the bucket and the link assembly.

12. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, "Bucket Linkage - Lubricate" or Operation and Maintenance Manual, "Boom, Stick, and Bucket Linkage - Lubricate".

Bolted Flag

WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- Confirm the verbal communication and the hand signals that will be used during the installation.
- Be alert for sudden movement of the front linkage and the work tool.
- Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.

NOTICE

To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

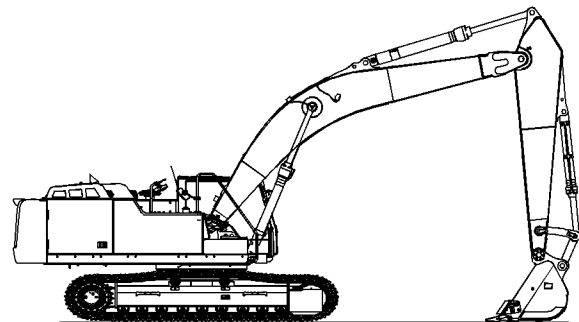


Illustration 287

g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

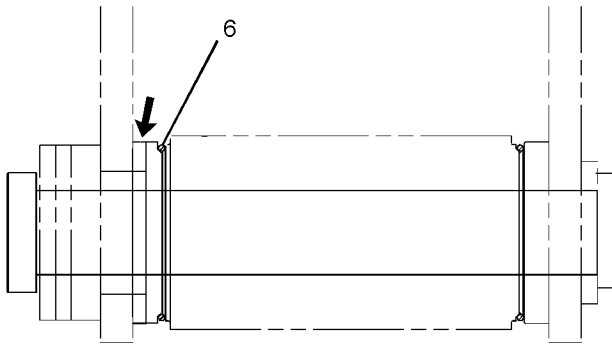


Illustration 288

g01303567

- Slide O-ring seals (6) off the pin joints and onto the flanges of the bucket.

WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

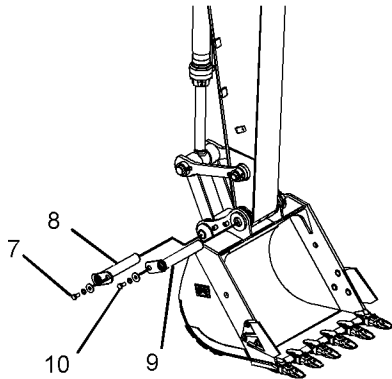


Illustration 289

g01303568

- Remove bolt (7). Remove support pin (8).
- Remove bolt (10). Remove support pin (9).
- Start the engine and raise the stick out of the bucket.
- Remove the O-ring seals (6) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

- Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

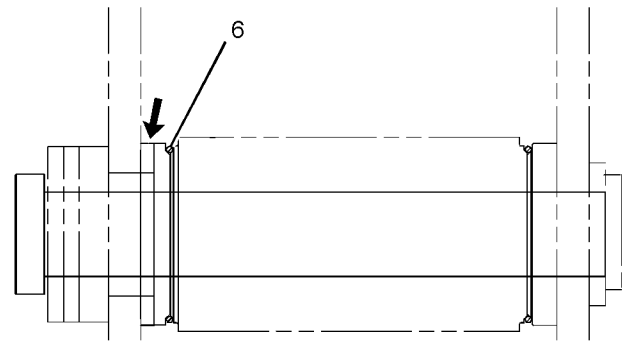


Illustration 290

g01303567

- Position the O-ring seals (6) onto the flanges of the bucket.

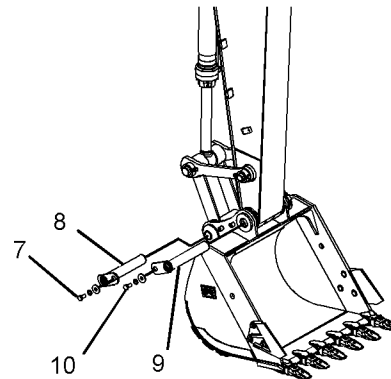


Illustration 291

g01303568

- Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.
- Install support pin (9) into the pin bore.
- Install bolt (10).
- Refer to Operation and Maintenance Manual, "Bucket Linkage - Inspect/Adjust" in order to adjust the bucket clearance.
- Slide O-ring seals (6) in position over the pin joints between the bucket and the stick.

8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.
9. Install support pin (8) into the pin bore.
10. Install Bolt (7).
11. Slide the O-ring seals (6) over the pin joints between the bucket and the link assembly.
12. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, "Bucket Linkage - Lubricate" or Operation and Maintenance Manual, "Boom, Stick, and Bucket Linkage - Lubricate".

Crossbolt

WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- Confirm the verbal communication and the hand signals that will be used during the installation.
- Be alert for sudden movement of the front linkage and the work tool.
- Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.

NOTICE

To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

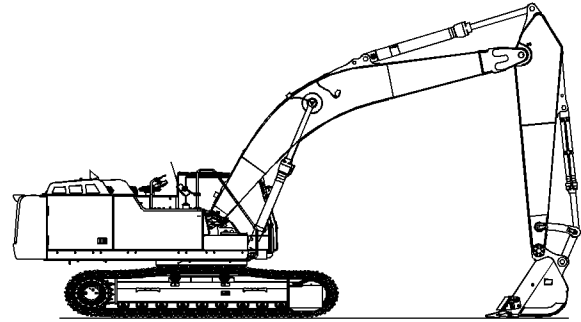


Illustration 292

g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

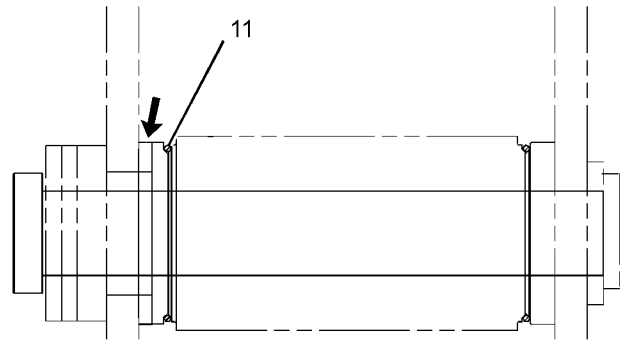


Illustration 293

g01303581

2. Slide O-ring seals (11) off the pin joints and onto the flanges of the bucket.

WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

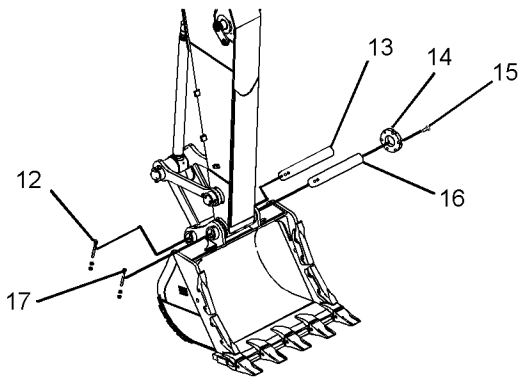


Illustration 294

g01303622

3. Remove nuts and retaining bolt (12) from support pin (13). Remove support pin (13).
4. Remove bolts (15) and adapter plate (14). Remove the shims.
5. Remove nuts and retaining bolt (17) from support pin (16). Remove support pin (16).
6. Start the engine and raise the stick out of the bucket.
7. Remove the O-ring seals (11) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

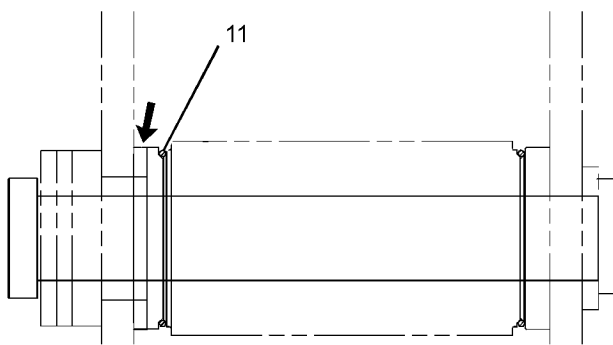


Illustration 295

g01303581

2. Position the O-ring seals (11) onto the flanges of the bucket.

3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

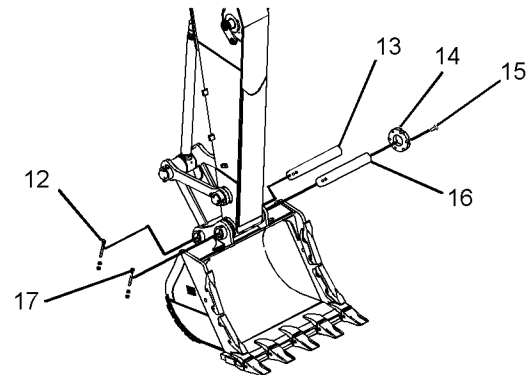


Illustration 296

g01303622

4. Install support pin (16). Put the retaining bolt hole that is in support pin (16) in alignment with the retaining bolt hole that is in the bucket.
5. Install the retaining bolt and nuts (17). Install adapter plate (14) without the shims, and without bolts (15) that hold adapter plate (14).
6. Refer to Operation and Maintenance Manual, "Bucket Linkage - Inspect/Adjust" in order to adjust the bucket clearance.
7. Slide O-ring seals (11) in position over the pin joints between the bucket and the stick.
8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.
9. Install support pin (13). Put the retaining bolt hole that is in the bucket pin in alignment with the retaining bolt hole that is in the bucket.
10. Install the retaining bolt and nuts (12).
11. Slide the O-ring seals (11) over the pin joints between the bucket and the link assembly.

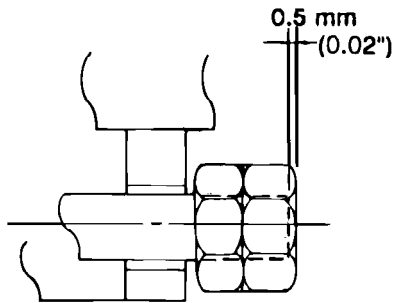


Illustration 297

g00510030

- 12.** Tighten retaining nuts (12) and (17). Position the outside nut even with the end of the retaining bolt or 0.5 mm (0.02 inch) beyond the end of the retaining bolt. Tighten the inside nut against the outside nut.

- 13.** Lubricate the bucket pins. Refer to Operation and Maintenance Manual, "Bucket Linkage - Lubricate" or Operation and Maintenance Manual, "Boom, Stick, and Bucket Linkage - Lubricate".

i07062223

Work Tool Operation (If Equipped)

SMCS Code: 6700; 7000

Hammer Operation (If Equipped)

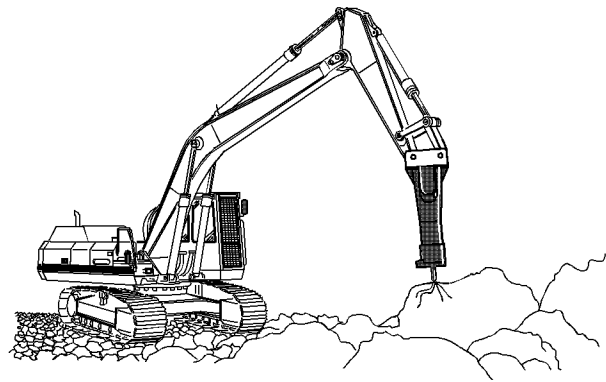


Illustration 298

g01876560

NOTICE

Use only a hydraulic hammer that is recommended by Caterpillar.

The use of a hydraulic hammer that is not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for information on recommended hydraulic hammers.

Only use the hydraulic hammer to break rocks, concrete, and other hard objects. Before you start hydraulic hammer operation, place the machine on a level, stable surface.

Before you start hydraulic hammer operation, close the front window. Caterpillar recommends the installation of a window guard on the front window for protection from flying debris.

NOTICE

In order to avoid structural damage to the host machine or the hydraulic hammer, comply with the following:

Do not attempt to break rocks or concrete by burying the hammer tool completely into the rocks or concrete.

Do not apply a prying force to the hammer tool in order to remove the hammer tool from the material.

Do not allow the hydraulic hammer to operate at one location and for more than 15 seconds. Change the location of the hydraulic hammer and repeat the procedure. Failure to change the location of the hydraulic hammer could cause the hydraulic oil to overheat. Overheated hydraulic oil could damage the accumulator.

Stop the hydraulic hammer immediately if the jumper lines are pulsating violently. This indicates that the accumulator nitrogen charge is lost. Consult your Caterpillar dealer for the necessary repair.

NOTICE

Do not use the dropping force of the hydraulic hammer to break rocks or other hard objects. This could cause structural damage to the machine.

Do not use the sides or back of the hydraulic hammer to move rocks or other hard objects. Doing this could cause damage not only to the hammer but to stick or boom cylinder.

Do not operate the hydraulic hammer with any of the cylinders fully retracted or extended. Doing this could cause structural damage to the machine, resulting in reduced machine life.

Do not use the hydraulic hammer to lift an object.

Do not operate the hydraulic hammer while the stick is vertical to the ground. This could allow the stick cylinder to vibrate excessively.

Operate the attachment control levers carefully to keep the hydraulic hammer tool from hitting the boom.

Do not operate the hydraulic hammer under water unless the hydraulic hammer is properly equipped. Operating the hydraulic hammer under water could damage the machine hydraulic system. Consult your Caterpillar dealer for information on underwater operation.

Do not operate the hydraulic hammer with the upper structure sideways to the undercarriage. Before you start hydraulic hammer operation, place the upper structure in the recommended positions that are shown in illustration 299 . Any other operating positions could make the machine unstable. Any other operating positions could place excessive loads on the undercarriage.

Refer to the following for any additional questions about the operation and care of your Caterpillar hydraulic hammer: Operation and Maintenance Manual, SEBU7346, "Hydraulic Hammers", Operation and Maintenance Manual, HEPU9000, "Hydraulic Hammers" and Decal, SMEU7397, "Hammer Operation/Maintenance".

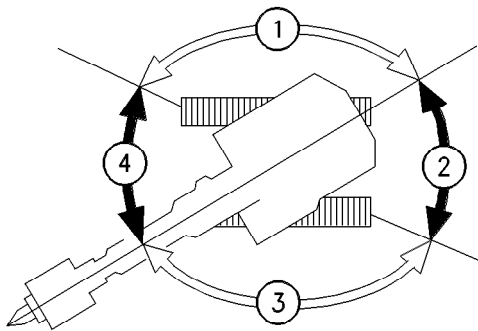


Illustration 299

g00101503

- (1) Not Recommended working position
- (2) Recommended working position
- (3) Not Recommended working position
- (4) Recommended working position

Shear Operation (If Equipped)

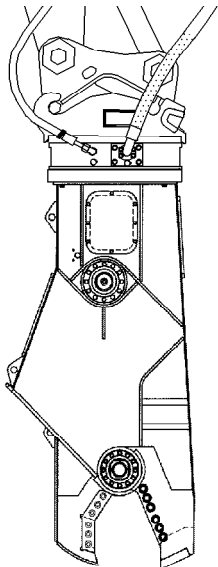


Illustration 300

g00763823

WARNING

Do not operate or work on this work tool unless you have read and understand the instructions and warnings in the Operation And Maintenance Manual for both the work tool and the host machine.

Failure to follow the instructions or heed the warnings could result in injury or death.

Contact your Caterpillar dealer for replacement manuals. Proper care is your responsibility.

NOTICE

Selection of a hydraulic shear must be done with extra care.

Use of a hydraulic shear not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic shear information.

Be sure that no one is near the work tool to prevent injury. Keep the work tool under control always to prevent injury. When a demolition tool is used, all personnel should maintain a minimum distance of 10 m (33 ft).

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.

WARNING

Serious injury or death could occur from the demolition of pipes, vessels, tanks or other containers that may contain gas, flammable materials or hazardous chemicals.

Do not perform any demolition work on these items until all of their contents have been removed.

Follow all regulations for the removal and disposal of these materials.

NOTICE

Using the demolition tool to level the work site or push over standing structures may damage the machine or the demolition tool. Use appropriate equipment to do site preparation or maintenance operations.

NOTICE

To avoid structural damage to the machine, do not break road surfaces by placing the cutting edge of the hydraulic shear on the ground and moving the machine.

Crusher Operation (If Equipped)**⚠ WARNING**

Improper operation and maintenance of the crusher could cause personal injury or death. Observe the following procedures for safe operation of the crusher.

Consult your Cat dealer for more information on the operation and maintenance of the crusher.

Do not operate the host machine with the work tool unless you have read and understood the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in machine or work tool damage, and/or serious injury or death. Contact your Cat dealer for a replacement manual, if needed.

When the crusher is installed on the host machine, always make sure that the protective guarding is in place.

Using the crusher in an incorrect manner can damage the machine and/or cause personal injury or death.

Always ensure that the work area is clear of ground personnel, due to the potential crush hazards with falling debris and machine movement.

Resting or placing your foot on the work tool pedal could result in unexpected movement of the machine / work tool which could result in personal injury or death. Always lock the crusher when not in use.

NOTICE

Selection of a hydraulic crusher must be done with extra care.

Use of a hydraulic crusher not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic crusher information.

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.

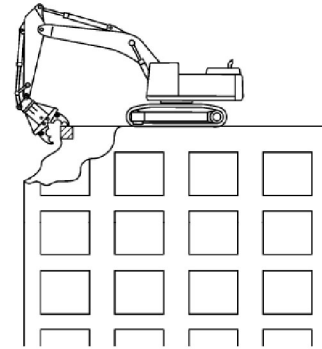


Illustration 301

g02688698

Demolition work on the roof of a building could lead to serious personal injury if the building were to collapse and the excavator turned over or fell off the roof. The demolition work must be started ONLY AFTER surveying the building for its structural integrity.

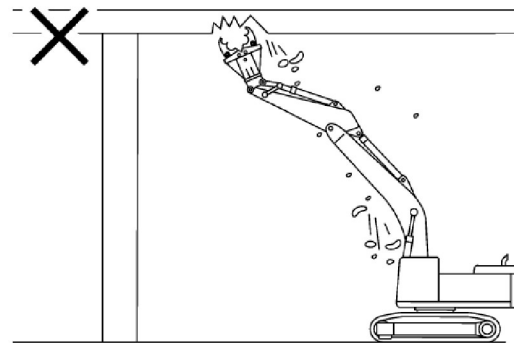


Illustration 302

g02688699

Crushing work above your head must be avoided because objects can fall and damage the machine.

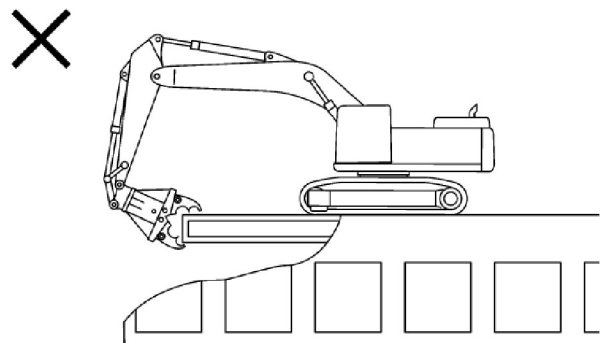


Illustration 303

g02688700

Do not perform demolition work at the base of the machine, because the ground could be unstable and cause the machine to fall.

Operation Section
If Equipped

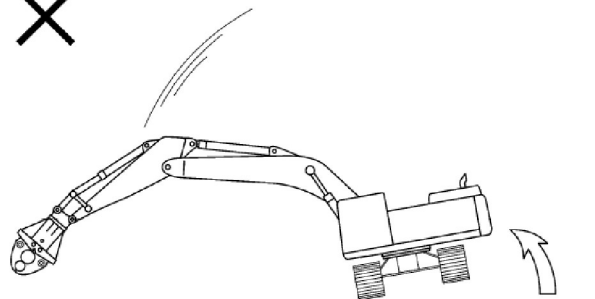


Illustration 304

g02688702

Do not suddenly lower or stop the work tool, otherwise the excavator could turn over.

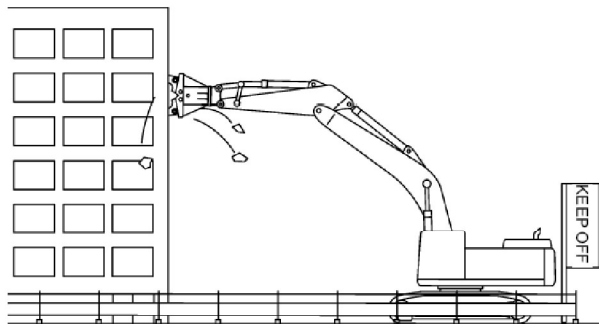


Illustration 307

g02688706

When performing work at elevated positions, always use care for the surroundings and for falling objects to avoid personal injury. Use guide personnel and signs as required.

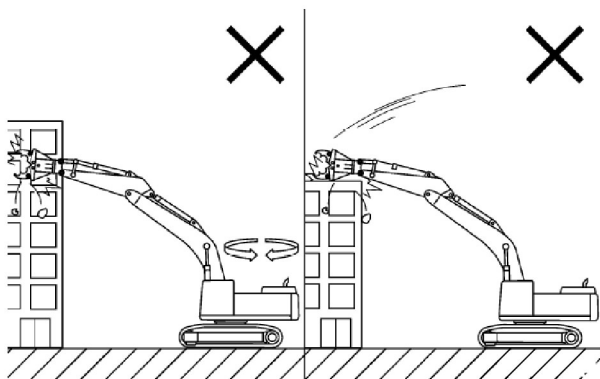


Illustration 305

g02688704

Crushing work using impact, swing, or dropping forces of the excavator could cause damages to the machine and also could lead to personal injury. As such, NEVER perform such an operation.

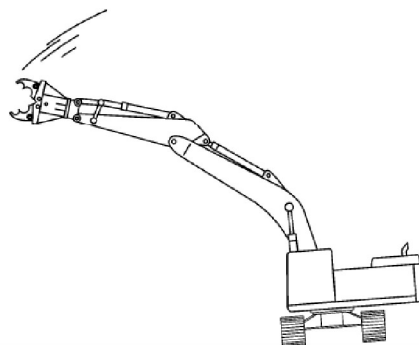


Illustration 308

g02688709

When working sideways, the track can lift. Avoid abrupt operation and operate slowly.

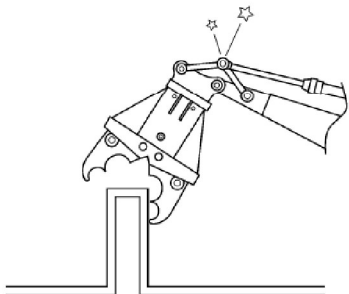


Illustration 306

g02688705

Crushing work with hydraulic cylinder at stroke end position could damage the excavator, resulting in shortening of lifespan. Also, as it could lead to unexpected personal injury due to breakage of the machine, do not perform any work at stroke end.

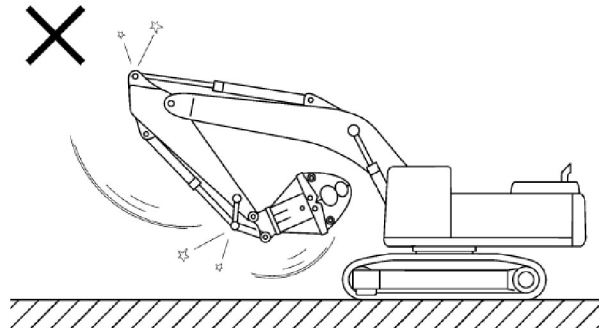


Illustration 309

g02688786

Crushers could interfere with the boom and the cab depending on the type and method of usage. Know the working range of the crusher being used.

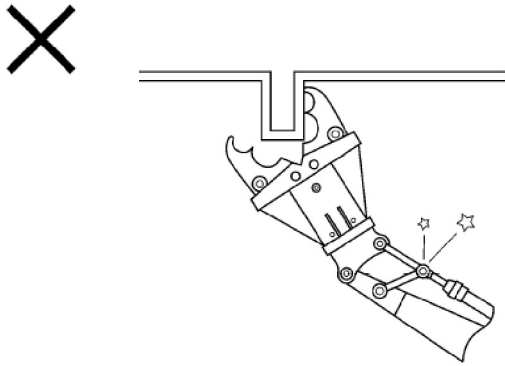


Illustration 310 g02688790

If the tooth of the crusher engages an object at a slant, excessive forces could be applied to the front regions. As such move the crusher to the front.

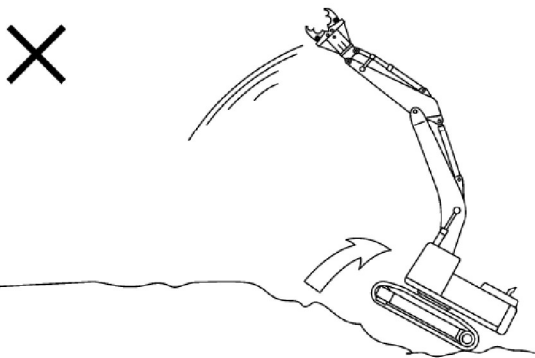


Illustration 311 g02688792

Never extend the boom cylinder suddenly. Sudden extension of the boom could cause tip backwards.

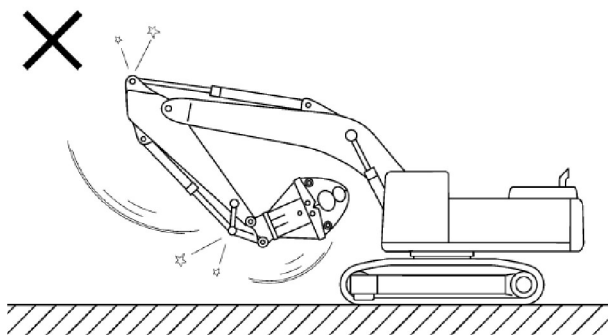


Illustration 312 g02688786

Sudden extension of the bucket cylinder, or sudden extension of the stick cylinder could cause damages at the stroke end position, resulting in personal injury. Operations that cause sudden extension of the cylinders is PROHIBITED!

Parking

i01871055

Stopping the Machine

i04176310

SMCS Code: 7000

WARNING

Leaving the machine unattended when the engine is running may result in personal injury or death. Before leaving the machine operator station, neutralize the travel controls, lower the work tools to the ground and deactivate all work tools, and place the lever for the hydraulic lockout control in the LOCKED position.

Note: There may be regulations that define the requirements for the operator and/or support personnel to be present when the engine is running.

Park on a level surface. If the machine must be parked on a grade, chock the tracks securely.

Note: The swing parking brake is automatically applied when the machine is stopped. The swing parking brake is released when the engine is running and the joystick is activated.

1. Turn the engine speed dial counterclockwise in order to reduce engine speed.

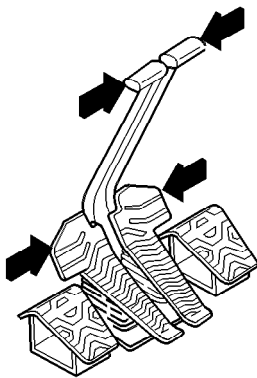


Illustration 313

g00560313

2. Release the travel levers/pedals in order to stop the machine.
3. Lower the work tool to the ground. Apply a slight downward pressure.
4. Move the hydraulic lockout control to the LOCKED position.

Freezing Conditions

SMCS Code: 7000

If freezing temperatures are expected, remove the mud and the dirt from each track roller frame. Park the machine on wood planks. Use the following procedure to clean each track roller frame.

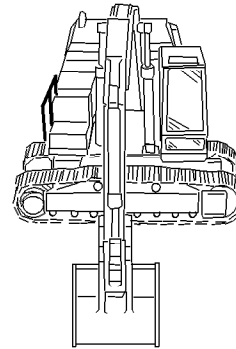


Illustration 314

g00101644

1. Position the boom over one side of the machine.
2. Use boom down pressure in order to lift the track on one side off the ground. Operate the track in the forward direction. Then operate the track in reverse. Continue this procedure until the maximum amount of material is thrown off the track.
3. Lower the track onto the wood planks.
4. Repeat the procedure for the other track.
5. Clean the area around the carrier rollers and around the track rollers.
6. Lower the work tool onto a wood plank in order to prevent the work tool from touching the ground.

i05835986

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 engine components.

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

NOTICE

Never turn the battery disconnect switch to the OFF position while the engine is running. Serious damage to the electrical system may result.

1. Park the machine on level ground. Refer to Operation and Maintenance Manual, "Stopping the Machine" for the recommended procedure.
2. While the machine is stopped, run the engine for 5 minutes at low idle. Idling the engine allows hot areas of the engine to cool gradually.
3. Turn the engine start switch to the OFF position and remove the key.

Note: If the "Regen Active" indicator is illuminated, do not shut off the engine. Refer to Operation and Maintenance Manual, "Monitoring System" for more information on indicators.

Engine Stop Control

Turn the engine start switch to the OFF position. If the engine does not stop, perform the following procedure.

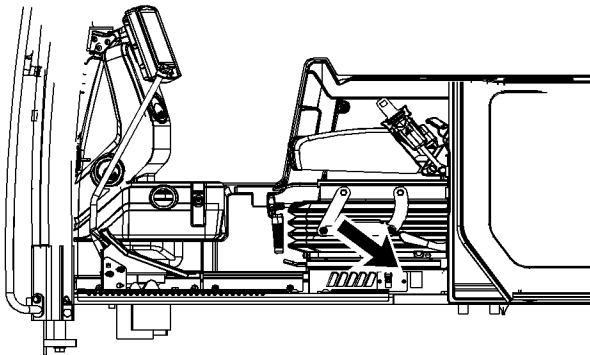


Illustration 315

g02038995

1. The switch is located below the left side of the operator seat.

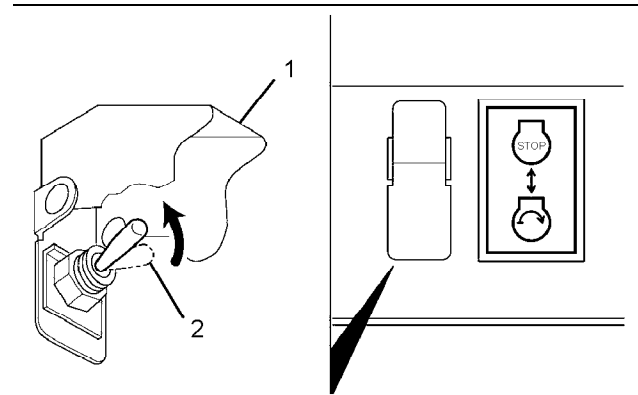


Illustration 316

g01048511

2. Lift cover (1).
3. Push switch (2) upward. This should stop the engine.

Note: Use the engine start switch to stop the engine first. Use the engine stop control as an alternate method to stop the engine.

4. Return the switch to the original position. The engine will be enabled to start.

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

5. Use the method that follows if the previous steps do not stop the engine.

Stop the Engine if an Electrical Malfunction Occurs

Turn the engine start switch to the OFF position. If the engine does not stop, perform the following procedure.

Operation Section Leaving the Machine

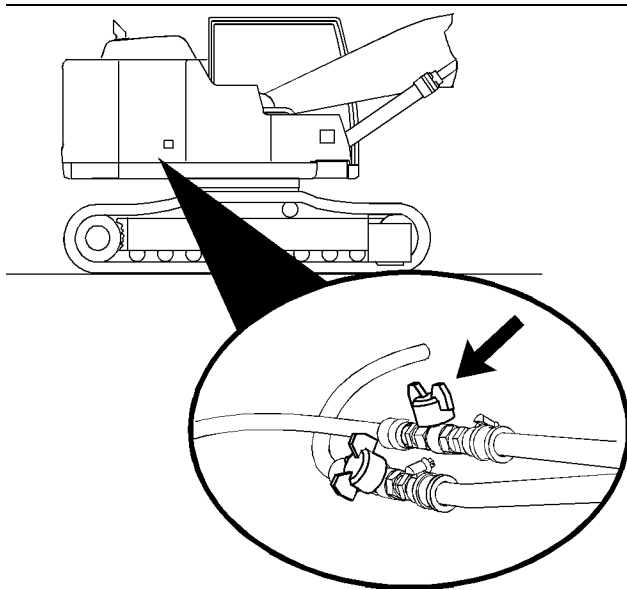


Illustration 317

g02457718

The fuel shutoff valve is located behind the right access door.

Shut off the fuel supply by turning the fuel shutoff valve clockwise. The engine will stop after consuming the fuel in the fuel line. The engine may continue to run for a few minutes.

Repair the engine before you restart the engine. The fuel system may need to be primed. See Operation and Maintenance Manual, "Fuel System - Prime" for instructions.

i06299353

Leaving the Machine

SMCS Code: 7000

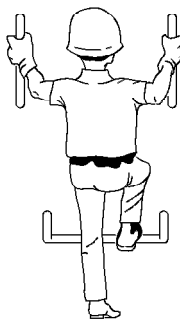


Illustration 318

g00037860

1. Use the steps and the hand holds when you dismount. When you dismount, face the machine and use both hands.

2. Inspect the engine compartment for debris. Clean out any debris in order to avoid a fire hazard.
3. Remove all flammable debris from the front bottom guard through the access doors in order to reduce a fire hazard. Discard the 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. Lock all compartments and all vandalism covers (if equipped).

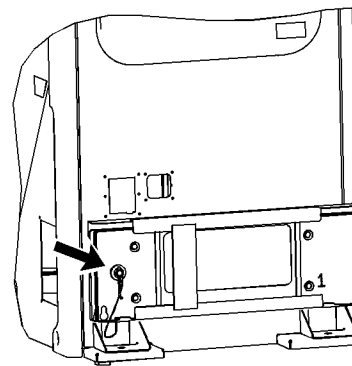


Illustration 319

g02038843

7. Remove the bolt that holds the vandalism guards in place. Remove the vandalism guards from the storage area.

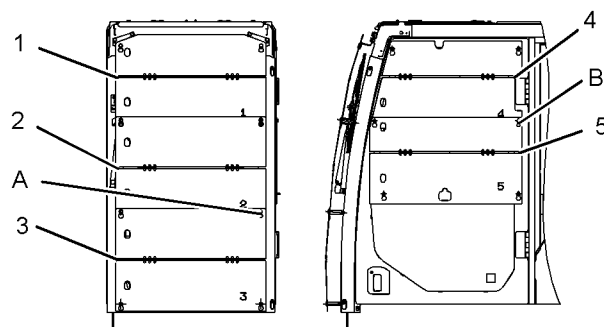


Illustration 320

g02148267

8. Install the vandalism guards on the front window and on the cab door. An identification number is stamped on each of the vandalism guards. Install the vandalism guards in the correct sequence. Use bolts (A) only for vandalism guard (3) and for vandalism guard (5).

Note: When you are storing the vandalism guards, make sure that you place the guards in the storage area in sequential order. The vandalism guards will only fit in the storage area in this manner.

i07735116

Machine Storage and Specified Storage Period

SMCS Code: 7000

Machine Storage

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

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

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

Specified Storage Period

The specified storage period of this machine is 1 year.

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

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

Transportation Information

i08036521

Shipping the Machine

SMCS Code: 7000; 7500

WARNING

Automatic Engine Speed Control (AEC) will increase engine speed automatically when you operate the control levers and/or travel pedals with AEC switch on.

When loading and unloading the machine from the truck or working in close quarters always turn AEC switch off to prevent any possibility of sudden movement of machine, which could result in serious injury or death.

Set the travel speed control switch to LOW before loading the machine. Never operate this switch when loading the machine on a trailer.

Investigate the travel route for overpass clearances. Make sure that there will be adequate clearance for the machine.

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

Note: Obey all laws that govern the characteristics of a load (height, weight, width, and length). Observe all regulations that govern wide loads. Certain regions may require the removal of door hooks and cab bumpers, if equipped. Consult all local and regional regulations

Choose the flattest ground when you load the machine or when you unload the machine.

1. Before you load the machine, chock the trailer wheels or the rail car wheels.
2. When you use loading ramps, make sure that the loading ramps have adequate length, adequate width, adequate strength, and an adequate slope.
3. Maintain the slope of the loading ramps within 15 degrees of the ground.
4. Position the machine so that the machine can drive straight up the loading ramps. The final drives should be toward the rear of the machine. Do not operate the control levers while the machine is on the loading ramps.
5. When you drive over the loading ramp joint areas, maintain the balance point of the machine.

6. Lower the work tool to the bed or to the floor of the transport machine.
7. To prevent rolling of the machine or sudden movement of the machine, perform the following items:
 - Chock both tracks.
 - Install sufficient tie-downs at several locations.
 - Fasten wire cables.
8. If equipped, remove door hooks, cab bumpers, and fuel tank step as necessary. Refer to local regulations.

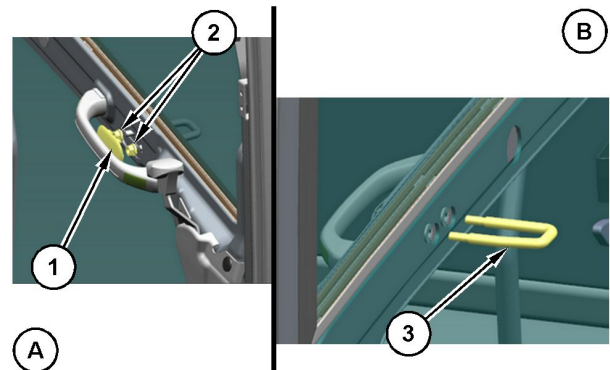


Illustration 321

g06516462

- (1) Cover
(2) Nuts
(3) Door Hook
(A) Inside
(B) Outside

- a. Remove cover (1) and nuts (2) to remove door hook (3).

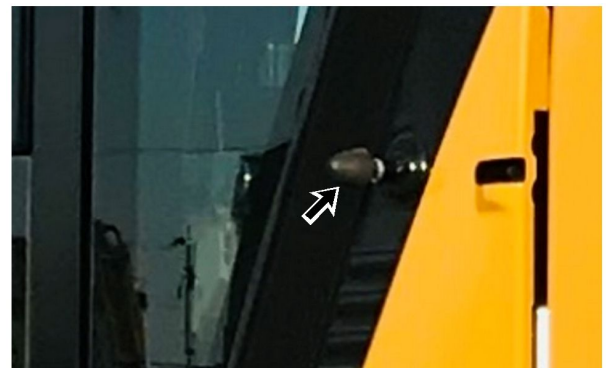


Illustration 322

g06516469

- b. Remove any bumpers on your cab.

NOTICE

Do not allow the chrome surface of the bucket cylinder rod to touch any part of the trailer. Damage to the rod can occur from impact with the trailer during transport.

Note: Refer to Operation and Maintenance Manual, "Specifications".

Shipping a Machine that is not Completely Assembled

If the machine must be shipped when the boom, stick, or counterweight is not assembled on the machine, follow the instructions in Operation and Maintenance Manual, "Operation".

WARNING

The ROPS structural certification depends on the support of the boom, stick, and counterweight in the event of a machine tip over or a machine rollover incident.

When the machine needs to be moved without the boom, stick, or counterweight being installed, avoid any machine operations which could affect machine stability as a machine tip over or a machine rollover incident could result in serious injury or death.

The machine should be operated slowly on flat, stable ground or pavement by qualified operators.

i06662090

Securing the Machine

SMCS Code: 7000

Comply with any laws that govern the characteristics of a load (length, width, height, and weight).

1. Move the hydraulic lockout control to the LOCKED position.
2. Turn the engine start switch to the OFF position in order to stop the engine. Remove the engine start switch key.
3. Turn the battery disconnect switch to OFF and remove the disconnect switch key.
4. Remove the ether starting aid cylinder. See Operation and Maintenance Manual, "Ether Starting Aid Cylinder - Replace" for the removal procedure.
5. Lock the door and the access covers. Attach any vandalism protection.

6. The Product Link antenna (if equipped) may be repositioned in order to meet the regulations regarding height of some locations. The Product Link antenna is located on top of the cab. Perform the following procedure in order to move the Product Link antenna to the transport position.

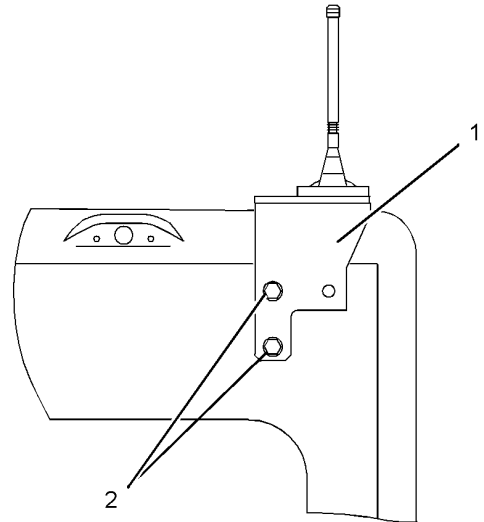


Illustration 323

g02263573

Bracket in normal operating position.

- a. Remove bolts (2) from bracket (1).

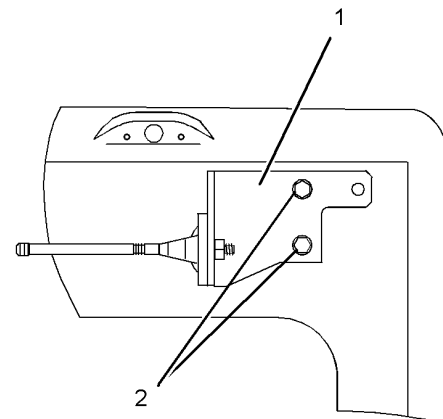


Illustration 324

g02270173

Bracket in position for transport

- b. Reinstall bracket (1) with bolts (2) located in the top two holes of the bracket. Refer to Illustration 324.

Operation Section
Securing the Machine

Note: The bracket for the Product Link antenna must be placed back into the normal operating position before the machine can be placed back into service.

7. The side view camera is located on top of the fuel tank and it must be repositioned for transport. Perform the following procedure in order to move the camera to the transport position.

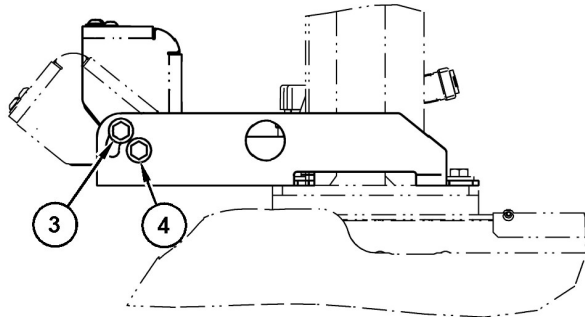


Illustration 325 g06053297

Side view camera in position for transport

- a. Loosen bolts (3) and (4) and slide the camera upward to the transport position.
- b. Tighten bolts (3) and (4).

Note: The side view camera must be placed back into the normal operating position before the machine can be placed back into service.

8. Cover the exhaust opening.

NOTICE

Do not allow the turbocharger to rotate while the engine is not operating. Damage to the turbocharger can result.

Note: Before you remove the excavator from the transport machine, remove the protective covering from the exhaust opening.

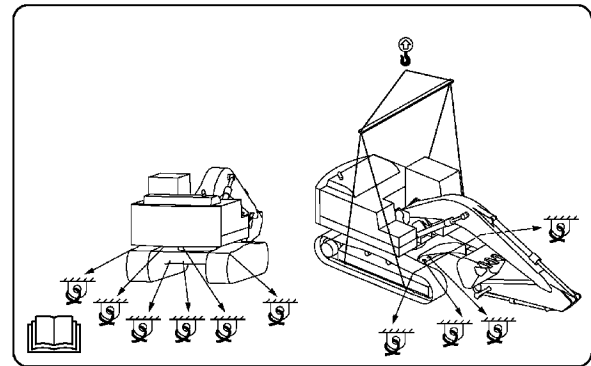


Illustration 326

g02444887

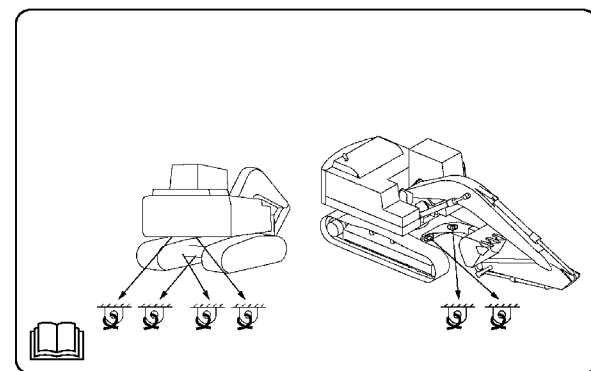


Illustration 327

g02104975

9. Chock the tracks and secure the machine with tie-downs. Make sure that you use the proper rated wire cable.

Use the front towing eyes on the lower frame, the rear towing eyes on the lower frame, and the rear towing eye that is on the upper frame.

Securely fasten all loose parts and all removed parts to the trailer or to the rail car.

When the engine is stopped, the swing parking brake is automatically applied. This prevents the upper structure from swinging.

NOTICE

In freezing weather, protect the cooling system with antifreeze, to the lowest outside expected temperature on the travel route. Or, drain the cooling system completely.

i06546704

Mirror Installation

SMCS Code: 7319

Make sure that the right side mirrors are in the correct position before you operate the machine or transport the machine.

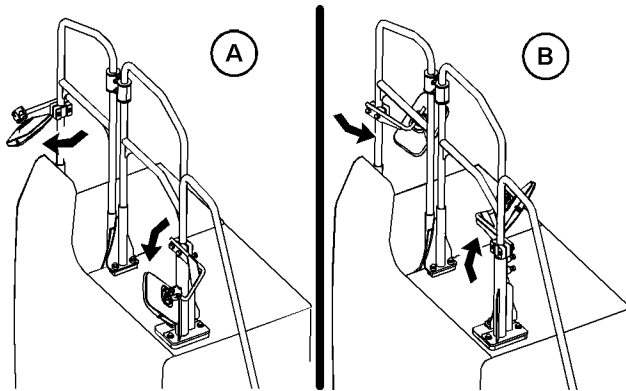


Illustration 328

g02841858

Typical example is shown

- (A) Operating position
(B) Transport position

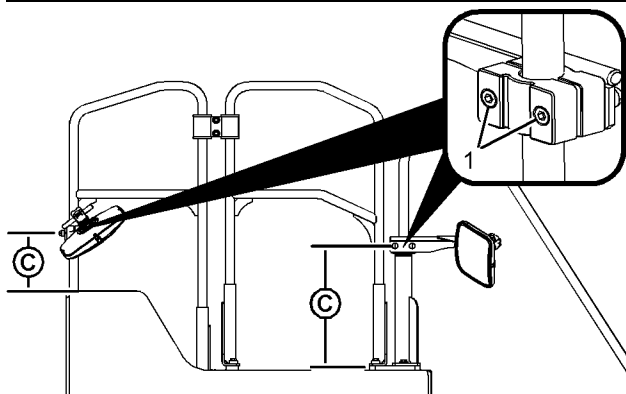


Illustration 329

g02842316

Typical example is shown

- (1) Bolts
(C) Mirror height

Transport Position

In order to transport the machine, move the right side mirrors to transport position (B).

1. Loosen bolts (1) on the mirror support bracket and move the mirror to the transport position

2. Tighten bolts (1) on the mirror support bracket to a torque of $60 \pm 12 \text{ N}\cdot\text{m}$ ($44 \pm 9 \text{ lb ft}$).

Operating Position

In order to operate the machine, move the right side mirrors to operating position (A).

1. Loosen bolts (1) on the mirror support bracket and return the mirrors to the operating position.
2. Adjust the mirrors to the correct mirror height (C) and tighten bolts (1) on the mirror support bracket to a torque of $60 \pm 12 \text{ N}\cdot\text{m}$ ($44 \pm 9 \text{ lb ft}$).

Note: The dimensions for correct mirror height (C) are listed in the table below:

Table 43

Model	Mirror Height (C)	
	Front Mirror Height	Rear Mirror Height
320 (E-F) 323 (E-F) 324 (E) 326 (F) 329 (E) 330 (F) 335 (F) 336 (E-F)	$454 \pm 3 \text{ mm}$ ($17.9 \pm 0.1 \text{ inch}$)	$589 \pm 3 \text{ mm}$ ($23.2 \pm 0.1 \text{ inch}$)
349 (E-F)	$1564 \pm 3 \text{ mm}$ ($61.6 \pm 0.1 \text{ inch}$)	NA

i07782781

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.

Operation Section
Lifting and Tying Down the Machine

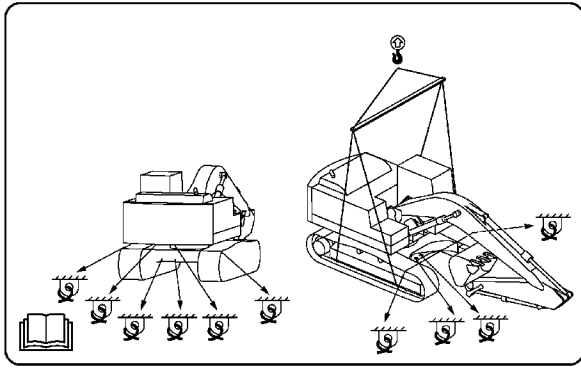


Illustration 330

g02444887

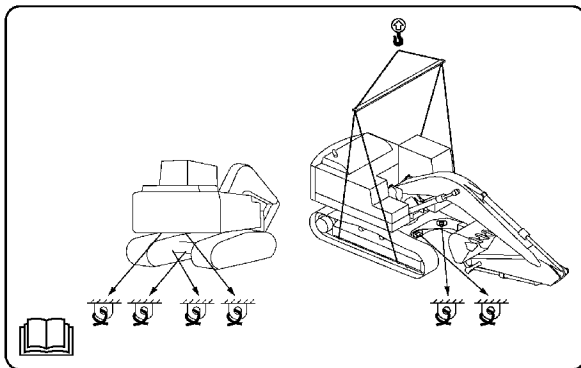


Illustration 331

g02097575

The lift and tie down film is located near the base of the boom.

Lifting the machine

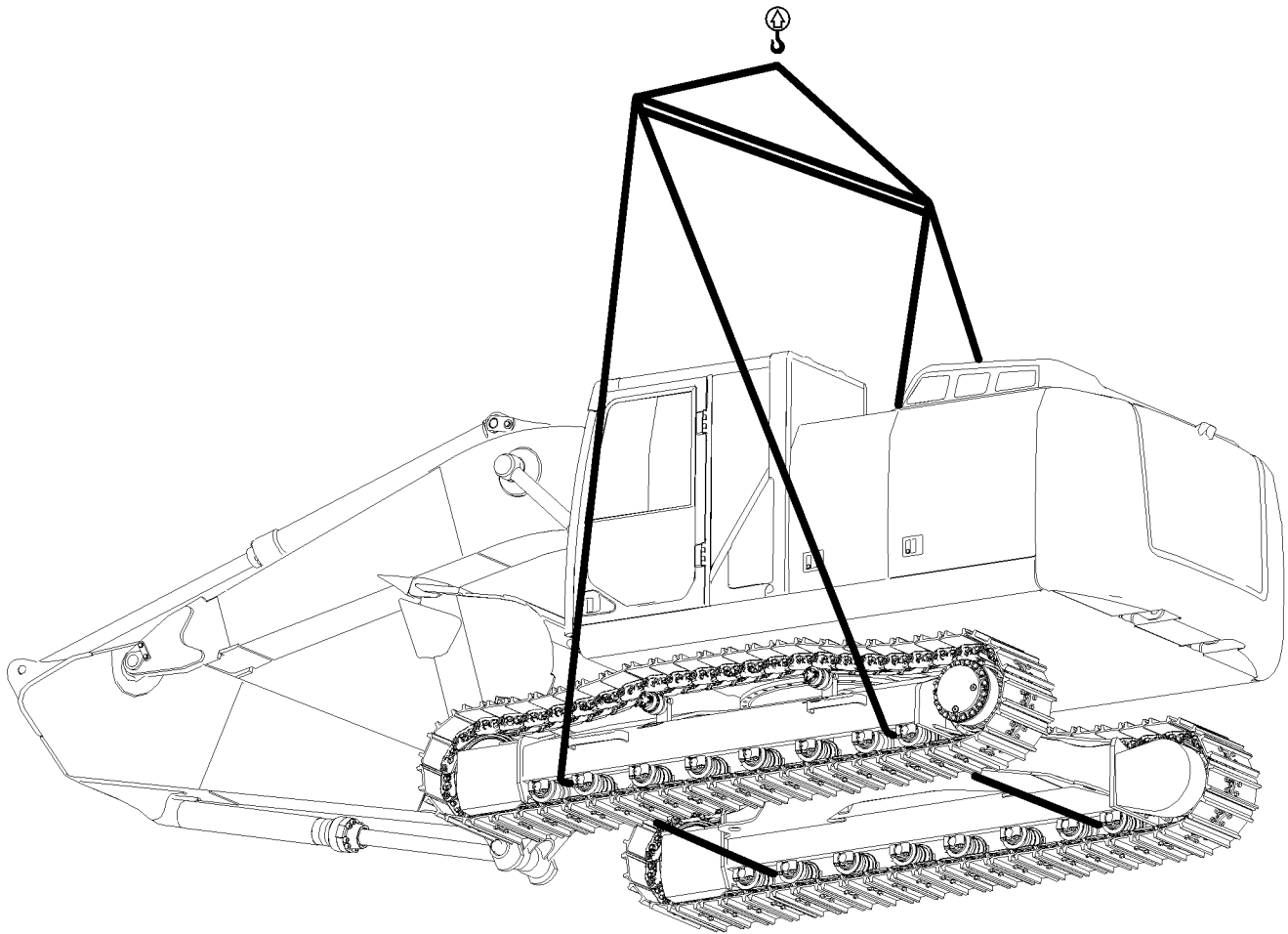


Illustration 332

g02793463

The machine center of gravity is at the center of the swing gear.



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

The weight and the instructions that are given herein describe the machine as the machine is manufactured by Caterpillar.

Refer to the Operation and Maintenance, “Specifications” for specific weight information.

Note: Only lift objects from approved lifting points and with approved lifting devices

1. Use proper rated cables and slings for lifting. The crane should be positioned so that the machine is lifted parallel to the ground.
2. To prevent contact with the machine, lifting cables should have sufficient length.

3. Move the hydraulic lockout control to the LOCKED position.
4. Thread the cable between the first and second rollers at each end of the track.
5. Do not use the foot step as a lifting point.
6. If the full length roller guard is equipped, remove the guard.
7. Apply the proper protector to prevent machine/wire damage and slippage. Make sure that the rollers are not affected by the load.

Tying Down the Machine

There are two methods that can be used to tie down a machine. Local and/or regional regulations will determine which method to use.

Note: Obey all local and regional governmental regulations.

Frictional and Direct Lashing

When allowed, a combination of frictional lashing and direct lashing is the preferred method to tie down a machine.

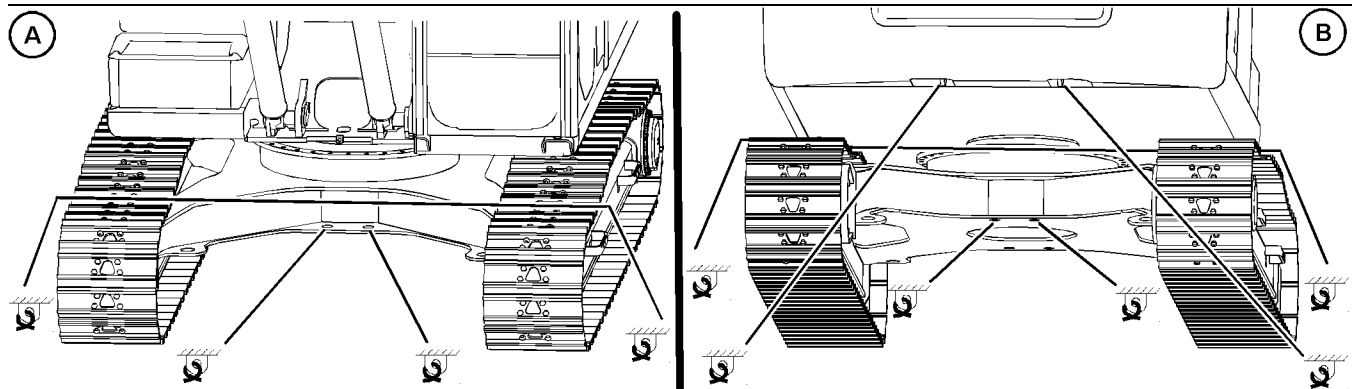


Illustration 333

g02793465

(A) Front of the machine

(B) Rear of the machine

Diagonal Lashing

In areas where frictional lashing is not allowed, diagonal lashing can be used as shown below.

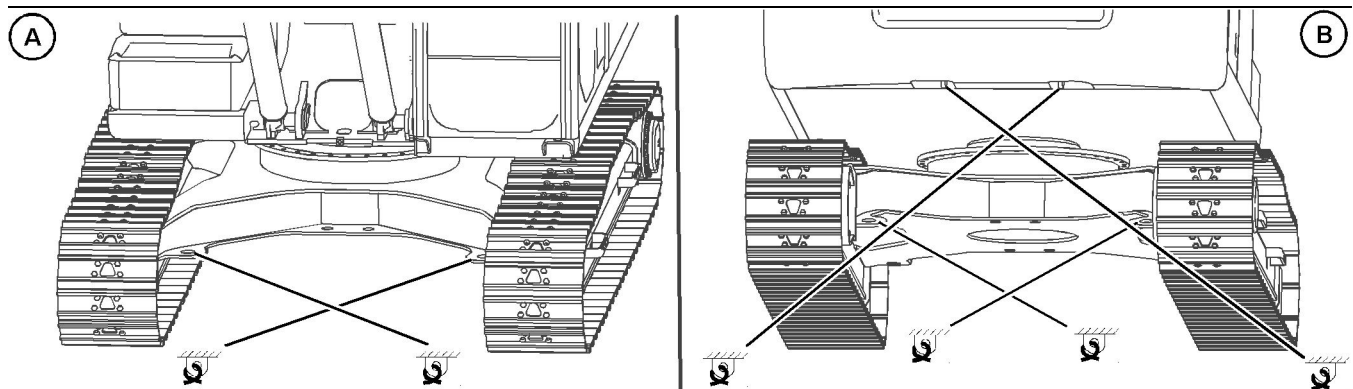


Illustration 334

g06434381

(A) Front of the machine

(B) Rear of the machine

Tying Down the Machine



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

The weight and the instructions that are given herein describe the machine as the machine is manufactured by Caterpillar.

Refer to the Operation and Maintenance, “Specifications” for specific weight information.

1. Use proper rated cables and shackles for tying down the machine.
2. Use the rear eyes and the front eyes that are provided on the lower frame to fasten tie-downs. Use corner protectors for sharp corners.
3. Move the hydraulic lockout control to the LOCKED position.

4. If there is a requirement of diagonal lashing for tying down, use the proper tie-down point on the lower frame. Set the lashing angle which is on the longitudinal axis of the machine and the cable, at 30 to 50 degrees.

Lifting the Machine Segments

Bucket

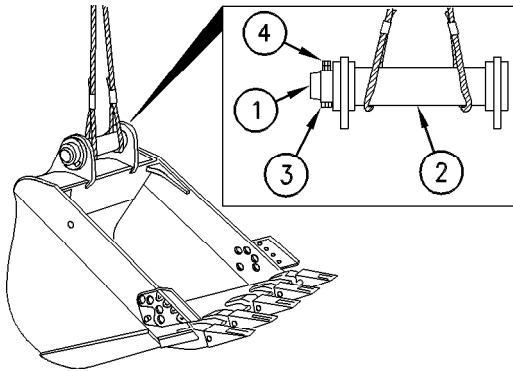


Illustration 335

g00115251

(1) Pin. (2) Sleeve. (3) Bolts. (4) Nuts.

Install pin (1) and install sleeve (2) in the brackets of the bucket. The previous illustration indicates the method to secure pin (1) with bolts (3) and nuts (4). Fasten two proper rated wire cables to pin (1).

Towing Information

i05034392

Towing the Machine

SMCS Code: 7000

WARNING

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

Block the machine to prevent movement before final drives are disengaged. The machine can roll free if it is not blocked. With final drives disengaged, the machine cannot be stopped or steered.

Follow the recommendations below, to properly perform the towing procedure.

Relieve the hydraulic tank and line pressure before any disassembly.

Even after the machine has been turned off, the hydraulic oil can still be hot enough to burn. Allow the hydraulic oil to cool before draining.

NOTICE

To tow the machine, both final drives must be disengaged.

Do not operate the travel motors with the final drives disengaged. Damage could result.

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

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

Do not allow an operator to be on the machine that is being towed.

Before you tow the machine, make sure that the tow line or the tow bar is in good condition. Do not use a wire rope that is kinked, twisted, or damaged. Make sure that the tow line or the tow bar has enough strength for the towing procedure that is involved. The strength of the tow line or of the tow bar should be at least 150 percent of the gross weight of the towed machine. This requirement is for a disabled machine that is stuck in the mud and for being towed on a grade.

Do not use a chain for pulling a disabled machine. A chain link can break. This may cause personal injury. Use a wire rope with ends that have loops or rings. Put an observer in a safe position in order to watch the pulling procedure. The observer can stop the procedure if the wire rope starts to break. Stop pulling whenever the towing machine moves without moving the towed machine.

During towing, do not allow anyone to step between the towing and the towed machines.

Do not allow the wire rope to be straddled while the machine is being towed.

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

Avoid towing the machine on a slope.

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

Prior to releasing the brake of the final drive, firmly lock both tracks in order to prevent the machine from moving suddenly. When the machine is ready to be towed, release the brake of the final drive. Refer to Operation and Maintenance Manual, "Final Drive Ring Gear Removal".

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

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

All situation requirements cannot be listed. Minimal towing machine capacity is required on smooth, level surfaces. Maximum towing machine capacity is required on an incline or on a surface that is in poor condition.

Do not tow a loaded machine.

Consult your Cat dealer for the equipment that is necessary for towing a disabled machine.

Retrieval and Towing of Machine

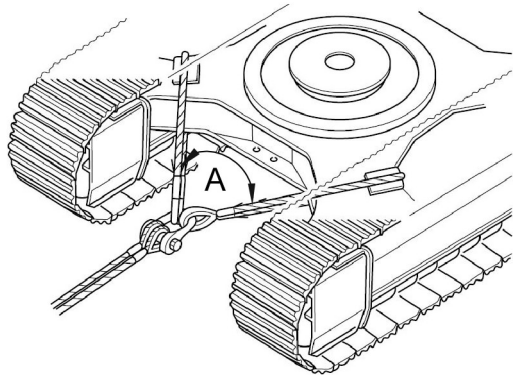


Illustration 336

g02533437

Note: Shackles must be used for towing the machine. The wire rope should be horizontal and straight to the track frame.

Install a properly rated wire rope to the lower frame of the towing machine and the lower frame of the towed machine. The permissible force for the lower frame is 100 percent of the gross weight of the towed machine.

Note: In order to prevent damage to the wire rope or the lower frame of the machines, use protective sleeves on the corners of the lower frame.

Retrieve the disabled machine carefully. The applied load for each wire rope should be equal. The angle (A) between each wire rope should be 60 degree maximum. Operate the machine at a low speed.

Lightweight Towing

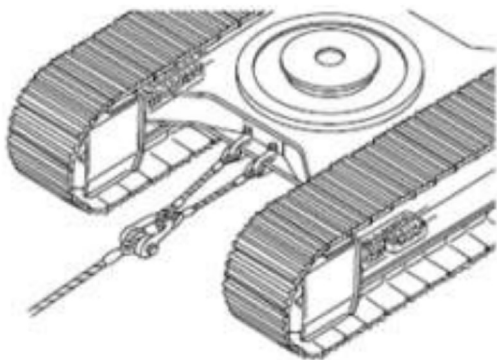


Illustration 337

g03204763

The maximum load for lightweight towing is 102900 N·m (75895 lb ft).

Shackles must be used for towing the machine. The wire rope should be horizontal and straight to the track frame.

Install a properly rated wire rope to the lower frame of the towing machine and the lower frame of the towed machine. Operate the machine at a low speed.

i06139738

Final Drive Ring Gear Removal

SMCS Code: 4050

WARNING

Without the ring gear in place, the brakes are ineffective. Personal injury or death could result. Provide other means to hold or stop the machine.

Table 44

Suggested Tools			
Item	Part Number	Description	Qty
A	128 - 5049	Guide Stud	2
B	1P - 0074	Slide Hammer Puller Gp	1
	4C - 5655	Adapter	1

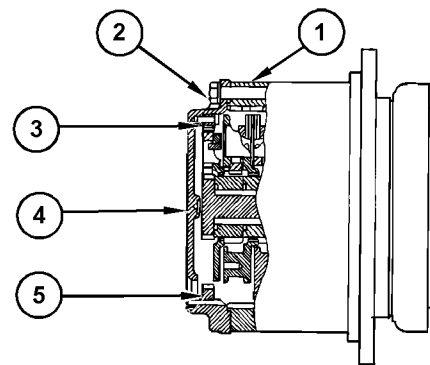


Illustration 338

g03822829

- (1) Ring gear
- (2) Cover bolts
- (3) Bolts
- (4) Final drive cover
- (5) Ring gear

1. Thoroughly clean the area around the final drive. Make sure that you also clean the track shoes that are positioned above the final drive.

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

Operation Section
Final Drive Ring Gear Removal

2. Drain the final drive oil into a suitable container. See Operation and Maintenance Manual, "Final Drive Oil - Change" for the procedure.
3. Remove one track shoe in order to allow access to the face between final drive cover (4) and ring gear (1).

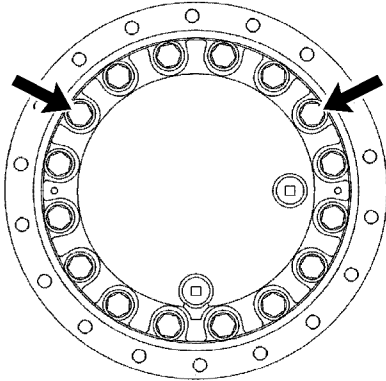


Illustration 339

g01846274

4. Remove two bolts (2). Attach Items (A). This is necessary in order to support ring gear (1) while you remove the final drive cover.

Note: If Item (A) is unavailable, you may use alignment dowels. Make sure that the alignment dowels are able to support the ring gear (1) while you remove the final drive cover.

5. Remove the remaining bolts (2) from the final drive cover.

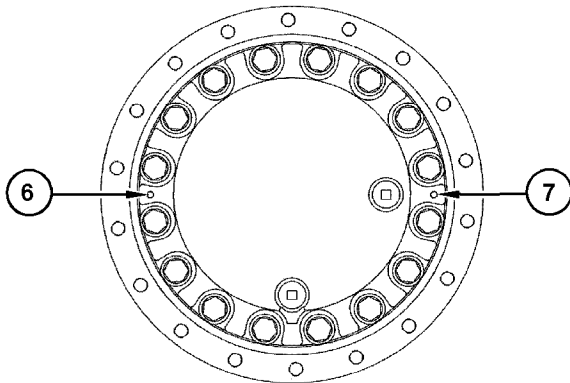


Illustration 340

g03822834

6. Install Item (B) into the final drive cover (1) at location (6) or (7). Use Item (B) in order to separate final drive cover (4) and ring gear (1). Make sure that ring gear (1) stays in place.

Note: If Item (B) is unavailable, you may use a hammer and a wedge in order to separate the final drive cover and the ring gear.

7. Remove twelve bolts (3) and ring gear (5) from final drive cover (4).
8. Apply Gasket Sealant to the mating surface of cover (4) and the housing.
9. Install final drive cover (4) and all cover bolts (2).
10. Fill the final drive with new oil. See Operation and Maintenance Manual, "Final Drive Oil - Change" for the procedure.
11. Repeat this procedure for the other final drive.
12. Refer to the Service Manual for information on the installation of the final drive ring gear.

Engine Starting (Alternate Methods)

i05974849

Engine Starting with Jump Start Cables (If Equipped)

SMCS Code: 1000; 7000

WARNING

Failure to properly service the batteries may cause personal injury.

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

Do not smoke when checking battery electrolyte levels.

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

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

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

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

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

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

NOTICE

To prevent damage to engine bearings and to electrical circuits when you jump-start a machine, do not allow the stalled machine to touch the machine that is used as the electrical source.

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

Use only equal voltage for starting. Check the battery and starter voltage rating of your machine. Use only the same voltage for jump starting. Use of a welder or higher voltage will damage the electrical system.

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.

Refer to Special Instruction, SEHS7633, "Battery Test Procedure" for complete testing and charging information. This publication is available from your Cat dealer.

When the auxiliary start receptacles are not available, use the following procedure.

1. Lower the equipment to the ground. Move all controls to the HOLD position. Move the hydraulic lockout control to the LOCKED position.
2. Turn the start switch on the stalled machine to the OFF position. Turn off all accessories.
3. Turn the battery disconnect switch on the stalled machine to the ON position.
4. Move the machine that is being used as an electrical source near the stalled machine so that the jump-start cables reach the stalled machine.
Do not allow the machines to contact each other.
5. Stop the engine of the machine that is being used as an electrical source. If you are using an auxiliary power source, turn off the charging system.
6. Ensure that battery caps on both machines are tight and correctly placed. Ensure that batteries in the stalled machine are not frozen. Make sure that the batteries have enough electrolyte.

Note: The positive terminal of the 24 V system of the source and the negative terminal of the 24 V system of the source must be identified correctly before the jumper cables are connected. The positive terminal of the 24 V system of the discharged battery must be identified correctly before the jumper cables are connected.

Operation Section

Engine Starting with Auxiliary Start Receptacle

7. The positive ends of the jump-start cable are red. Connect one positive end of the jump-start cable to the positive cable terminal of the discharged battery. Some machines have battery sets.

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

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

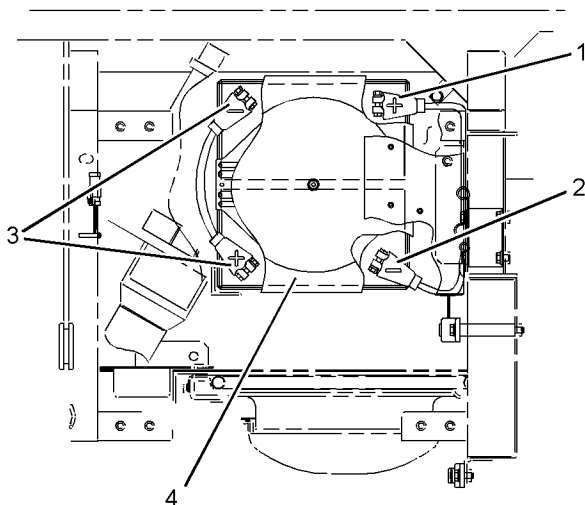


Illustration 341

g01226420

Typical example of the location of the batteries in an excavator

- (1) Red positive post to starter
 - (2) The black negative post connects to the battery disconnect switch.
 - (3) Do not use these two connections for jump starting. The red positive post is connected in series to the black negative post.
 - (4) Cover
8. Connect the other positive end of the jump-start cable to the positive cable terminal of the electrical source.
 9. Connect one negative end of the jump-start cable to the negative cable terminal of the electrical source.
 10. Finally, connect the other negative end of the jump-start cable to the frame of the stalled machine. Do not connect the jump-start cable to the battery post. Do not allow the jump-start cables to contact the battery cables, the fuel lines, the hydraulic lines, or any moving parts.

11. Start the engine of the machine that is being used as an electrical source or energize the charging system on the auxiliary power source.
12. Wait at least two minutes before you attempt to start the stalled machine. This will allow the batteries in the stalled machine to partially charge.
13. Attempt to start the stalled engine. See Operation and Maintenance Manual, "Engine Starting" for the correct starting procedure.
14. Immediately after you start the stalled engine, disconnect the jump-start cables in reverse order.

i05317649

Engine Starting with Auxiliary Start Receptacle (If Equipped)

SMCS Code: 1000; 7000

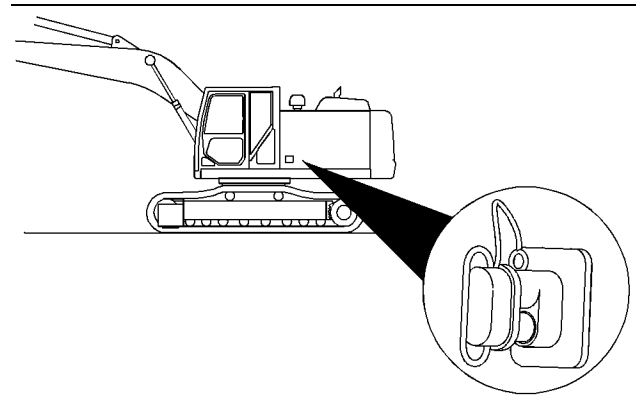


Illustration 342

g02173561

Typical location

Some Caterpillar products may be equipped with an auxiliary start receptacle as a standard part. If your machine is not equipped with an auxiliary start receptacle, the machine can be equipped with an auxiliary start receptacle from parts service. This will ensure that a permanent receptacle is always available in order to jump-start the machine.

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

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

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

2. Ensure that the travel control levers on the stalled machine are in the CENTER position. Engage the hydraulic lockout control. Engage the parking brake. Lower all work tools to the ground. Move all controls to HOLD.
3. Turn the engine start switch key on the stalled machine to the OFF position. Turn off all accessories.
4. Turn the battery disconnect switch on the stalled machine to ON.
5. Move the machine that is being used as a power source close to the stalled machine. The jump-start cables should reach the batteries on both machines. **DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.**
6. Stop the engine on the machine that is being used as a power source. If you use an auxiliary power source, turn off the charging system.
7. Connect the appropriate jump-start cable to the auxiliary start receptacle on the stalled machine.
8. Connect the other end of the jump-start cable to the auxiliary start receptacle of the machine that is being used as a power source.
9. Start the engine on the machine that is being used as a power source or energize the charging system on the auxiliary power source.
10. Wait for a minimum of 2 minutes while the batteries in the stalled machine partially charge.
11. Attempt to start the stalled engine.
12. Immediately after the stalled engine starts, disconnect the jump-start cable from the power source.
13. Disconnect the other end of the jump-start cable from the stalled machine.
14. Conclude the failure analysis on the starting charging system of the stalled machine, as required. Check the machine while the engine is running and the charging system is in operation.

Maintenance Section

Maintenance Access

i06970253

Access Door and Cover Locations

SMCS Code: 726A-CH

Engine Hood

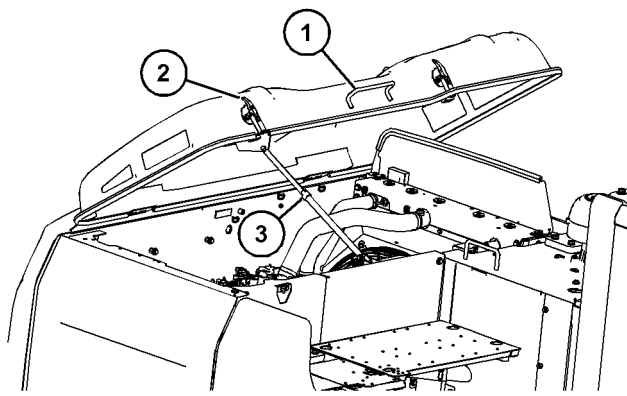


Illustration 343

g06182683

- (1) Handle
- (2) Latch
- (3) Gas spring

1. Unlatch the engine hood.
2. Fully open the engine hood. Gas spring (3) will lock in place to hold the engine hood open.

⚠ WARNING

Operation of the Push Button Release for the Engine Hood

When closing the engine hood, only operate the push-button release by hand.

Failure to remove hands from the push-button release before closing the engine hood could result in personal injury.

Be sure to remove hands from the push-button release before completely closing the engine hood.

NOTICE

Do not add pressure to the engine hood when open.

⚠ WARNING

When closing the engine hood, Do Not operate the push-button release by foot.

Operation of the push-button release by foot could result in damage to the gas spring of the closing mechanism and/or personal injury.

Only operate the push-button release for closing the engine hood by hand.

3. To close the engine hood, support the engine hood. Press the push-button release to unlock gas spring (3). Release the push button and slowly close the engine hood.

4. Latch the engine hood.

Left side

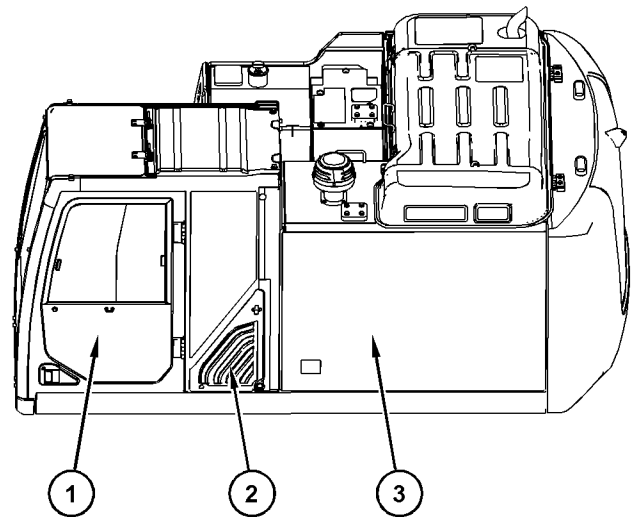


Illustration 344

g03731466

Typical example of the left side of the machine

- (1) Cab Door
- (2) Cab Air Filter Access Door

(3) Left Access Door

Right Side

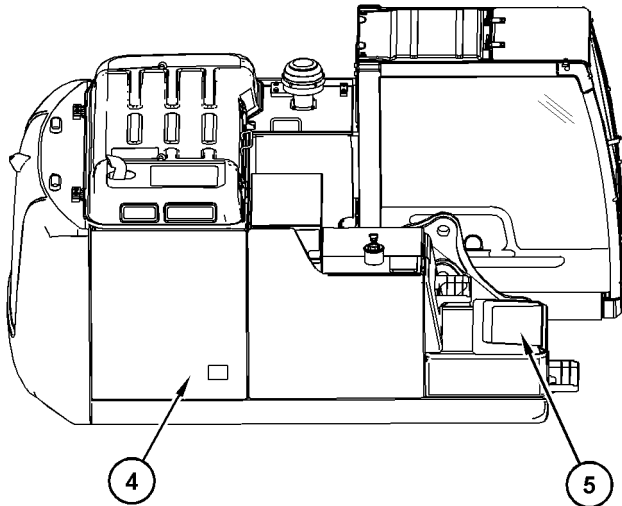


Illustration 345

g06205029

Typical example of the right side of the machine

(4) Right Access Door

(5) Storage Box for DEF Tank and Fuel Transfer
Pump (if equipped)

Lubricant Viscosities and Refill Capacities

i07419350

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 7581

General Information for Lubricants

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

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

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

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Measure the temperature when the machine is started and while the machine is operated. To determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the "Lubricant Viscosities for Ambient Temperatures" tables, use the highest oil viscosity that is allowed for the ambient temperature.

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

NOTICE

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

Engine Oil

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

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

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

Typical aftertreatment systems may include the following:

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

Other systems may apply.

Oils that are per API CI-4 or prior categories are not allowed. These oils have high ash and are not appropriate for use in engines with aftertreatment devices.

Table 45

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	SAE 10W-30	-18	40	0	104
		SAE 15W-40	-10	50	14	122
Pump Coupling (If Equipped)	Cat DEO-ULS	SAE 10W-30	-18	40	0	104

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 20 SAE 20W
- Cat HYDO Advanced 30 SAE 30
- Cat BIO HYDO Advanced, Multigrade

Cat HYDO Advanced oils allow 6000 hours or higher oil drain intervals for most applications. S·O·S Services oil analysis is recommended when the oil drain interval is increased to 6000 hours or higher. In comparison, non-Cat commercial hydraulic oils (second choice oils) allow 2000 hours oil drain interval. It is recommended to 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. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

Second choice oils are listed below.

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

Note: Oil drain intervals of the oils listed above are less than those of Cat HYDO Advanced oils. The oil drain interval of these oils is typically 2000 hours and up to a maximum of 4000 hours. An exception is Cat TDTO Cold Weather oil which allows 6000 hours or higher oil drain interval. S·O·S Services oil analysis is required when the oils listed above are used in Cat hydraulic system components and hydrostatic transmissions.

Table 46

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 Cat TDTO	SAE 10W	-20	40	-4	104
	Cat HYDO Advanced 20 Cat TDTO	SAE 20W	-5	45	23	113
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	10	50	50	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	50	-22	122
	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

For applications requiring the use of fire-resistant hydraulic fluids, Caterpillar recommends the use of EcoSafe FR-46. This product is a fully synthetic, non-aqueous hydraulic fluid. Water based and glycol-based hydraulic products are not recommended for use in Cat machine hydraulic systems. EcoSafe FR-46 is an ISO 46 multi-grade product. For more information refer to the product information provided by the manufacturer of EcoSafe hydraulic oil. Refer to your Cat dealer for availability.

Other Fluid Applications

Table 47

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosity Grade	°C		°F	
			Min	Max	Min	Max
Final Drives and Swing Drives	Cat TDTO Cold Weather	SAE 0W-20	-40	0	-40	32
	Cat TDTO	SAE 10W	-30	0	-22	32
		SAE 30 ⁽¹⁾	-30	35	-22	95
		SAE 50	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	-25	25	-13	77
Track Roller Frame Recoil Spring and Pivot Shaft Bearings	Cat TDTO Cold Weather	SAE 0W-20	-40	0	-40	32
	Cat TDTO	SAE 10W	-30	0	-22	32
		SAE 30 ⁽¹⁾	-20	25	-4	77

(continued)

(Table 47, contd)

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosity Grade	°C		°F	
			Min	Max	Min	Max
		SAE 50	0	50	32	122
	Cat TDTO-TMS	Multi-Grade	-25	25	-13	77
Track Idlers and Track Rollers	Cat DEO-ULS Cat DEO	SAE 15W-40 ⁽¹⁾	-10	50	14	122
	Cat DEO Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat DEO-ULS SYN	SAE 5W-40	-35	40	-31	104
	Cat FDAO SYN	Multi-Grade	-30	50	-22	122

⁽¹⁾ Factory fill oil for standard configuration machines.

Special Lubricants

Grease

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

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

Table 48

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
External Lubrication Points	Cat Prime Application Grease	NLGI Grade 2	-20	140	-4	284
	Cat Extreme Application Grease	NLGI Grade 1	-20	140	-4	284
		NLGI Grade 2	-15	140	+5	284
	Cat Extreme Application Grease-Artic	NLGI Grade 0.5	-50	130	-58	266
	Cat Extreme Application Grease-Desert	NLGI Grade 2	-10	140	+14	284
	Cat Utility Grease	NLGI Grade 2	-20	140	-4	284
	Cat Ball Bearing Grease	NLGI Grade 2	-20	160	-4	320

Diesel Fuel Recommendations

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

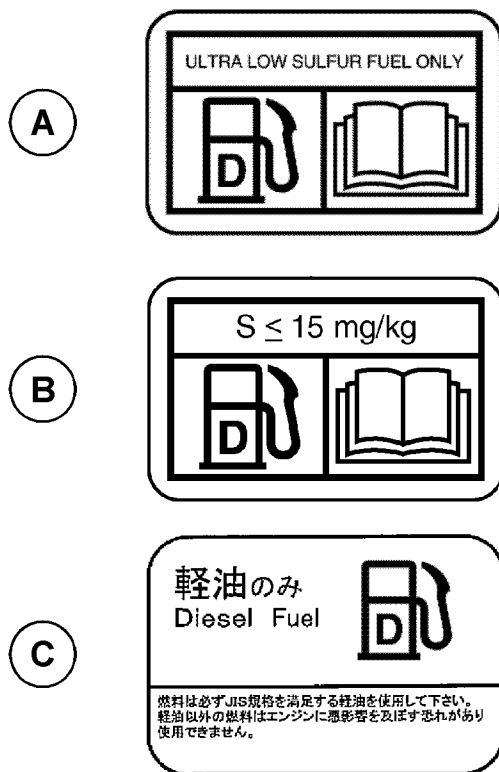


Illustration 346

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- (A) North America film
(B) Europe, Africa, Middle East film
(C) Japan film

NOTICE

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

European ULSD 0.0010 percent (≤ 10 ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European Stage V type-approved nonroad engines. Additionally, the Cetane number should not be less than 45, and the bio-diesel content should not be greater than 20% volume/volume.

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

- Shorten the time interval between aftertreatment device service intervals (cause the need for more frequent service intervals)
 - Adversely impact the performance and life of aftertreatment devices (cause loss of performance)
 - Reduce regeneration intervals of aftertreatment devices
- 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.

Failures that result for the use of improper fuels are not Caterpillar factory defects. Therefore, the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in non-road and machine applications that are not Tier 4/ Stage V certified engines and are not equipped with aftertreatment devices. For Tier 4/Stage V certified engines, always follow operating instructions to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more details about fuels, lubricants, and Tier 4/Stage V requirements. This manual may be found on the web at Safety.Cat.com.

Diesel Exhaust Fluid

General Information

Diesel Exhaust Fluid (DEF) is a liquid that is injected into the exhaust system of engines equipped with Selective Catalytic Reduction (SCR) systems. SCR reduces emissions of nitrogen oxides (NOx) in diesel engine exhaust.

Diesel Exhaust Fluid (DEF) is also known under other names including Aqueous Urea Solution (AUS) 32, AdBlue, or generically referred to as urea.

In engines equipped with SCR emissions reduction system, DEF is injected in controlled amounts into the engine exhaust stream. At the elevated exhaust temperature, urea in DEF is converted to ammonia. The ammonia chemically reacts with NOx in diesel exhaust in the presence of the SCR catalyst. The reaction converts NOx into harmless nitrogen (N₂) and water (H₂O).

DEF Recommendations

For use in Cat engines, DEF must meet all the requirements defined by "ISO 22241-1" Requirements.

Caterpillar recommends the use of DEF available through the Cat parts ordering system for use in Cat engines equipped with SCR systems.

In North America, commercial DEF that is API approved and meets all the requirements defined in "ISO 22241-1" may be used in Cat engines that are equipped with SCR systems.

Outside of North America, commercial DEF that meets all requirements defined in "ISO 22241-1" may be used in Cat engines that are equipped with SCR systems.

The supplier should provide documentation to prove that the DEF is compliant with the requirements of "ISO 22241-1".

NOTICE

Cat does not warrant the quality or performance of non-Cat fluids.

NOTICE

Do not use agriculture grade urea solutions. Do not use any fluids that do not meet "ISO 22241-1" Requirements in SCR emissions reduction systems. Use of these fluids can result in numerous problems including damage to SCR equipment and a reduction in NOx conversion efficiency.

DEF is a solution of solid urea that is dissolved in demineralized water to produce a final concentration of 32.5% urea. DEF concentration of 32.5% is optimal for use in SCR systems. DEF solution of 32.5% urea has the lowest attainable freeze point of -11.5° C (11.3° F). DEF concentrations that are higher or lower than 32.5% have higher freeze points. DEF dosing systems and "ISO 22241-1" specifications are designed for a solution that is approximately 32.5%.

Caterpillar offers a refractometer, Cat part number 360-0774, that can be used to measure DEF concentration. Follow the instructions provided with the instrument. Appropriate commercial portable refractometers can be used to determine urea concentration. Follow the instructions from the manufacturer.

DEF Guidelines

DEF solution is typically colorless and clear. Changes to color or clarity are indicators of quality issues. Quality of DEF can degrade when stored and handled inappropriately or if DEF is not protected from contamination. Details are provided below.

If quality issues are suspected, testing of DEF should focus on urea percentage, alkalinity as NH₃ and biuret content. DEF that does not pass all these tests or that is no longer clear should not be used.

Materials compatibility

DEF is corrosive. Due to the corrosion caused, DEF must be stored in tanks constructed of approved materials. Recommended storage materials:

Stainless Steels:

- 304 (S30400)
- 304L (S30403)
- 316 (S31600)
- 316L (S31603)

Alloys and metals:

- Chromium Nickel (CrNi)
- Chromium Nickel Molybdenum (CrNiMo)
- Titanium

Non-metallic materials:

- Polyethylene
- Polypropylene
- Polyisobutylene
- Teflon (PFA)
- Polyfluoroethylene (PFE)
- Polyvinylidene fluoride (PVDF)
- Polytetrafluoroethylene (PTFE)

Materials NOT compatible with DEF solutions include Aluminum, Magnesium, Zinc, Nickel coatings, Silver and Carbon steel, and Solders containing any of the above. Unexpected reactions may occur if DEF solutions come in contact with any non-compatible material or unknown materials.

Bulk storage

Follow all local regulations covering bulk storage tanks. Follow proper tank construction guidelines. Tank volume typically should be 110% of planned capacity. Appropriately vent indoor tanks. Plan for control of overflow of the tank. Heat tanks that dispense DEF in cold climates.

Bulk tank breathers should be fitted with filtration to keep airborne debris from entering the tank. Desiccant breathers should not be used because water will be absorbed, which potentially can alter DEF concentration.

Handling

Follow all local regulations covering transport and handling. DEF transport temperature is recommended to be -5° C (23° F) to 25° C (77° F). All transfer equipment and intermediate containers should be used exclusively for DEF. Containers should not be reused for any other fluids. Ensure that transfer equipment is made from DEF-compatible materials. Recommended material for hoses and other non-metallic transfer equipment includes:

- Nitrile Rubber (NBR)
- Fluoroelastomer (FKM)
- Ethylene Propylene Diene Monomer (EPDM)

The condition of hoses and other nonmetallics that are used with DEF should be monitored for signs of degradation. DEF leaks are easily recognizable by white urea crystals that accumulate at the site of the leak. Solid urea can be corrosive to galvanized or unalloyed steel, aluminum, copper, and brass. Leaks should be repaired immediately to avoid damage to surrounding hardware.

Cleanliness

Contaminants can degrade the quality and life of DEF. Filtering DEF is recommended when dispensed into the DEF tank. Filters should be compatible with DEF and should be used exclusively with DEF. Check with the filter supplier to confirm compatibility with DEF before using. Mesh-type filters using compatible metals, such as stainless steel, are recommended. Paper (cellulose) media and some synthetic filter media are not recommended because of degradation during use.

Care should be taken when dispensing DEF. Spills should be cleaned immediately. Machine or engine surfaces should be wiped clean and rinsed with water. Caution should be used when dispensing DEF near an engine that has recently been running. Spilling DEF onto hot components will cause harmful vapors.

Stability

NOTICE

Storing Diesel Exhaust Fluid in high heat areas is not recommended. Do not store DEF in high heat generating areas on the machine, such as the pump compartment or the engine compartment. The quality of the DEF can degrade when exposed to high temperatures.

DEF fluid is stable when stored and handled properly. The quality of DEF rapidly degrades when stored at high temperatures. The ideal storage temperature for DEF is between -9°C (15.8°F) and 25°C (77°F). DEF that is stored above 35°C (95°F) for longer than 1 month must be tested before use. Testing should evaluate Urea Percentage, Alkalinity as NH_3 and Biuret content.

The length of storage of DEF is listed in the following table:

Table 49

Storage Temperature	Expected DEF Life
Below 25°C (77°F)	18 months
25°C (77°F) to 30°C (86°F)	12 months
30°C (86°F) to 35°C (95°F)	6 months
Above 35°C (95°F)	test quality before use

Refer to "ISO 22241" document series for more information about DEF quality control.

Note: Dispose of all fluids according to applicable regulations and mandates.

Fuel Additives

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

Biodiesel

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

U.S. distillate diesel fuel specification "ASTM D7467" includes up to B20 (20 percent) biodiesel. Any diesel fuel in the U.S. may contain up to B20 biodiesel fuel.

European distillate diesel fuel specification "EN16709:2015" includes up to B20 (20 percent) biodiesel. Any diesel fuel in Europe may contain up to B20.

Note: The diesel portion used in the biodiesel blend must be Ultra Low Sulfur Diesel (15 ppm sulfur or less, per "ASTM D975"). In Europe the diesel fuel portion used in the biodiesel blend must be sulfur free diesel (10 ppm sulfur or less, per "EN 590"). The final blend must have 15 ppm sulfur or less.

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

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.

Table 50

Recommendations for Finished Coolants for use in Cat engines				
Coolant Type	Recommendations	Product	Service hours ⁽¹⁾⁽²⁾	Required Maintenance ⁽³⁾
Cat ELC, Cat ELI, or commercial coolant that meets Cat EC-1	Preferred	Cat ELC	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life
		Cat ELI (water based) ⁽⁴⁾	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life
	Min requirements	Cat EC-1 specification and "ASTM D6210" and Organic Additive Technology (OAT) based on a combination of a monocarboxylic acid and a dicarboxylic acid. Free of phosphate, borate, and silicate. Tolyltriazole: minimum typical concentration of 900 ppm Nitrite: minimum typical concentration of 500 ppm in new coolants	6000 hours or 6 years	Add Extender at 3000 service hours or one half of service life
Cat DEAC, Cat SCA, conventional coolants, and commercial extended life coolants that do not meet EC-1	Acceptable	Cat DEAC	3000 hours or 3 years	SCA at maintenance intervals
		Cat SCA (water based) ⁽⁴⁾	3000 hours or 2 years	SCA at maintenance intervals

(continued)

Maintenance Section
Capacities (Refill)

(Table 50, contd)

Recommendations for Finished Coolants for use in Cat engines				
	Min requirements for fully formulated Heavy-Duty Commercial coolants	"ASTM D6210" and Nitrite (as NO ₂) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 2 years	SCA at maintenance intervals
	Min requirements for SCA and water ⁽⁴⁾ ⁽⁵⁾	Commercial supplemental coolant additive and water having Nitrite (as NO ₂) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 1 year	Per manufacturer recommendations

- (1) New Coolants at 50 volume percent diluted. Coolants that are prediluted at the coolant manufacturer must be diluted with water that meets Reagent 4 "ASTM D1193" requirements.
- (2) Maintain the in-service coolant at the given limits.
- (3) For appropriate maintenance procedures, refer to the details given in this Chapter. For applications that allow the use of Cat ELI in water, a minimum of 7.5 percent of Cat ELI is recommended. For applications that allow the use of SCA and water, a minimum of 6 percent to a maximum of 8 percent concentration of Cat SCA are recommended.
- (4) Water-based coolants are not allowed for use in machines that has NO_x reduction aftertreatment devices, in engines that has AATAC and in Marine engines that have SWAC
- (5) There are currently no industry standards to define the quality of water-based conventional coolants. To control the quality of SCA and water coolants, the commercial SCA additive package should pass ASTM D6210 when this package is used in a glycol-based coolant. Do not use a commercial SCA additive package that only meets the ASTM D3306 or equivalent specification when used in a glycol-based coolant.

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Capacities (Refill)

SMCS Code: 1000; 7000

Table 51

Approximate Capacities (Refill)			
Component or System	Liters	US gal	Recommended Type
Cooling System	30	8	Cat ELC (Extended Life Coolant)
Fuel Tank	410	108	Refer to Operation and Maintenance Manual, "Lubricant Viscosities".
Engine Crankcase with Filter	25	6.6	
Hydraulic System ⁽¹⁾	159	42	
Swing Drive	8	2	
Each Final Drive	8	2	
DEF Tank	23	6	
	kg	lbs	
Swing Gear	14.9	33	Refer to Operation and Maintenance Manual, "Lubricant Viscosities".

(continued)

(Table 51, contd)

Approximate Capacities (Refill)			
Component or System	Liters	US gal	Recommended Type
Refrigerant ⁽²⁾	1	2.2	R-134a
	ml	oz	
Refrigerant Oil (Compressor) ⁽²⁾	240	8.1	Polyalkylene Glycol (PAG) Oil

(1) The amount of hydraulic fluid that is needed to refill the hydraulic system after performing Operation and Maintenance Manual, "Hydraulic System Oil - Change"

(2) Refer to Service Manual, "Air Conditioning and Heating R-134a for All Caterpillar Machines" for additional information

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S·O·S Information

SMCS Code: 1000; 1348; 3080; 4050; 5050; 7000;
7542-008

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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Service Interval Chart

SMCS Code: 7000

The service interval chart is located inside the cab and on the window.

Refer to this Operation and Maintenance Manual, "Maintenance Interval Schedule" for the correct maintenance intervals and procedures that are specific to your machine.

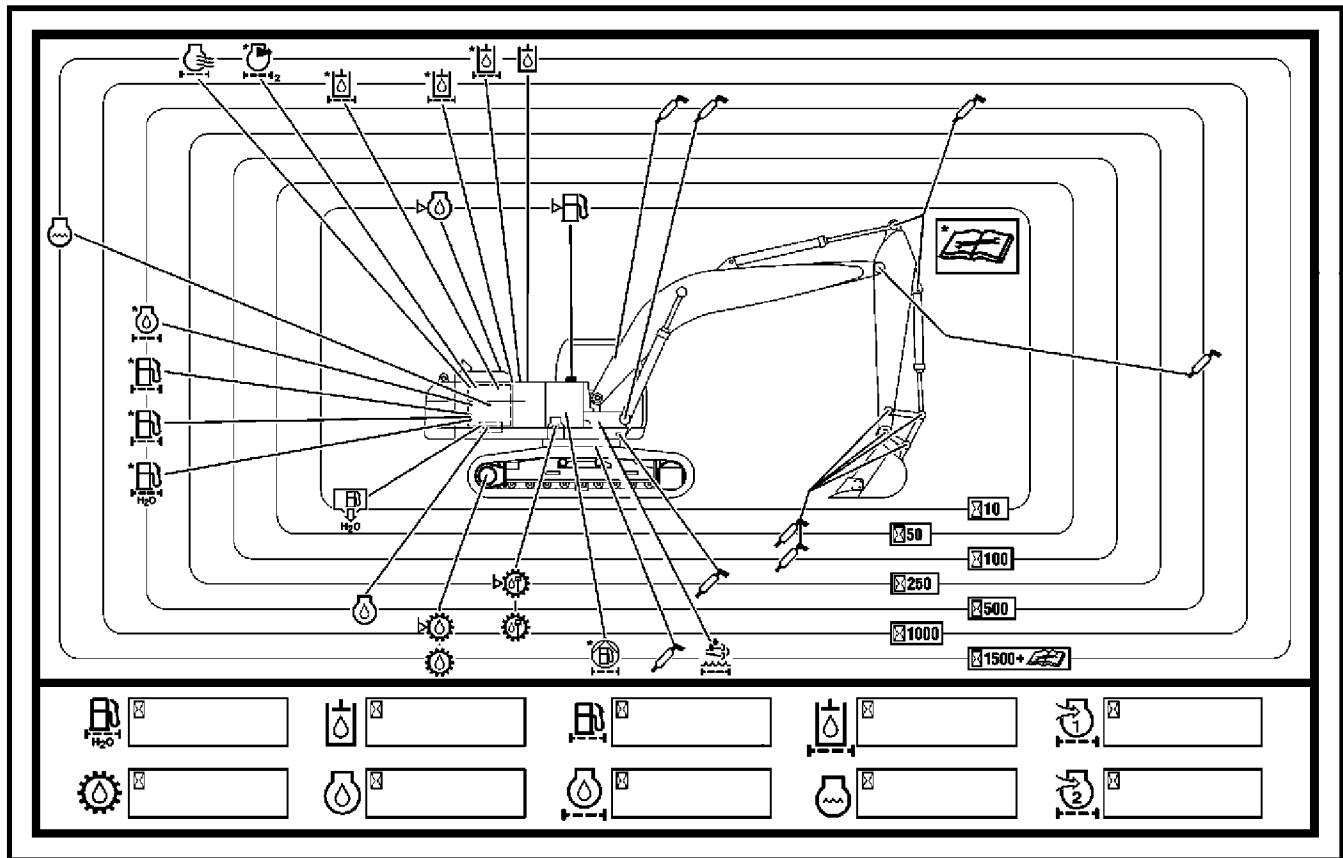


Illustration 347

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Typical example of a service interval chart



Service hour interval – Hourly interval in which a maintenance procedure should be performed.



Cooling system coolant – Change the ELC (Extended Life Coolant) .



Coolant level – Check the coolant level.



Diesel Exhaust Fluid Filter – Replace the DEF filter.



Engine air filter primary element – Clean or replace the primary air filter element.



Engine air filter secondary element – Replace the secondary air filter element.



Engine oil level – Check the engine oil level.



Engine oil – Change the engine oil.



Engine oil filter – Change the engine oil filter.



Final drive oil level – Check the final drive oil level.



Final drive oil – Change the final drive oil.



Fuel level – Check the fuel level.



Fuel system filter – Replace the fuel system filters.



Fuel system water separator – Drain the water separator.



Fuel system water separator element – Replace the fuel system water separator element.



Fumes Disposal Filter Element – Replace the fumes disposal filter element.



Grease zerk – Lubricate the designated locations.



Hydraulic oil level – Check the hydraulic oil level.



Hydraulic oil – Change the hydraulic oil.



Hydraulic oil filter – Change the hydraulic oil filter.



Swing drive oil level – Check the swing drive oil level.



Swing drive oil – Change the swing drive oil.

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System Pressure Release

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

WARNING

Personal injury or death can result from sudden machine movement.

Sudden movement of the machine can cause injury to persons on or near the machine.

To prevent injury or death, make sure that the area around the machine is clear of personnel and obstructions before operating the machine.

Coolant System

WARNING

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

To relieve the pressure from the coolant system, turn off the machine. Allow the cooling system pressure cap to cool. Remove the cooling system pressure cap slowly to relieve pressure.

Hydraulic System

The release of hydraulic pressure in a hydraulic circuit is required before service is performed to that hydraulic circuit. Release the pressure in the following hydraulic circuits before any service associated with that hydraulic circuit is performed.

- Boom hydraulic circuit
- Stick hydraulic circuit
- Bucket hydraulic circuit
- Swing hydraulic circuit
- Travel hydraulic circuit
- Attachment hydraulic circuits (if equipped)
- Pilot hydraulic circuit
- Return hydraulic circuit

Note: Refer to the Disassembly and Assembly Manual for additional information concerning service of the components of specific hydraulic circuits.

Release of Hydraulic Pressure from the Main Hydraulic System

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before performing any service. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

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.

Perform the following steps to release the hydraulic system pressure from the main hydraulic system. For information on any fluids and capacities, refer to this Operation and Maintenance Manual, "Lubricant Viscosities" and "Capacities (Refill)" for more information.

Note: For additional safety, wrap hydraulic joint with material that could absorb/reduce any residual pressure of oil when released. Loosen the joint slowly, pause, and carefully check hydraulic joint for tensions indicating presence of pressure or spring force in lines or components.

1. Position the machine on level ground.

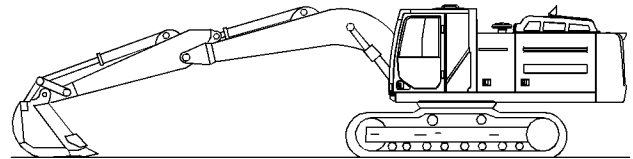


Illustration 348

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2. Fully retract the stick cylinder rod. Adjust the position of the linkage so that the work tool is parallel to the ground. Lower the boom until the work tool is flat on the ground. Refer to Illustration 348.

3. Release the system pressure from the implement and swing hydraulic circuits.

a. Shut off the engine.

Note: Perform Step 3b through Step 3d immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

b. Turn the engine start switch to the ON position without starting the engine.

c. Place the hydraulic activation control lever in the UNLOCKED position.

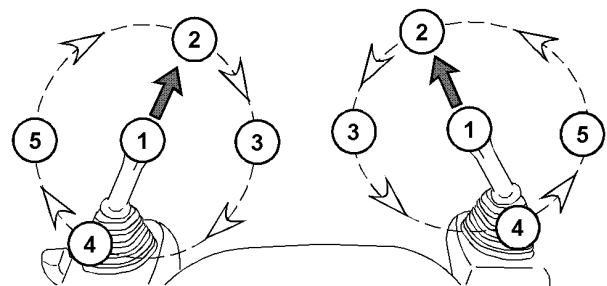


Illustration 349

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d. Move both joysticks in a circular motion to the FULL STROKE positions multiple times until the pilot accumulator has been exhausted.

Note: Pilot pressure is required to relieve hydraulic system pressure.

- e. Place the hydraulic activation control lever in the LOCKED position.
- f. Start the engine to recharge pilot accumulator.
- g. Shut off the engine.
- h. Repeat Step 3b through Step 3g until the high-pressure lines have been released.

Note: Do not activate any levers when recharging pilot accumulator.

Each time the accumulator is recharged, start the joysticks at different positions or rotate in the reverse direction. Doing so will ensure that the same circuit is not being relieved each time.

Note: Pressure could build on these circuits after pressure is released due to linkage settling or bucket rolling.

Note: To release pressure in a single circuit, move the joysticks or pedals of the hydraulic circuit that requires service to the full stroke positions after moving joysticks in a circular motion. Moving the joysticks or pedals to the full stroke position will release the high pressure only in that single hydraulic circuit. Moving the joysticks or pedals to the full stroke position will also release any pressure that might be present in the pilot hydraulic circuit.

4. Release hydraulic system pressure in the attachment circuits, if equipped.

- a. Start the engine to charge pilot accumulator.
- b. Shut off the engine.

Note: Perform Step 4c through Step 4e immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

- c. Turn the engine start switch to the ON position without starting the engine.
- d. Place the hydraulic activation control lever in the UNLOCKED position.
- e. Activate the switch or pedal for the attachment circuit.
- f. Place the hydraulic activation control lever in the LOCKED position.
- g. Start the engine to recharge pilot accumulator.

Note: Do not activate any pedals or switches when recharging pilot accumulator.

- h. Shut off the engine.

- i. Repeat Step 4a through Step 4h for each attachment circuit.

5. After releasing the hydraulic pressure in each of the desired hydraulic circuits, place the hydraulic activation control lever in the LOCKED position.

6. Turn the engine start switch to the OFF position.

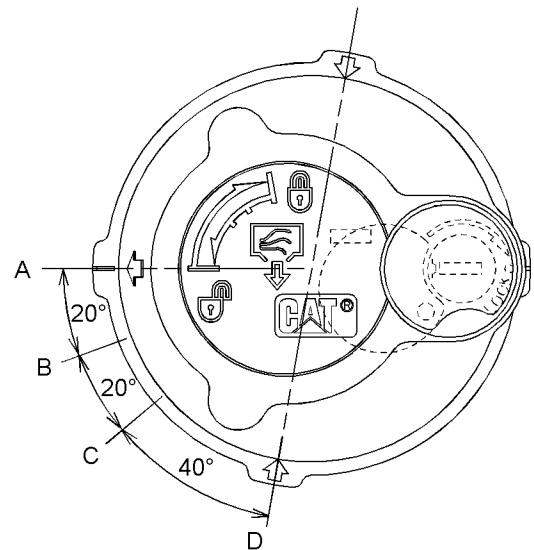


Illustration 350

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Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

7. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 350 for filler cap positions.

- a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
- b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
- c. Push down the filler cap and move the arrow from position (C) to position (D).

Note: The travel hydraulic circuit is open to the hydraulic tank. Pressure from the travel circuit is released by releasing pressure from the return circuit.

8. Release the pressure that may be present in the boom circuit to remove the risk of residual pressure in the line. Make sure that the engine start switch is in the OFF position and the pressure in the hydraulic tank has been released.

For machines equipped with a boom lowering control valve, there is a manual valve located near the base of the boom or a valve on the load control valve on the boom cylinder. Refer to Operation and Maintenance Manual, Equipment Lowering with Engine Stopped Machine with a Boom Lowering Control Valve for more information.

For machines **NOT** equipped with a boom lowering control valve, refer to Operation and Maintenance Manual, Equipment Lowering with Engine Stopped Machine without a Boom Lowering Control Valve for more information.

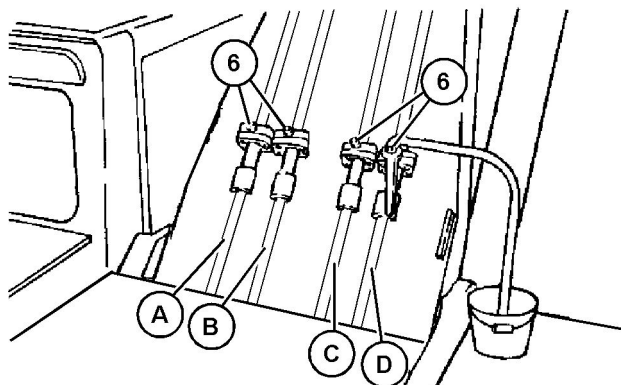


Illustration 351 g06234927

Stick and Bucket circuit locations

- (6) Purge Screws (If Equipped)
- (A) Circuit A
- (B) Circuit B
- (C) Circuit C
- (D) Circuit D

9. If the purge screws are equipped, perform the following pressure release procedure for each Stick and Bucket circuit. Refer to Illustration 351 and Table 52 for the stick and bucket circuit locations.

Table 52

Stick and Bucket Circuit Locations				
Sales Model	Circuits			
	A	B	C	D
326 / 329 / 330	Stick In	None	Stick Out	None
336 / 340	Bucket Close	Stick In	Stick Out	Bucket Open
349 / 352	Stick Out	Stick In	Bucket Close	Bucket Open

- a. Connect one end of a drain hose to purge screw (6). Insert the other end of the drain hose into an empty container.
- b. Loosen purge screw (6) by 1/2 turn. Hydraulic oil will be drained from the drain hose to the container.

Note: Dispose of drained fluid according to local regulations.

- c. Tighten purge screw (6) to a torque of 13 +/- 2 Nm (9 +/- 1 lb ft) after all the hydraulic oil has been drained from the line.
- d. Repeat Steps 9a through 9c for all circuits.
- e. Remove the drain hose and install hydraulic tank fill cap.

10. The pressure in the multiple hydraulic circuits that require service is now released and lines and components can be disconnected or removed from those hydraulic circuits.

i07746333

Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Cat dealer.

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

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

NOTICE

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

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

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

i08067839

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, to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance. Refer to the maintenance procedure for any other exceptions that may change the maintenance intervals.

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

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

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 6000 hours. S·O·S services after 3,000 hours is strongly recommended. Consult your Cat dealer for details.

When Required

“ Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace”	243
“ Battery - Recycle”	243
“ Battery or Battery Cable - Inspect/Replace”	243
“ Bucket Linkage - Inspect/Adjust”	248
“ Bucket Tips - Inspect/Replace”	253
“ Bucket Tips - Inspect/Replace”	250
“ Cab Air Filter (Fresh Air) - Clean/Replace”	256
“ Cab Door Latch - Inspect/Adjust/Replace”	256
“ Camera - Clean”	258
“ Circuit Breakers - Reset”	259

“ Cooling System Coolant Level - Check”	263
“ DEF Filler Screen - Clean”	265
“ Diesel Exhaust Fluid - Fill”	270
“ Engine Air Filter Primary Element - Clean/Replace”	271
“ Engine Air Filter Secondary Element - Replace”	273
“ Engine Oil Level - Check”	274
“ Ether Starting Aid Cylinder - Replace”	278
“ Film (Product Identification) - Clean”	279
“ Fuel System - Prime”	283
“ Fuel System Water Separator - Drain”	285
“ Fuses - Replace”	287
“ High Intensity Discharge Lamp (HID) - Replace”	289
“ Hydraulic System Oil Level - Check ”	303
“ Oil Filter - Inspect”	307
“ Radiator, Aftercooler and Oil Cooler Cores - Clean”	308
“ Track Adjustment - Adjust”	315
“ Window - Check”	318
“ Window Washer Reservoir - Fill”	318
“ Window Wiper - Inspect/Replace”	318
“ Windows - Clean”	319

Every 10 Service Hours or Daily for First 100 Hours

“ Boom Cylinder Head (Long Reach Configuration) - Lubricate”	244
“ Boom and Stick Linkage - Lubricate”	245
“ Boom and Stick Linkage - Lubricate”	246
“ Boom, Stick and Bucket Linkage (Long Reach Configuration) - Lubricate”	247
“ Bucket Linkage - Lubricate”	249

Every 10 Service Hours or Daily

“ Fuel Tank Water and Sediment - Drain”	286
“ Indicators and Gauges - Test”	305
“ Seat Belt - Inspect”	309

“ Track Adjustment - Inspect”	317
“ Travel Alarm - Test”	317
“ Undercarriage - Check”	318

Every 10 Service Hours or Daily for Machines Used in Severe Applications

“ Boom, Stick and Bucket Linkage (Long Reach Configuration) - Lubricate”	247
“ Bucket Linkage - Lubricate”	249

Every 50 Service Hours

“ Boom, Stick and Bucket Linkage (Long Reach Configuration) - Lubricate”	247
“ Bucket Linkage - Lubricate”	249

Every 100 Service Hours or 2 Weeks for Machines Used in Severe Applications

“ Boom Cylinder Head (Long Reach Configuration) - Lubricate”	244
“ Boom and Stick Linkage - Lubricate”	245
“ Boom and Stick Linkage - Lubricate”	246

Every 100 Service Hours of Continuous Hammer Use

“ Oil Filter (Hydraulic Hammer) - Replace”	305
--	-----

Initial 250 Service Hours

“ Final Drive Oil - Change”	280
“ Hydraulic System Oil Filter (Case Drain) - Replace”	294
“ Hydraulic System Oil Filter (Pilot) - Replace”	296
“ Hydraulic System Oil Filter (Return) - Replace”	298
“ Swing Drive Oil - Change”	311

Every 250 Service Hours

“ Condenser (Refrigerant) - Clean”	259
“ Cooling System Coolant Sample (Level 1) - Obtain”	264
“ Engine Oil Sample - Obtain”	275

“ Final Drive Oil Level - Check”	281
“ Final Drive Oil Sample - Obtain”	281
“ Swing Bearing - Lubricate”	310
“ Swing Drive Oil Level - Check”	312

Every 250 Service Hours for Machines Used in Severe Applications

“ Fuel System Primary Filter (Water Separator) Element - Replace”	283
---	-----

Every 250 Service Hours of Partial Hammer Use (50% of Service Hours)

“ Oil Filter (Hydraulic Hammer) - Replace”	305
--	-----

Every 250 Service Hours of Continuous Hammer Use

“ Hydraulic System Oil Filter (Case Drain) - Replace”	294
“ Hydraulic System Oil Filter (Pilot) - Replace”	296

Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

“ Cooling System Coolant Sample (Level 2) - Obtain”	265
---	-----

Every 500 Service Hours

“ Belt - Inspect/Adjust/Replace”	244
“ Engine Oil and Filter - Change”	275
“ Fuel System Primary Filter (Water Separator) Element - Replace”	283
“ Fuel System Secondary Filter - Replace”	284
“ Fuel Tank Strainer - Clean”	286
“ Hydraulic System Oil Sample - Obtain”	304

“ Swing Drive Oil Sample - Obtain” 313

Every 500 Service Hours of Partial Hammer Use (50% of Service Hours)

“ Hydraulic System Oil Filter (Case Drain) - Replace” 294

“ Hydraulic System Oil Filter (Pilot) - Replace” 296

Every 600 Service Hours of Continuous Hammer Use

“ Hydraulic System Oil - Change” 290

Every 1000 Service Hours

“ Battery - Clean” 243

“ Battery Hold-Down - Tighten” 243

“ Boom and Stick Linkage - Lubricate” 245

“ Boom and Stick Linkage - Lubricate” 246

“ Boom Cylinder Head (Long Reach Configuration) - Lubricate” 244

“ Fuel Tank Cap Filter - Replace” 286

“ Hydraulic System Oil Filter (Case Drain) - Replace” 294

“ Hydraulic System Oil Filter (Pilot) - Replace” 296

“ Rollover Protective Structure (ROPS) - Inspect” 309

“ Swing Drive Oil - Change” 311

Every 1000 Service Hours of Partial Hammer Use (50% of Service Hours)

“ Hydraulic System Oil - Change” 290

Every 2000 Service Hours

“ Final Drive Oil - Change” 280

“ Fumes Disposal Filter Element - Replace” 287

“ Hydraulic System Oil Filter (Return) - Replace” 298

“ Receiver Dryer (Refrigerant) - Replace” 309

“ Swing Gear - Lubricate” 313

Every Year

“ Cooling System Coolant Sample (Level 2) - Obtain” 265

Every 3000 Service Hours

“ Fuel Lift Pump Strainer - Replace” 282

Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture

“ Seat Belt - Replace” 310

Every 5000 Service Hours

“ Diesel Exhaust Fluid Filter - Replace” 268

“ Diesel Exhaust Fluid Injector - Replace” 269

Every 6000 Service Hours

“ Cooling System Coolant Extender (ELC) - Add” 262

“ Hydraulic System Oil - Change” 290

Every 10 000 Service Hours

“ DEF Manifold Filters - Replace” 266

Every 12 000 Service Hours

“ Cooling System Coolant (ELC) - Change” 260

i04004709

i00934864

Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace

SMCS Code: 1054-510-A/C; 1054-040-A/C

NOTICE

An air recirculation filter element plugged with dust will result in decreased performance and service life to the air conditioner or cab heater.

To prevent decreased performance, clean the filter element, as required.

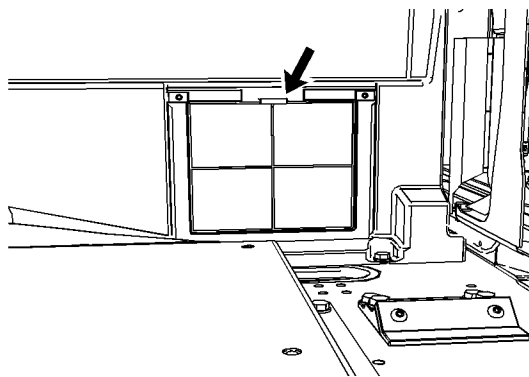


Illustration 352

g02017613

The air conditioner filter is located on the lower left side of the cab behind the seat.

1. Slide the operator seat forward.
2. Slide the filter element upward.
3. Tap the air filter in order to remove the dirt. Do not use compressed air to clean the filter.
4. After you clean the filter element, inspect the filter element. If the filter element is damaged or badly contaminated, use a new filter element. Make sure that the filter element is dry.
5. Install the filter element.

NOTICE

Failure to reinstall the filter element for the air conditioning system will contaminate and damage the system components.

Battery - Clean

SMCS Code: 1401-070

Clean the battery surface with a clean cloth. Keep the terminals clean and keep the terminals coated with petroleum jelly. Install the post cover after you coat the terminal post with petroleum jelly.

i07746330

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

i00934872

Battery Hold-Down - Tighten

SMCS Code: 7257

Tighten the hold-downs for the battery in order to prevent the batteries from moving during machine operation.

i04064489

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-561; 1401; 1401-040; 1401-510; 1402-040; 1402-510

WARNING

Personal injury can result from battery fumes or explosion.

Batteries give off flammable fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts the skin or eyes.

Prevent sparks near the batteries. Sparks could cause vapors to explode. Do not allow jumper cable ends to contact each other or the engine. Improper jumper cable connections can cause an explosion.

Always wear protective glasses when working with batteries.

Maintenance Section
Belt - Inspect/Adjust/Replace

1. Turn all of the switches to the OFF position. Turn the engine start switch key to the OFF position.
2. Turn the battery disconnect switch to the OFF position. Remove the key.
3. Disconnect the negative battery cable at the battery.
4. Disconnect the positive battery cable at the battery.
5. Disconnect the battery cables at the battery disconnect switch. The battery disconnect switch is connected to the machine frame.
6. Make necessary repairs or replace the battery.
7. Connect the battery cable at the battery disconnect switch.
8. Connect the positive battery cable of the battery.
9. Connect the negative battery cable of the battery.
10. Install the key and turn the battery disconnect switch to the ON position.

i07197963

Belt - Inspect/Adjust/Replace

SMCS Code: 1357-040; 1357-025; 1357-510; 1397-510; 1397-040; 1397-025

Note: This engine is equipped with a belt tightener that automatically adjusts the belt to the correct tension.

1. Unlatch the engine hood and raise the engine hood.

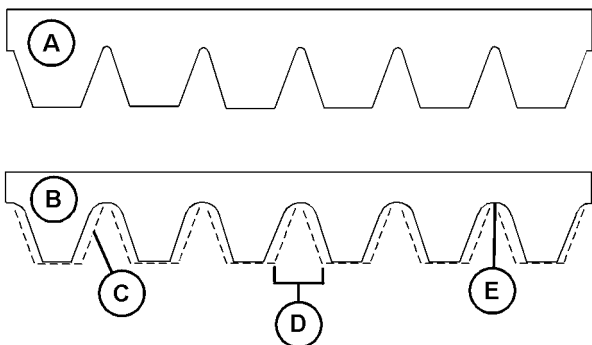


Illustration 353

g06114636

- (A) New belt
(B) Worn belt

2. Inspect the condition of the serpentine belt. Over time the belt ribs will lose material (C). The space between the ribs will increase (D). The loss of material will cause the pulley sheave to contact the belt valley. This will lead to belt slippage and accelerated wear (E). Replace the belt if the belt is worn or frayed.
3. If the belt requires replacement, perform Step 3a through Step 3f.
 - a. Remove the upper fan guard.

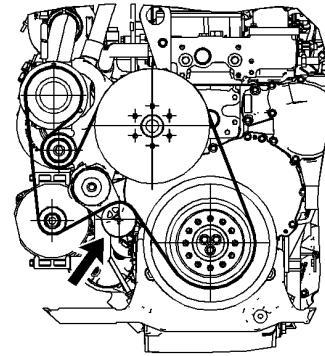


Illustration 354

g02153037

- b. Rotate the belt tensioner clockwise in order to remove the belt.
- c. Remove the belt.
- d. Install a new belt.
- e. Rotate the belt tensioner clockwise in order to install the belt.
- f. Install the upper fan guard.
- g. Lower the engine hood and latch the engine hood.

i01949843

Boom Cylinder Head (Long Reach Configuration) - Lubricate

SMCS Code: 5456-086-HE

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, stick and bucket control linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Apply lubricant through all fittings after operation under water.

Wipe all fittings before you apply lubricant.

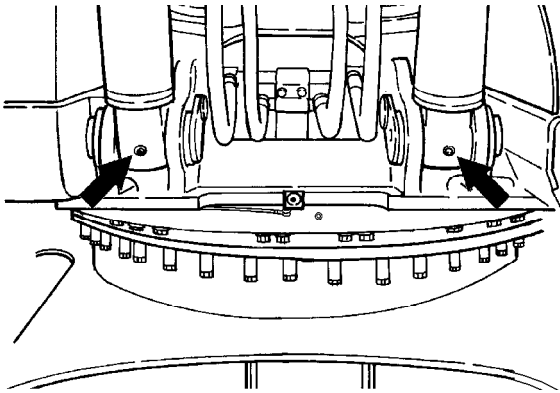


Illustration 355

g00685797

Apply lubricant through the fitting at the base of each boom cylinder.

i01933858

Boom and Stick Linkage - Lubricate

SMCS Code: 6501-086; 6502-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, stick and bucket control linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Apply lubricant through all fittings after operation under water.

Wipe all fittings before you apply lubricant.

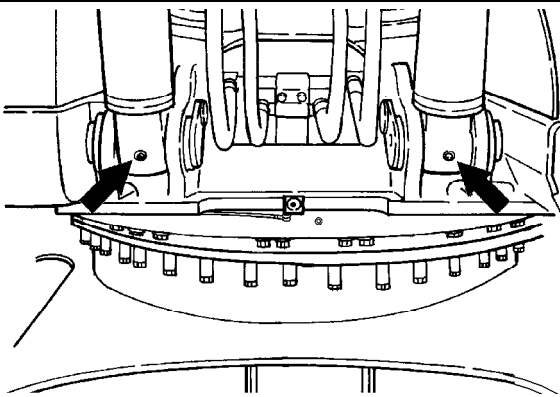


Illustration 356

g00685797

1. Apply lubricant through the fitting at the base of each boom cylinder.

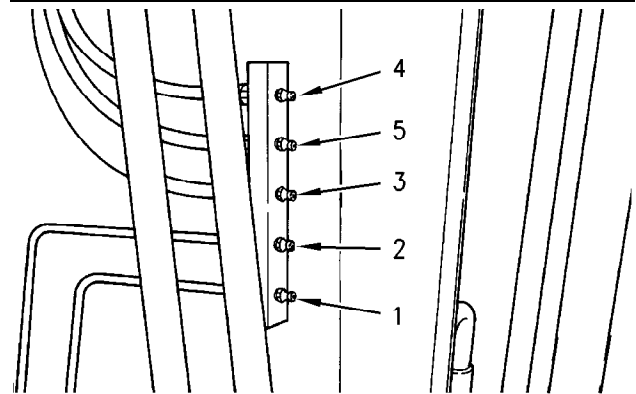


Illustration 357

g00685798

2. The fittings are at the base of the boom. The fittings can be serviced from the platform on top of the storage box. To lubricate the lower boom bearings, apply lubricant through fittings (1) and (2).
3. Apply lubricant through fittings (3) and (4) for the boom cylinder rod.
4. Apply lubricant through fitting (5) for the stick cylinder head.

Note: To ensure proper lubrication of the lower boom bearings and of the boom cylinder rod end bearings, lubricant should be applied through fittings (1), (2), (3), and (4). Apply lubricant first when the boom is raised and any attachment is suspended. Then apply lubricant when the boom is lowered and the attachment is rested on the ground with a slight downward pressure.

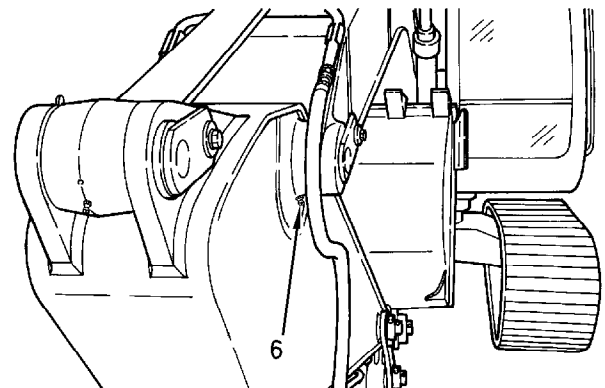


Illustration 358

g00685798

5. Apply lubricant through fitting (6). Fitting (6) is at the connection point of the boom and of the stick.

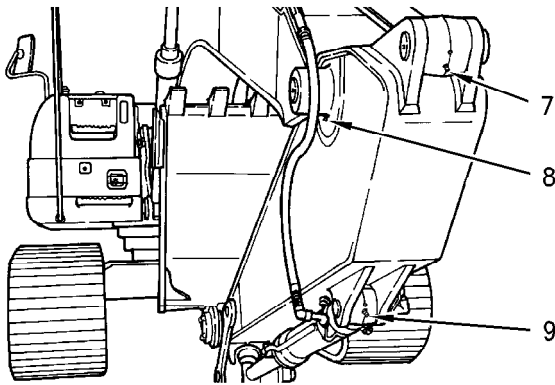


Illustration 359

g00685800

6. Apply lubricant through fitting (7) on the stick cylinder rod, fitting (8) at the connection point of the boom and of the stick, and fitting (9) at the bucket cylinder head end.

i05037672

Boom and Stick Linkage - Lubricate (VA Boom (If Equipped))

SMCS Code: 6501-086; 6502-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, and stick linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Apply lubricant through all fittings after operation under water.

Wipe all fittings before you apply lubricant.

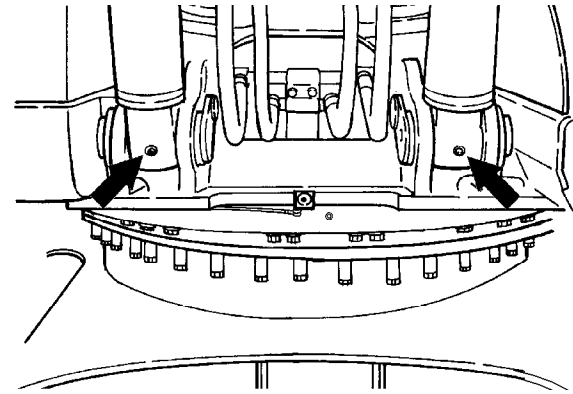


Illustration 360

g00685797

1. Apply lubricant through the fitting at the base of each boom cylinder.

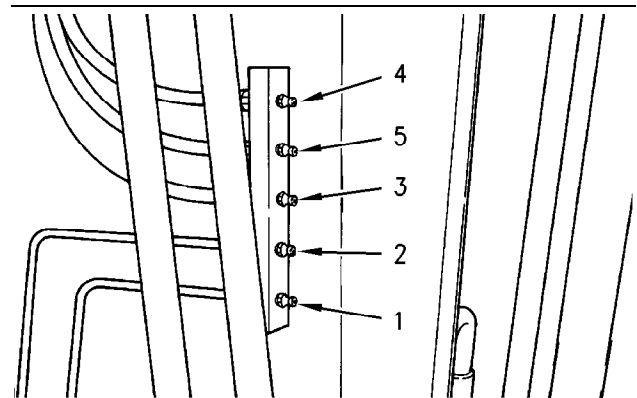


Illustration 361

g00685798

Note: Your machine may have the fittings mounted in a vertical position as shown in the illustration above, or your machine may have the fittings mounted in a horizontal position.

2. The fittings are at the base of the boom. The fittings can be serviced from the platform on top of the storage box. To lubricate the lower boom bearings, apply lubricant through fittings (1) and (2).
3. Apply lubricant through fitting (3) for the head end of the VA boom cylinder.
4. Apply lubricant through fittings (4) and (5) for the boom cylinder rod.

Note: To ensure proper lubrication of the lower boom bearings and of the boom cylinder rod end bearings, lubricant should be applied through fittings (1), (2), (4), and (5). Apply lubricant first when the boom is raised and any attachment is suspended. Then apply lubricant when the boom is lowered and the attachment is rested on the ground with a slight downward pressure.

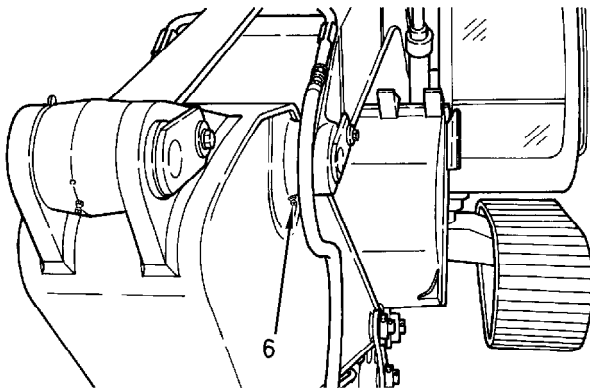


Illustration 362

g00685799

5. Apply lubricant through fitting (6). Fitting (6) is at the connection point of the boom and of the stick.

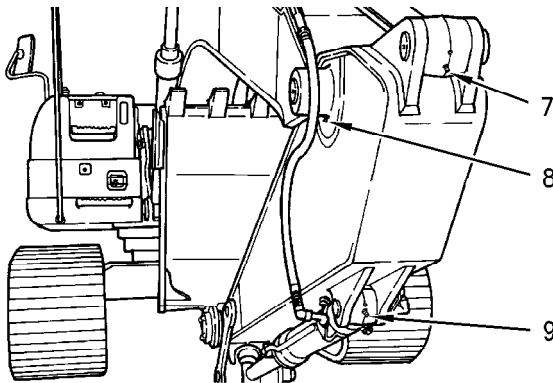


Illustration 363

g00685800

6. Apply lubricant through fitting (7) on the stick cylinder rod, fitting (8) at the connection point of the boom and of the stick, and fitting (9) at the bucket cylinder head end.

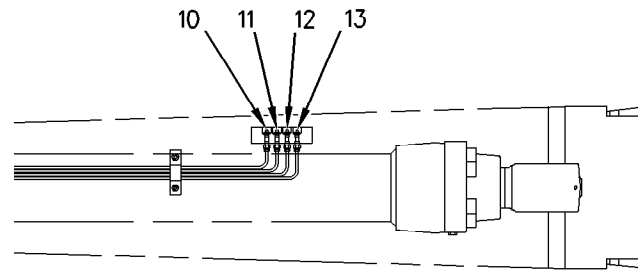


Illustration 364

g00754421

End of fore boom

7. Apply lubricant through fitting (10) and fitting (13) in order to lubricate the connection point between the stub boom and the fore boom.
8. Apply lubricant through fitting (11) in order to lubricate the stick cylinder head end.
9. Apply lubricant through fitting (12) in order to lubricate the rod end of the VA boom cylinder.

i04534289

Boom, Stick and Bucket Linkage (Long Reach Configuration) - Lubricate

SMCS Code: 6501-086; 6502-086; 6513-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, stick, and bucket control linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Apply lubricant through all fittings after operation under water.

Wipe all fittings before you apply lubricant.

Maintenance Section
Bucket Linkage - Inspect/Adjust

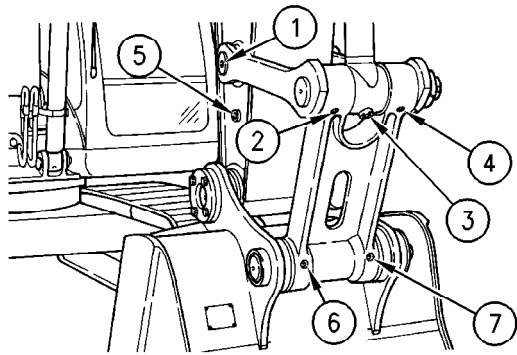


Illustration 365

g00682908

1. Apply lubricant through fittings (1), (2), (3), and (4) that are on the link.
2. Apply lubricant through fittings (5), (6), and (7) that are on the bucket.

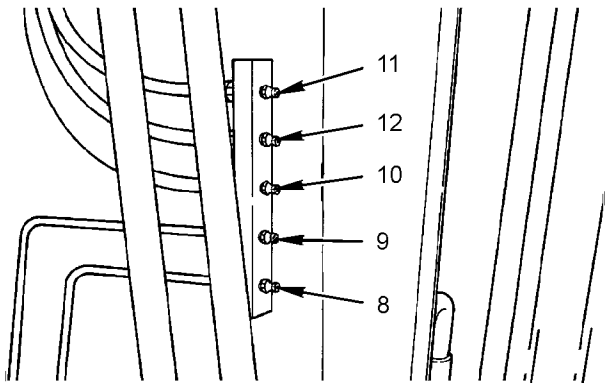


Illustration 366

g02712684

3. The fittings are at the base of the boom. The fittings can be serviced from the platform on top of the storage box. To lubricate the lower boom bearings, apply lubricant through fittings (8) and (9).
4. Apply lubricant through fittings (10) and (11) for the boom cylinder rod.
5. Apply lubricant through fitting (12) for the stick cylinder head.

Note: To ensure proper lubrication of the lower boom bearings and of the boom cylinder rod end bearings, lubricant should be applied through fittings (8), (9), (10), and (11). Apply lubricant first when the boom is raised and any attachment is suspended. Then apply lubricant when the boom is lowered and the attachment is rested on the ground with a slight downward pressure.

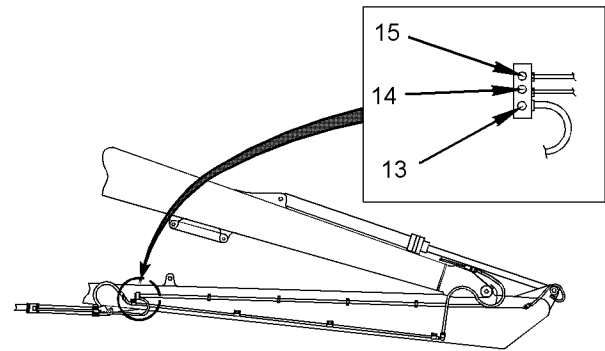


Illustration 367

g02712686

6. Apply lubricant through fitting (13) for the head of the bucket cylinder.
7. Apply lubricant through fitting (14) for the stick cylinder rod.
8. Apply lubricant through fitting (15) for the connection of the boom and of the stick.

i03902571

Bucket Linkage - Inspect/Adjust

SMCS Code: 6513-040; 6513-025

WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

NOTICE

Improperly adjusted bucket clearance could cause galling on the contact surfaces of the bucket and stick, resulting in excessive noise and/or damaged O-ring seals.

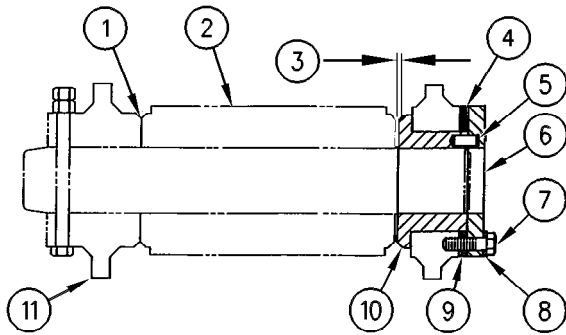


Illustration 368

g00101687

(1) No gap. (2) Stick boss. (3) Bucket clearance. (4) Shims. (5) Pin. (6) Plate. (7) Bolts. (8) Washers. (9) Location. (10) Flange. (11) Bucket boss.

The clearance of the bucket control linkage on this machine can be adjusted by shimming. If the gap between the bucket and the stick becomes excessive, adjust bucket clearance (3) to 0.5 to 1 mm (0.02 to 0.04 inch).

Two shims of different thickness are used at location (9). The thicknesses of the shims are 0.5 mm (0.02 inch) and 1.0 mm (0.04 inch).

- Determine the number of shims that need to be removed from shims (4) by using the following calculation:

Subtract 0.5 mm (0.02 inch) or 1.0 mm (0.04 inch) from bucket clearance (3).

- Remove the appropriate number of shims at location (9) in order to meet the above thickness. Make sure that you use a minimum of three 0.5 mm (0.02 inch) shims. To remove the shims, remove bolts (7), washers (8), and plate (6).
- After the correct number of shims has been removed and pin (5) is aligned with the pin hole, install plate (6), washers (8), and bolts (7). Tighten bolts (7) to a torque of $240 \pm 40 \text{ N}\cdot\text{m}$ ($175 \pm 30 \text{ lb}\cdot\text{ft}$).
- After installation, make sure that bucket clearance (3) is still correct.

i05845332

Bucket Linkage - Lubricate (TB Bucket Family)

SMCS Code: 6513-086

Note: Use this procedure for the TB bucket family. Lubricate the bucket linkage at the maintenance interval of every 50 service hours.

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, stick, and bucket control linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Wipe all fittings before you apply lubricant.

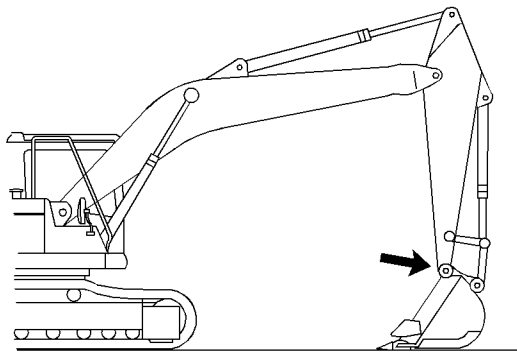


Illustration 369

g02109636

Area for linkage adjustment

- Position the machine on a level surface and lower the bucket to the ground.
- Slowly operate the swing control lever until stick boss (2) and the bucket boss (11) are in full face contact at no gap (1). This will help to determine the total clearance of the connection point of the stick and of the bucket.
- Move the hydraulic lockout control to the LOCKED position. Stop the engine.
- Measure bucket clearance (3), which is the existing total clearance.

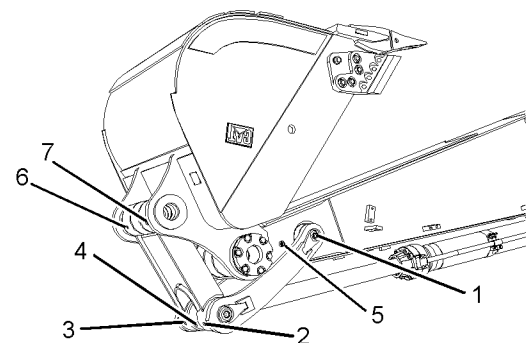


Illustration 370

g02018615

Note: Completely fill all cavities of the bucket control linkage with grease when you initially install a bucket.

1. Apply lubricant through fittings for the linkages (1), (2), (3), and (4).
2. Apply lubricant through fittings for the bucket (5), (6), and (7). Continue to fill with grease until the grease is visible on both sides of the power link.

Note: Service the above fittings after you operate the bucket under water.

Installation of the Bucket

Use the procedure that follows when a bucket is changed. Use the procedure that follows when a new pin is installed. Use the procedure that follows when new bearings are installed.

Note: Fill the cavity of the stick nose with grease before you install the pin.

1. Insert the pin into the stick nose.
2. Secure the bucket to the stick.
3. Apply grease through fitting (5).
4. Continue to fill with grease until the grease is visible on both sides of stick nose.
5. Apply lubricant through fittings for the bucket (6), and (7). Continue to fill with grease until the grease is visible on both sides of power link.

i03450548

Bucket Tips - Inspect/Replace (Drive-through System)

SMCS Code: 6805-510; 6805-040

WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket tips or side cutters.

Bucket Tips

Note: In order to maximize the life of the bucket tip and the penetration of the bucket tip, the bucket tip can be rotated.



Illustration 371

g01055179

Acceptable wear



Illustration 372

g01055196

Replace this bucket tip.

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal Procedure

WARNING

Retainer pin, when struck with force, can fly out and cause injury to nearby people.

Make sure the area is clear of people when driving retainer pins.

To avoid injury to your eyes, wear protective glasses when striking a retainer pin.

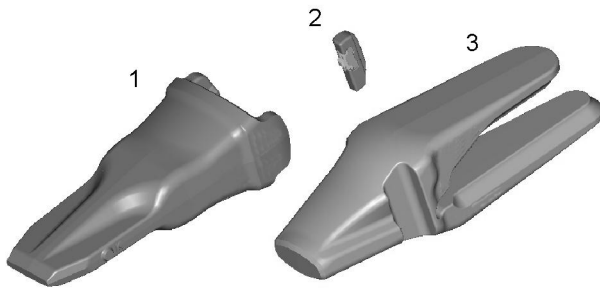


Illustration 373

g01053737

- (1) Bucket tip
- (2) Retainer
- (3) Adapter

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.

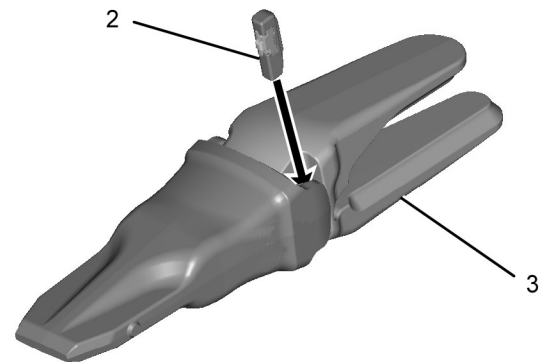


Illustration 375

g01498093

Proper location for installing the retainer

3. The retainer can be installed from the top of the bucket tip or from the bottom of the bucket tip. Use a hammer and a 1 inch X 1 inch X 8 inch steel bar stock in order to drive retainer (2) into adapter (3).

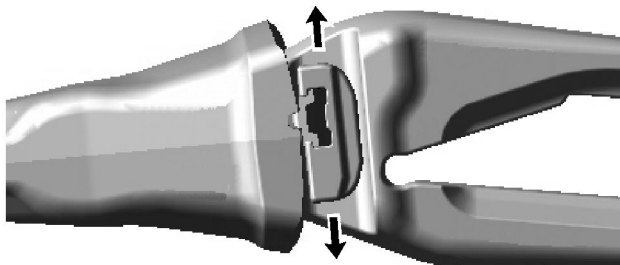


Illustration 374

g01054386

Internal view

1. Use a hammer and a punch in order to drive out the retainer. The retainer can be removed from the top of the bucket tip or from the bottom of the bucket tip.
2. Remove the bucket tip from the adapter with a slight counterclockwise rotation.

Installation Procedure

1. Clean the adapter, if necessary.
2. Install the new bucket tip or the rotated bucket tip onto the adapter with a slight clockwise rotation.

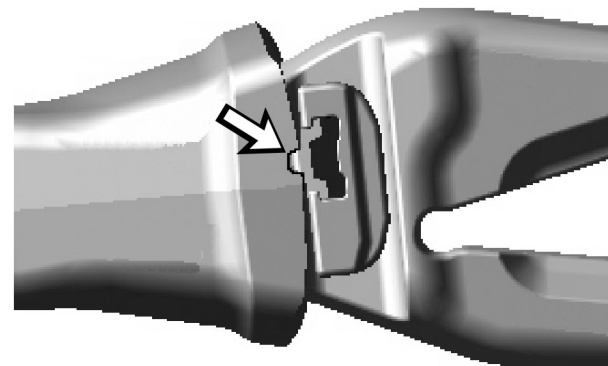


Illustration 376

g01492733

Internal View

The latch of the retainer is properly seated in the recess of the bucket tip.

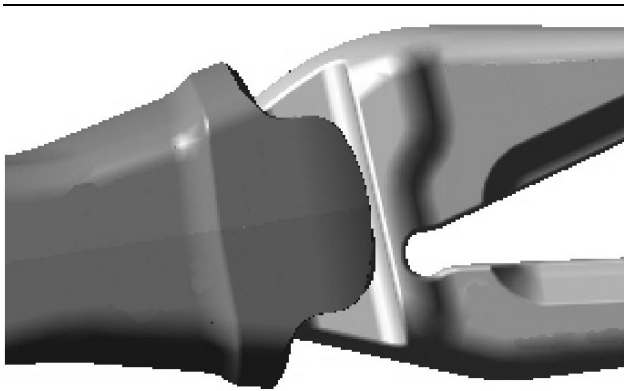


Illustration 377

g01054753

A properly installed retainer does not extend beyond the ear of the bucket tip.

- The retainer is properly seated if the retainer can be moved slightly by the technician's hand. If the retainer cannot be moved, adjust the retainer, as needed. The ends of the retainer should not extend beyond the ear of the bucket tip.

Side Cutters (If Equipped)

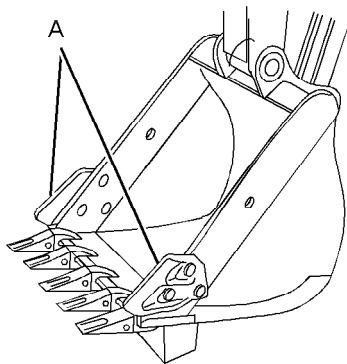


Illustration 378

g01092808

Bucket with side cutters

(A) Side cutters

- Remove the mounting bolts and the side cutters.
- Clean the mounting surface of the side plate on the bucket and of the side cutter. Remove any burrs or protrusions on the mating surfaces.

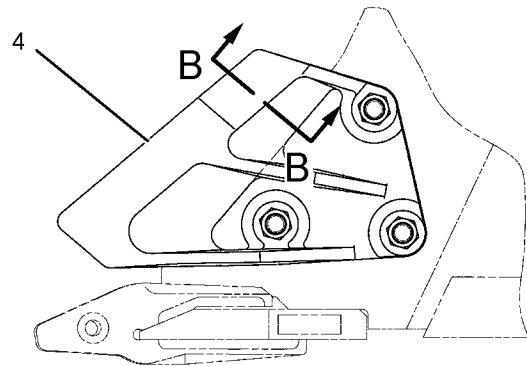


Illustration 379

g01389435

(4) Side cutter

Note: Some side cutters may be rotated for additional wear.

- Install the side cutter.

Note: Certain bolts may require thread compound.

- Hand tighten the bolts.

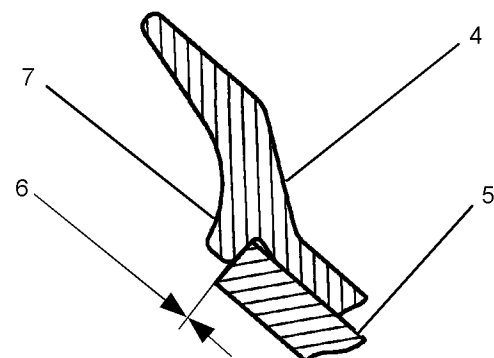


Illustration 380

g01389435

Section B-B From Illustration 379

- (4) Side cutter
(5) Side plate on a bucket
(6) 0.0 mm (0.0 inch)
(7) Shear ledge on a side cutter

- Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.

- Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

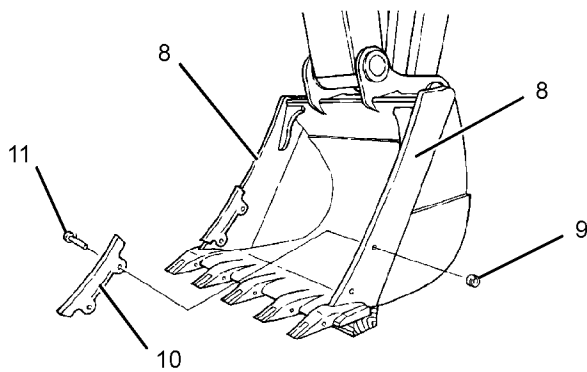


Illustration 381

g01389452

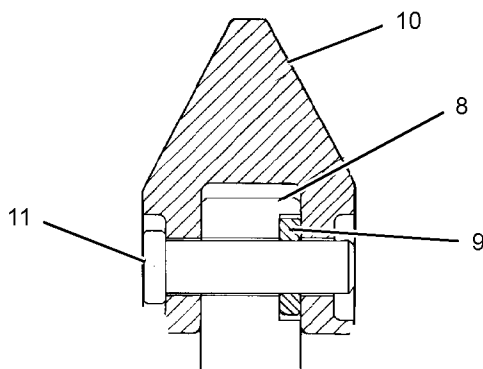


Illustration 382

g01389453

(8) Side plate
(9) Retainer
(10) Side protector
(11) Pin

1. Hit pin (11) from the retainer side of the bucket in order to remove side protector (10) from side plate (8).
2. Clean side protector (10), pin (11), retainer (9) and side plate (8) before installation.

Note: Lateral clearance between the side plate and the side protector should not exceed 1 mm (0.04 inch). Shims may be required in order to decrease the lateral clearance which will decrease movement. Install the shims between the side plate and the side protector on the opposite side of the retainer.

3. Put retainer (9) in side plate (8).
4. Align two pin holes of the new protector and the side plate. Hit the pin from the side of the bucket without the retainer.

Note: If the pin and/or the retainer are worn, replace the pin and/or the retainer.

i03574841

Bucket Tips - Inspect/Replace

SMCS Code: 6805-510; 6805-040

WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket tips.

Note: In order to maximize the life of the bucket tip and the penetration of the bucket tip, the bucket tip can be rotated.

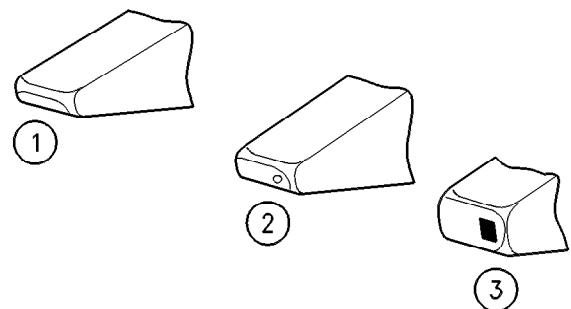


Illustration 383

g00101352

(1) Usable
(2) Replace
(3) Overworn

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal

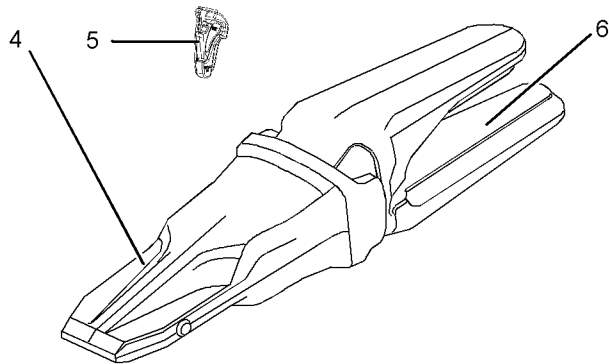


Illustration 384

g01389463

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.

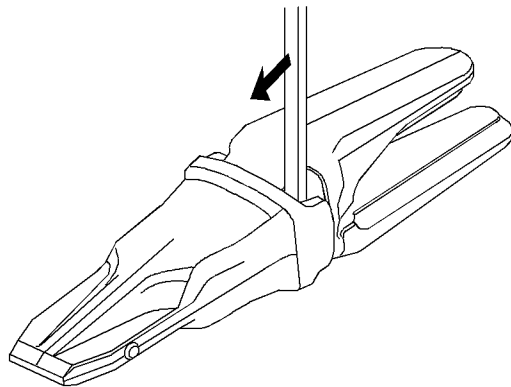


Illustration 385

g01175361

1. Use a pry bar in order to disengage retainer (5).
2. Use the pry bar in order to remove retainer (5) from bucket tip (4).
3. Remove bucket tip (4) from adapter (6) with a slight counterclockwise rotation.
4. Clean adapter (6).

Installation

1. Clean the adapter and the area around the latch, if necessary.
2. Install the new bucket tip onto the adapter with a slight clockwise rotation.

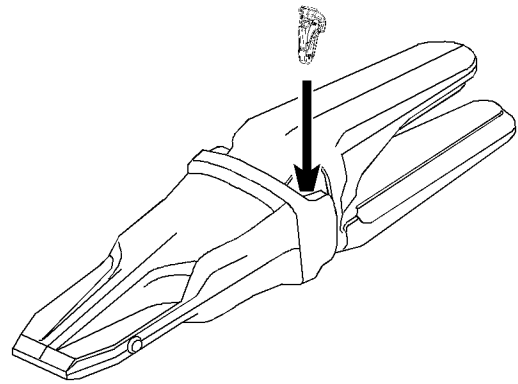


Illustration 386

g01124736

3. Install the retainer. Make sure that the retainer's latch catches under the tip pocket.
4. Make sure that the latch is properly seated by trying to remove the bucket tip.

Side Cutters (If Equipped)

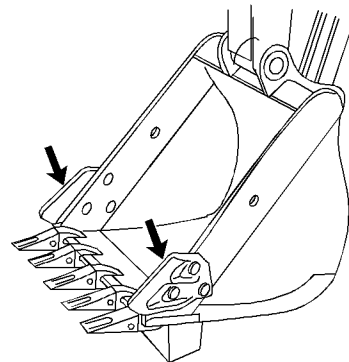


Illustration 387

g01389740

Bucket with side cutters
 Side cutters

1. Remove the mounting bolts and the side cutters.
2. Clean the mounting surface of the side plate on the bucket and of the side cutter. Remove any burrs or protrusions on the mating surfaces.

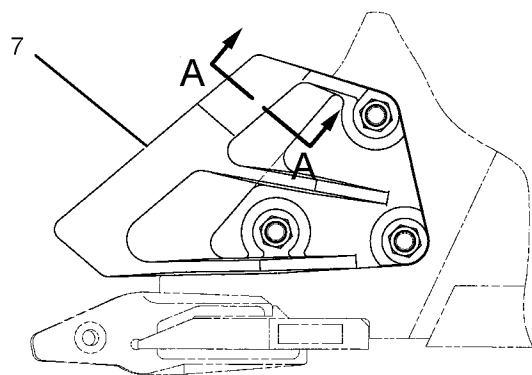


Illustration 388 g01389456
(7) Side cutter

Note: Some side cutters may be rotated for additional wear.

3. Install the side cutter.

Note: Certain bolts may require thread compound.

4. Hand tighten the bolts.

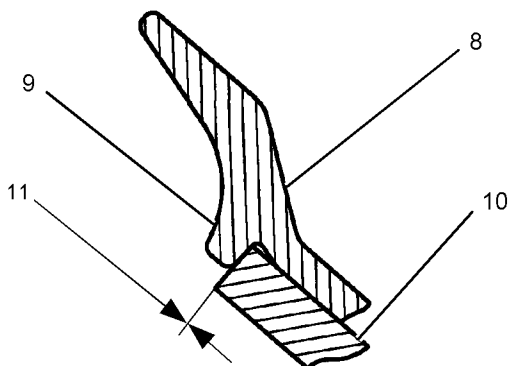


Illustration 389 g01389457
Section A-A From Illustration 388
(8) Side cutter
(9) Shear ledge on a side cutter
(10) Side plate on a bucket
(11) 0.0 mm (0.0 inch)

5. Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.

6. Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

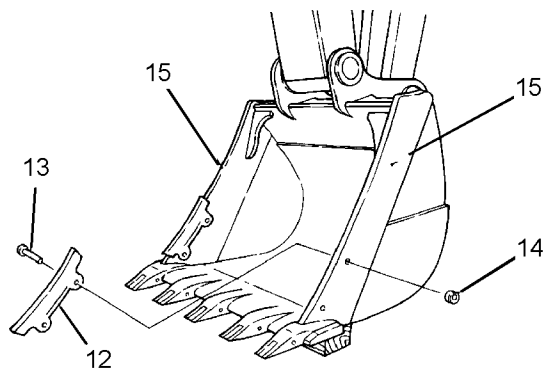


Illustration 390 g01389458

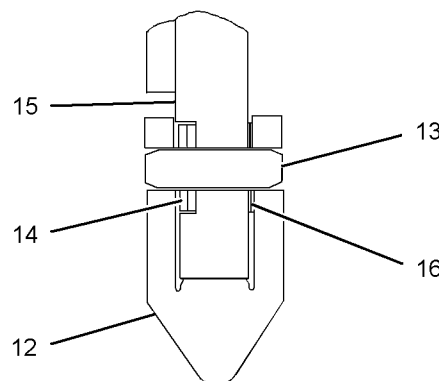


Illustration 391 g01903698

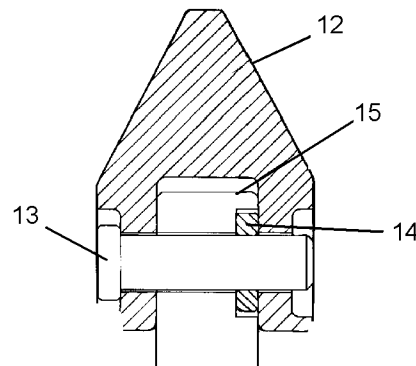


Illustration 392 g01389459
(12) Side protector
(13) Pin
(14) Retainer
(15) Side plate
(16) Shim

1. Hit pin (13) from the side of the bucket without the retainer in order to remove side protector (12) from side plate (15).

Maintenance Section
Cab Air Filter (Fresh Air) - Clean/Replace

- Clean side protector (12), pin (13), retainer (14) and side plate (15) before installation.

Note: Lateral clearance between the side plate and the side protector should not exceed 1 mm (0.04 inch). Shims (16) may be required in order to decrease the lateral clearance which will decrease movement. Install the shims(16) between the side plate and the side protector on the opposite side of the retainer.

- Put retainer (14) in side plate (15).
- Align two pin holes of the new protector and the side plate. Hit the pin from the retainer side of the bucket.

Note: If the pin and/or the retainer are worn, replace the pin and/or the retainer.

i03901495

Cab Air Filter (Fresh Air) - Clean/Replace

SMCS Code: 7342-510; 7342-070

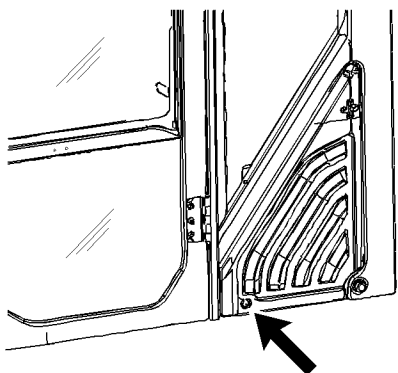


Illustration 393

g01973174

The cab air filter is located on the left side of the cab.

- Use the ignition key in order to open the access panel.

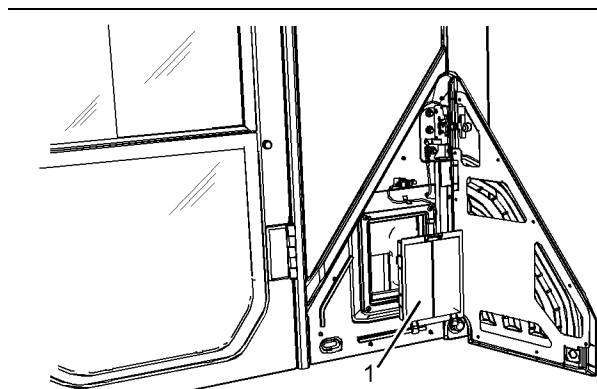


Illustration 394

g02144326

(1) Air filter

- Remove air filter (1).
- Clean the air filter with a maximum of 200 kPa (30 psi) pressure air.
- After you clean the air filter, inspect the air filter. If the air filter is damaged or badly contaminated, use a new air filter.
- Install the air filter and the filter cover.

i04281350

Cab Door Latch - Inspect/Adjust/Replace

SMCS Code: 7308-LX

Cab Door Latch Inspect

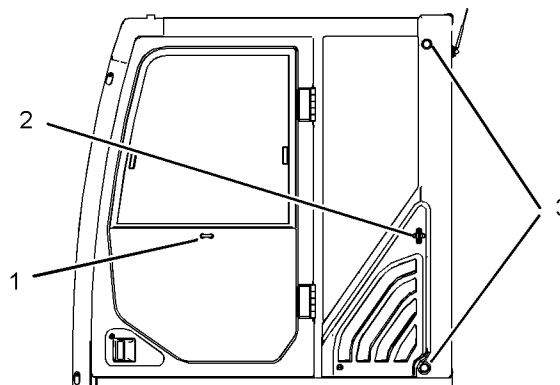


Illustration 395

g02449296

(1) Cab Door Striker
(2) Cab Door Latch
(3) Cab Door Stop

- Open the cab door and latch the door in the open position.

- Inspect door stops (3) for proper adjustment. The cab door should contact the door stops and slightly compress the rubber stoppers.

Note: Refer to “Cab Door Stop Adjust” if the door stops require adjustment.

- Inspect the operation of the door latch. The latch should not release the door unless you pull down on one of the door release levers located in the cab. When the door is closed, the door should release from the latch smoothly.

Note: If needed, spray an appropriate lubricant throughout the latch in order to clean and lubricate the latch mechanism

- Inspect the cab door striker (1) and the cab door latch (2). Ensure that the striker is properly aligned with the latch.

- Close the cab door.

Note: If the door does not latch properly or if the door does not release from the latch properly, refer to “Cab Door Latch Adjust” for the adjustment procedure.

Cab Door Stop Adjust

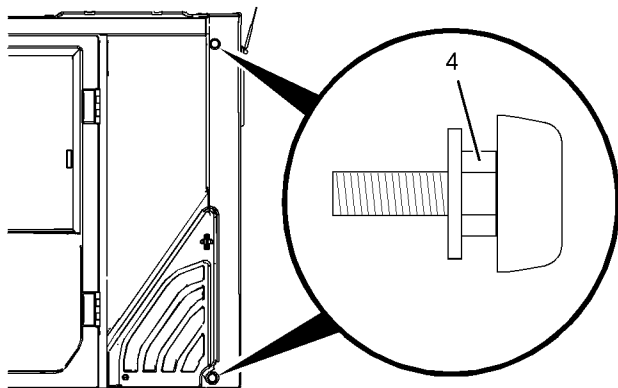


Illustration 396

g02449162

- Completely loosen nut (4) and rotate the door stop clockwise.
- Carefully open the cab door and latch the door in the open position.
- Rotate the door stop counter clockwise until the door stop contacts the door.
- Close the cab door.

- Rotate the door stop counter clockwise an additional 1 to 1 1/4 revolutions and tighten nut (4).

Cab Door Latch Adjust

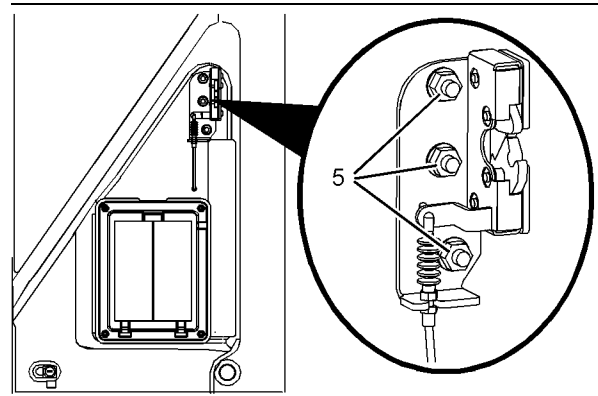


Illustration 397

g02449164

- Use the ignition key in order to open the access panel for the cab air filter.
- Loosen bolts (5) and align the striker on the cab door with the latch mechanism.
- Tighten bolts (5) and close the access panel.

Cab Door Latch Replace

Cab Door Latch Removal

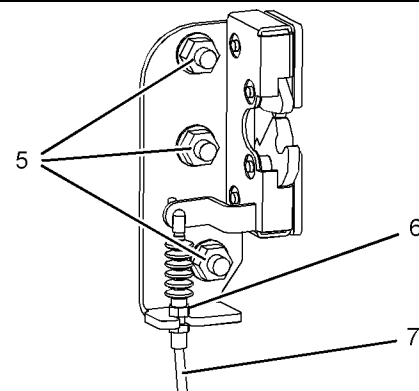


Illustration 398

g02449166

- Use the ignition key in order to open the access panel for the cab air filter.
- Loosen nut (6) and disconnect cable (7) from the latch assembly.
- Remove bolts (5) in order to remove the entire latch assembly.

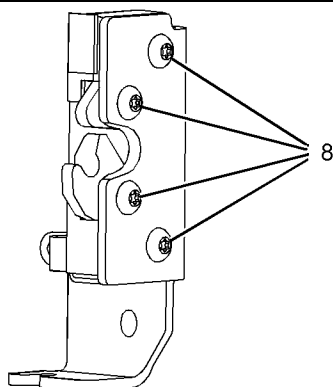


Illustration 399

g02449276

- Remove bolts (8) and remove the latch mechanism from the assembly.

Cab Door Latch Installation

- Perform the installation procedure in reverse order.

Note: Make sure that the striker and the latch are properly aligned. Refer to “Cab Door Latch Adjust”.

i06587366

Camera - Clean (If Equipped)

SMCS Code: 7348-070

WARNING

Failure to use an appropriate external ladder or an appropriate platform for direct access to the cameras could result in slipping and falling which could result in personal injury or death. Be sure to use an appropriate external ladder or an appropriate platform for direct access to the cameras.

The counterweight of the machine and the engine hood of the machine are not approved as maintenance platforms.

WARNING

Unexpected machine movement can cause injury or death.

In order to avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, “Do Not Operate” or similar warning tag to the hydraulic lockout control.

Note: When you access the cameras for cleaning, be sure to observe safe procedures for access. Maintain a three-point contact and/or use a body harness.

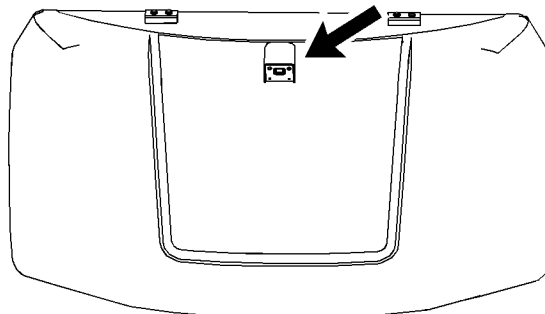


Illustration 400

g02158495

The rear view camera is located on top of the counterweight.



Illustration 401

g06035100

The side view camera is located on top of Fuel Tank.

If necessary, use a damp cloth in order to clean the glass of the camera. The camera is sealed. The camera is not affected by a wash with high-pressure spray.

Note: Alternatively, cameras may be cleaned from ground level by using a wash with a high-pressure spray or a damp rag on a wand.

i06524022

i04054869

Circuit Breakers - Reset

SMCS Code: 1420-529

The circuit breakers are located behind the front access door on the left side of the machine.

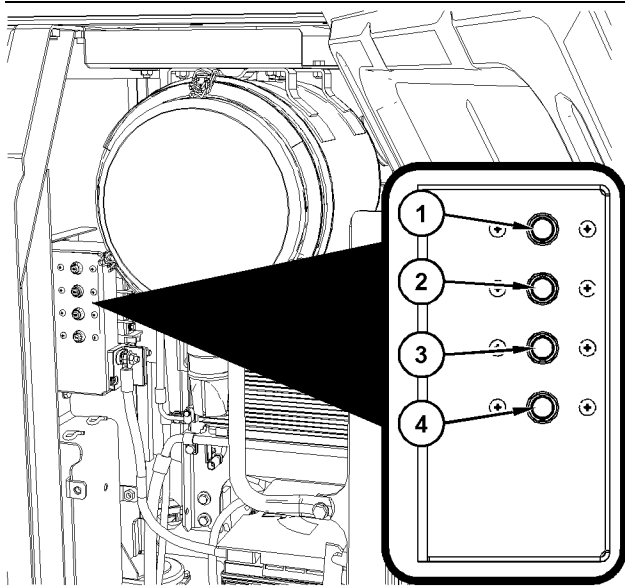


Illustration 402

g03703220



Diesel Exhaust Fluid Circuit (1) – This circuit breaker is designed to protect the DEF system. If the wires are shorted to the machine body, this circuit breaker would minimize the damage to the wires.



Alternator Circuit (2) – This circuit breaker is designed to protect the alternator. If the batteries are installed with reversed polarity, the circuit breaker would prevent the alternator from damaging the rectifier.



Main Circuit (3) – This circuit breaker is designed to protect the wires between the batteries and the fuses. If the wires are shorted to the machine body, this circuit breaker would minimize the damage to the wires.



Glow Plug Circuit (4) – This circuit breaker is designed to protect the glow plugs.

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

Condenser (Refrigerant) - Clean

SMCS Code: 1805-070

⚠ WARNING

Personal injury can result from air pressure.

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

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

NOTICE

If excessively dirty, clean condenser with a brush. To prevent damage or bending of the fins, do not use a stiff brush.

Repair the fins if found defective.

1. Open the access door on the left side of the machine.

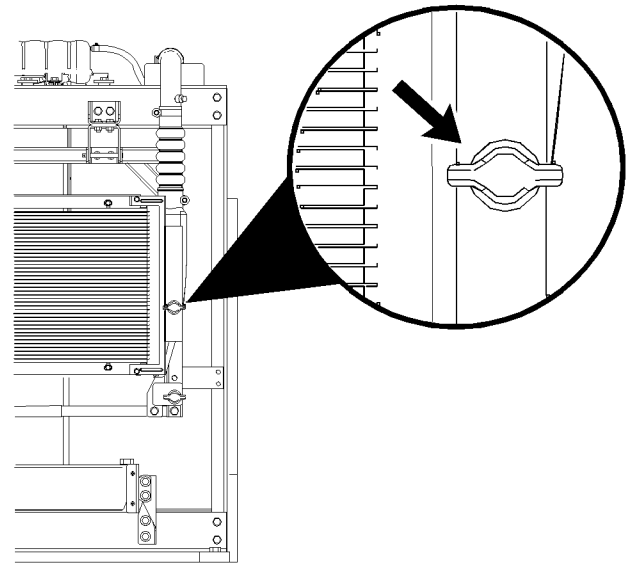


Illustration 403

g02255954

Air conditioner condenser latch

2. Unlatch the air conditioner condenser.

i05844475

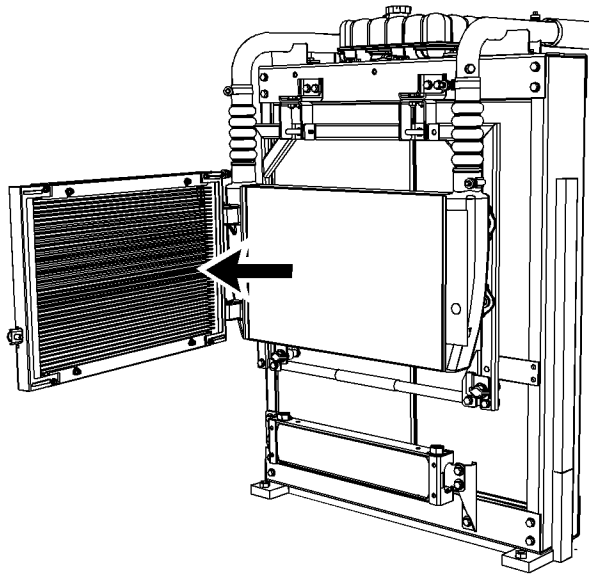


Illustration 404

g02255955

3. Swing the air conditioner condenser outward until the air conditioner condenser comes into contact against the stopper. Do not force the air conditioner condenser to open further.
4. Inspect the condenser for debris. Clean the condenser, if necessary.

Compressed air is preferred, but high-pressure water or steam can be used to remove dust and general debris from a core.

See Special Publication, SEBD0518, "Know Your Cooling System" for more detailed information about cleaning core fins.
5. Close and latch the air conditioner condenser.
6. Close the access door on the left side of the machine.

Cooling System Coolant (ELC) - Change

SMCS Code: 1350-044

! WARNING

Engine hood and engine hood parts can be hot while engine is running or immediately after engine shutdown. Hot parts or hot components can cause burns or personal injury. Do not allow these parts to contact your skin, when engine is running or immediately after engine shutdown. Use protective clothing or protective equipment to protect your skin.

! WARNING

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

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

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

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

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

NOTICE

Do not change the coolant until you read and understand the cooling system information in Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

Failure to do so could result in damage to the cooling system components.

NOTICE

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

Note: This machine was filled at the factory with Cat Extended Life Coolant.

If the coolant in the machine is changed to Extended Life Coolant from another type of coolant, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

1. Unlatch the engine hood and raise the engine hood.

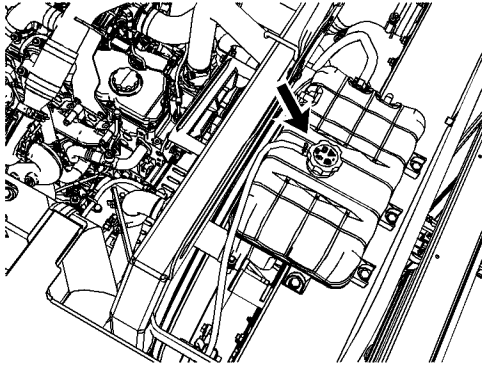


Illustration 405

g02153073

2. Slowly loosen the pressure cap that is on the coolant reservoir in order to release pressure from the cooling system.
 3. Remove the pressure cap.
 4. Inspect the gasket of the cooling system pressure cap. If the gasket is damaged, replace the pressure cap.
- Note:** Refer to Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.
5. Open the rear access door on the left side of the machine.

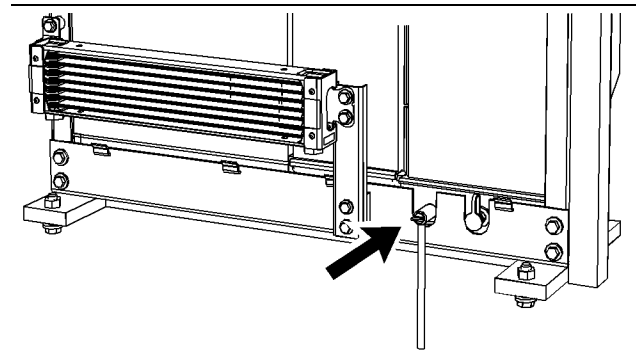


Illustration 406

g03694902

6. Open the drain valve and allow the coolant to drain into a suitable container. The drain valve is located on the bottom of the radiator.
7. Flush the cooling system. Follow Step 7a through Step 7h in order to flush the cooling system.
 - a. Close the drain valve.
 - b. Fill the cooling system with clean water.
 - c. Install the pressure cap.
 - d. Start the engine and run the engine until the engine reaches operating temperature.
 - e. Stop the engine and allow the engine to cool.
 - f. Loosen the pressure cap slowly in order to relieve any pressure in the cooling system.
 - g. Open the drain valve that is on the bottom of the radiator and allow the coolant to drain into a suitable container.
 - h. Flush the radiator with clean water until the draining water is transparent.
8. Close the drain valve.
9. Add the Extended Life Coolant. Refer to the following topics:
 - Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations"
 - Operation and Maintenance Manual, "Capacities (Refill)"
10. After the cooling system has been filled, perform the following procedures during initial start-up:
 - a. Start the engine without the filler cap.
 - b. Run the engine at low idle for 10 minutes.

- c. Then, increase the engine speed to a high idle until the water temperature regulator is open and the coolant level is stabilized.
- d. Maintain the coolant at the proper level as the water temperature regulator opens and air is purged from the system. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check".

i04064549

11. Install the cooling system pressure cap.

12. Stop the engine.

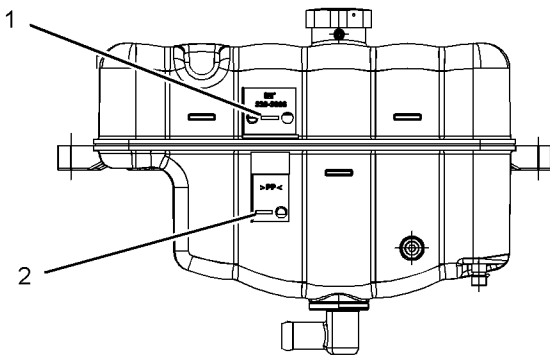


Illustration 407

g02153074

- (1) "FULL"
- (2) "LOW"

13. Check the coolant reservoir. Maintain the coolant level between "FULL" mark (1) and "LOW" mark (2).
14. If additional coolant is necessary, remove the pressure cap and add the appropriate coolant solution.
15. Install the pressure cap.
16. Close the engine hood and latch the engine hood. Close the left access door.

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352; 1353; 1395

⚠ WARNING

Engine hood and engine hood parts can be hot while engine is running or immediately after engine shutdown. Hot parts or hot components can cause burns or personal injury. Do not allow these parts to contact your skin, when engine is running or immediately after engine shutdown. Use protective clothing or protective equipment to protect your skin.

⚠ WARNING

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

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

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

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

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

Use Cat Extended Life Coolant (ELC) when you add coolant to the cooling system. See Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for all cooling system requirements.

Use a Coolant Conditioner Test Kit in order to check the concentration of the coolant.

NOTICE

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

i04047486

Note: This machine was filled at the factory with Cat Extended Life Coolant.

1. Park the machine on level ground.
2. Stop the engine.
3. Unlatch the engine hood and raise the engine hood.

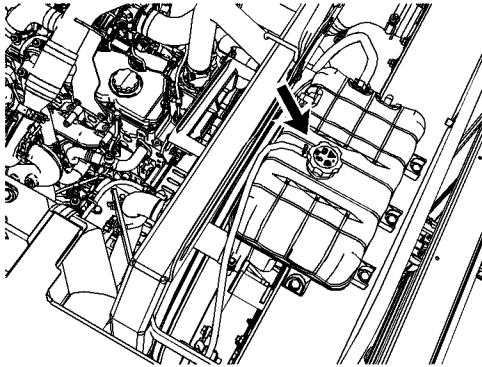


Illustration 408

g02153073

4. Make sure that the cooling system has cooled down. Loosen the cooling system pressure cap slowly in order to relieve system pressure. Remove the pressure cap.
- Note:** Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.
5. You may need to drain some coolant from the radiator so that Cat Extender can be added to the cooling system.
- Note:** Always discard drained fluids according to local regulations.
6. Add Cat Extended Life Coolant (ELC) to the cooling system. Refer to the following topics for the proper amount of Cat Extender:
 - Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations"
 - Operation and Maintenance Manual, "Capacities (Refill)"
 7. Inspect the o-ring of the cooling system pressure cap. If the o-ring is damaged, replace the pressure cap.
 8. Install the cooling system pressure cap.
 9. Close the engine hood and latch the engine hood.

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV; 1350-040; 1395-535-FLV

WARNING

Engine hood and engine hood parts can be hot while engine is running or immediately after engine shutdown. Hot parts or hot components can cause burns or personal injury. Do not allow these parts to contact your skin, when engine is running or immediately after engine shutdown. Use protective clothing or protective equipment to protect your skin.

WARNING

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

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

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

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

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

1. Unlatch the engine hood and raise the engine hood.

Maintenance Section
Cooling System Coolant Sample (Level 1) - Obtain

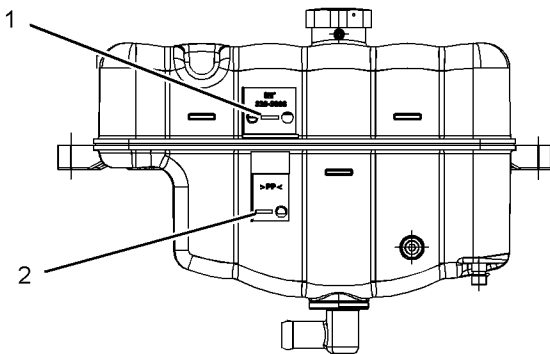


Illustration 409

g02153074

- (1) "FULL" level
(2) "LOW" level

2. Check the coolant level of the coolant reservoir when the engine is cold. Maintain the coolant level between the "FULL" mark and the "LOW" mark. If the coolant reservoir is empty, follow Steps 2a through 2g.

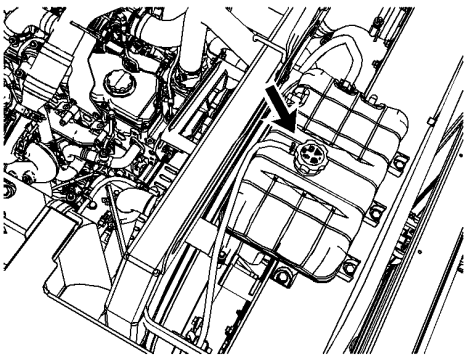


Illustration 410

g02153073

- a. Slowly loosen the cooling system pressure cap in order to relieve system pressure. Remove the pressure cap.

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

- b. Add the appropriate coolant solution to the cooling system. Refer to the following topics:

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

- c. Start the engine. Operate the engine without the cooling system pressure cap until the water temperature regulator opens and the coolant level stabilizes.
- d. Inspect the condition of the o-ring on the pressure cap. If the o-ring is damaged, replace the pressure cap.
- e. Install the cooling system pressure cap.
- f. Stop the engine.
- g. Close the engine hood and latch the engine hood.

i04248140

Cooling System Coolant Sample (Level 1) - Obtain

SMCS Code: 1395-554; 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 contamination 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.

Note: Level 1 results may indicate a need for Level 2 Analysis.

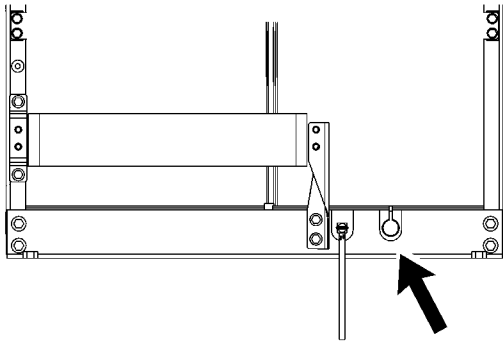


Illustration 411

g02419898

The coolant sampling port is located on the radiator.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of S·O·S analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.

- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

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

i07349178

Cooling System Coolant Sample (Level 2) - Obtain

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

Reference: Refer to Operation and Maintenance Manual, "Cooling System Coolant Sample (Level 1) - Obtain" for the guidelines for proper sampling of the coolant.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Cat dealer.

Submit the sample for Level 2 analysis.

Reference: For additional information about coolant analysis, refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Cat dealer.

i08057952

DEF Filler Screen - Clean ((Emission Related Component))

SMCS Code: 108K-070-Z3

NOTICE

Ensure that the engine is stopped before any servicing or repair is performed.

Maintenance Section
DEF Manifold Filters - Replace

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, "Cat Dealer Service Tool Catalog" or refer to Special Publication, PECJ0003, "Cat Shop Supplies and Tools Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

The filler neck adapter filter screen in the diesel exhaust fluid tank will need to be cleaned or replaced if contaminated.

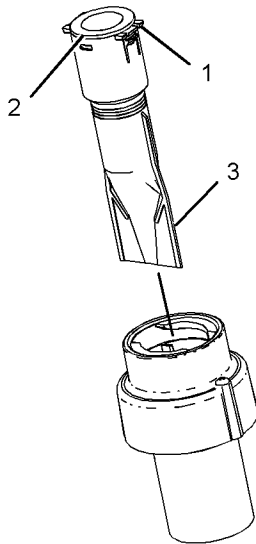


Illustration 412

g03618438

1. Use a screwdriver or pick to press the tabs (1).
2. Pull the screen assembly (2) upward from both sides and remove from the fill neck adapter
3. Use water or compressed air to clean out the filter screen (3). If there is any debris inside, let dry and remove the debris by turning the screen upside down and dumping debris out. If the debris cannot be removed or the filter screen is damaged, replace the filler neck adapter filter screen.

i07443771

DEF Manifold Filters - Replace (Emission Related Component)

SMCS Code: 108K-510-FI

NOTICE

Ensure that the engine is stopped before any servicing or repair is performed.

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, "Cat Dealer Service Tool Catalog" or refer to Special Publication, PECJ0003, "Cat Shop Supplies and Tools 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: Refer to Special Instruction, REHS8231, "Removal Procedures for Diesel Exhaust Fluid (DEF) Connectors" for the correct removal procedure of hose assemblies (1) and (5).

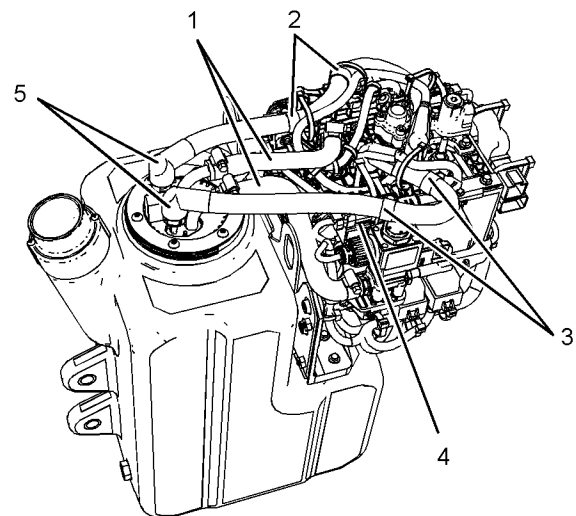


Illustration 413

g03662693

Typical Example

1. Clamp off hoses (1).

2. Remove clips (2) and (3). Disconnect harness assemblies (4). Remove hose assemblies (1) and (5).

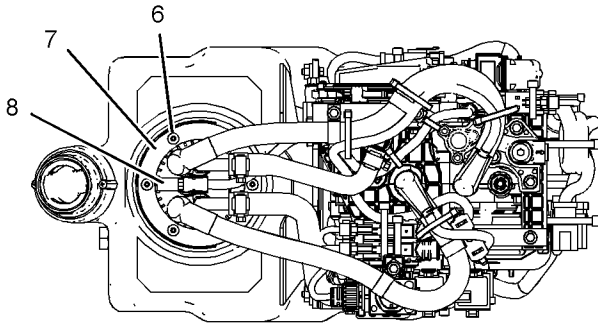


Illustration 414

g03665701

Typical Example

3. Remove bolts (6), plate (7), tank manifold (8), and gasket (not shown).

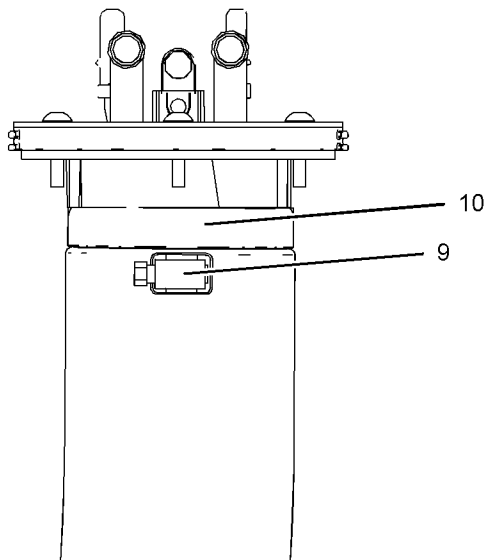


Illustration 415

g03665737

4. Unscrew the band clamp (9) and remove the band clamp from the filter base (10).

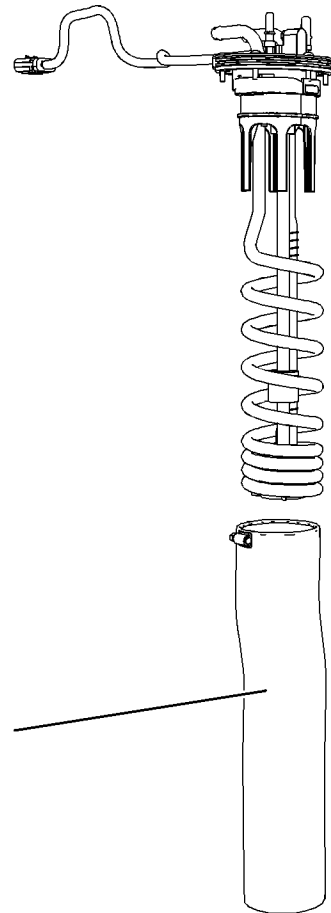


Illustration 416

g03664911

5. Remove the filter (11) from the filter base.

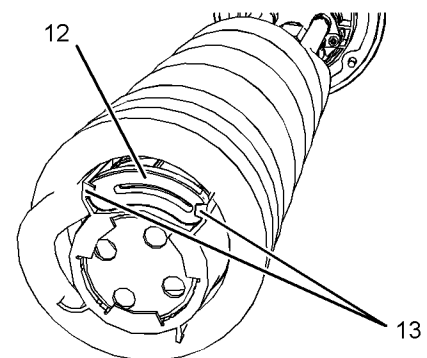


Illustration 417

g03666075

6. Remove the suction filter (12) at the bottom of the header coils by pulling tabs (13). Replace with a new suction filter.

Maintenance Section
Diesel Exhaust Fluid Filter - Replace

7. Install new filter by pulling filter over the manifold coils up to the bottom of the assembled filter base.

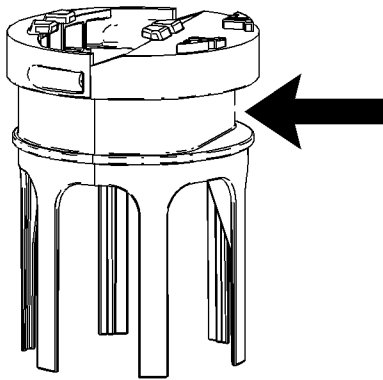


Illustration 418

g03665754

8. Tighten the band clamp 4.5 ± 0.7 N·m (40 ± 6 lb in), ensuring that the band clamp is aligned, as shown in illustration 418, to the flat spot on the base. Ensure that the filter does not bunch when tightening the band clamp.
9. Install the tank manifold following steps 3 through 5 in reverse order with a new gasket.
10. Tighten bolts (6) in an alternating sequence to 5 ± 1 N·m (44 ± 9 lb in). Tighten bolts (6) a second time in an alternating sequence to 5 ± 1 N·m (44 ± 9 lb in). Apply rubber lubricant to the o-ring seal inside of hose assemblies (1).

i05338005

Diesel Exhaust Fluid Filter - Replace

SMCS Code: 108K-510-FI

The Diesel Exhaust Fluid (DEF) filter is located on the DEF tank. The DEF tank is located in the tool box on the right side of the machine.

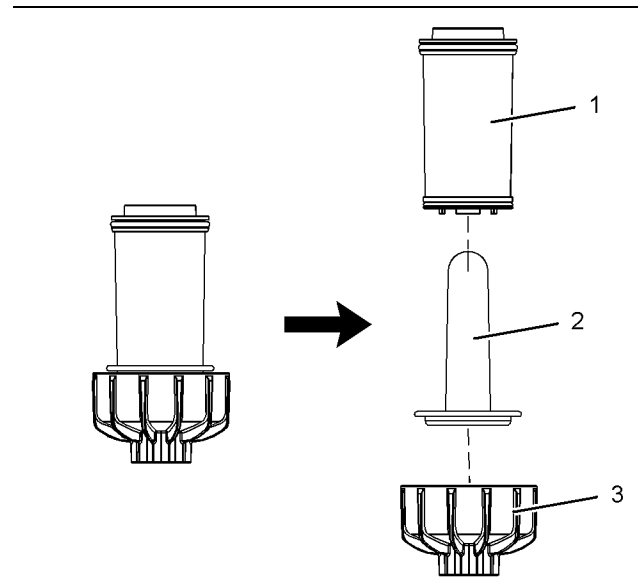


Illustration 419

g03332612

Typical Example

NOTICE

Ensure that the engine is stopped before any servicing or repair is performed.

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, "Cat Dealer Service Tool Catalog" or refer to Special Publication, PECJ0003, "Cat Shop Supplies and Tools 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. Remove the diesel exhaust fluid (DEF) filter cap (3) with a 27 mm (1.06 inch) wrench.
2. Remove the rubber cone insert (2) from the DEF filter (1).

i05872079

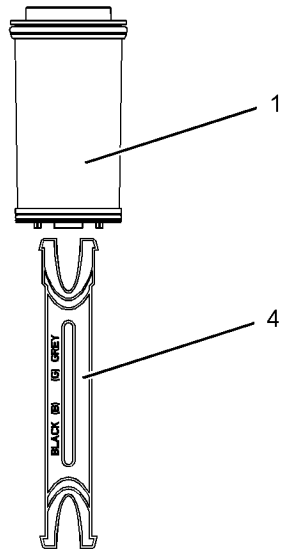


Illustration 420

g03332637

Typical Example

3. Insert the DEF filter removal tool (4) into the DEF filter (1) and remove the DEF filter (1).

Note: Wear gloves when you handle the DEF filter removal tool (4).

4. Clean the area around the filter housing.
5. Apply a thin coat of 207 - 1601 Lubricant to the seals of the new DEF filter (1).
6. Install new DEF filter (1) and rubber cone insert. Torque the filter to $20 \pm 5 \text{ N}\cdot\text{m}$ ($14.8 \pm 3.7 \text{ lb ft}$) with a 27 mm (1.06 inch) wrench.

Diesel Exhaust Fluid Injector - Replace

SMCS Code: 108I-510

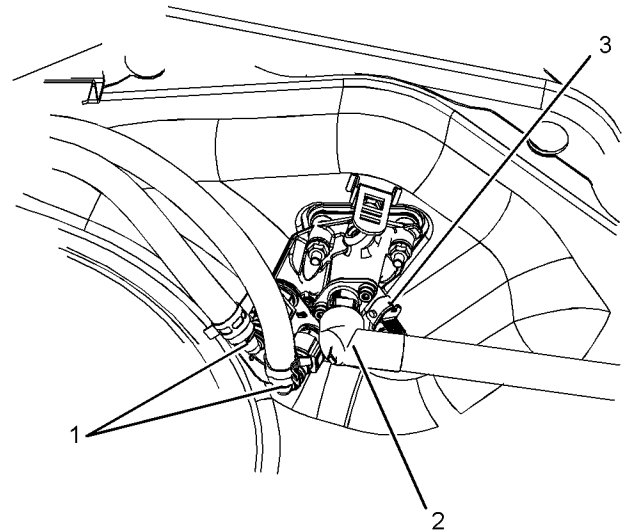


Illustration 421

g03418548

Typical example

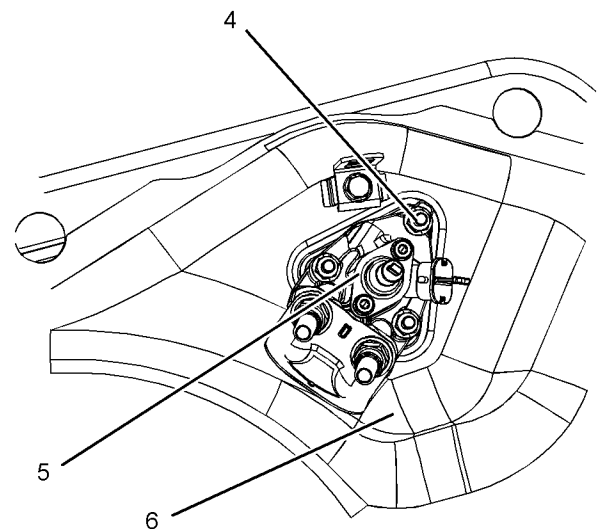


Illustration 422

g03418553

Typical example

1. Drain the coolant in order to remove the coolant lines (1). Remove the cooling lines (1) and remove Diesel Exhaust Fluid (DEF) line (2).

Maintenance Section
Diesel Exhaust Fluid - Fill

- Remove electrical connect from position (3) and install protection caps to DEF injector (5). Remove nuts (4) and washers (9) from DEF injector (5) and remove DEF injector from Clean Emission Module (CEM) (6).

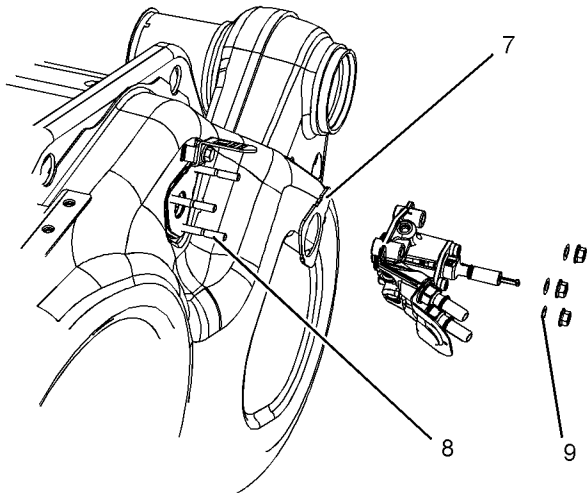


Illustration 423

g03418578

Typical example

- Remove gasket (7) and remove the studs (8). Discard the gasket and the studs.
- Ensure that the sealing face of the CEM is clean and free from dirt.
- Apply bostik pure nickel ant-seize compound to ends of the new studs (8). Install the coated ends of the new studs into the CEM, and tighten to a torque of 5 N·m (44 lb in).
- Install new gasket (7), ensure that the metal side of the gasket is to the CEM. Install new DEF injector (5) to CEM (6).
- Install washers (9) and apply bostik pure nickel ant-seize compound to the threads of the studs (8).
- Install the nuts (4) and tighten the nuts to a torque of 5 N·m (44 lb in). Retighten the nuts to 5 N·m (44 lb in). Then, turn the nuts additional 90 degrees.
- Install electrical connection into position (3) and install DEF line (2). Install coolant lines (1).
- Fill cooling system to the correct level. Ensure that the correct specification of coolant is used.

If available, using the electronic service tool (ET) perform DEF Dosing System Verification test.

i07143042

Diesel Exhaust Fluid - Fill

SMCS Code: 108K-544

Note: Stop the engine and turn the key to the OFF position before filling the DEF tank. Failure to stop the engine may cause fault codes.

Refer to Operation and Maintenance Manual, "Selective Catalytic Reduction Warning System" for more information.

NOTICE

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

Dispose of all fluids according to local regulations and mandates.

Reference: See Operation and Maintenance Manual, "Capacities (Refill)" for the capacity of the DEF tank for your machine.

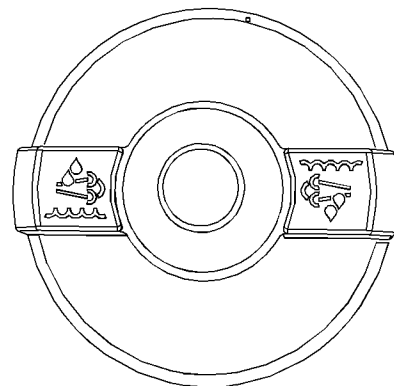


Illustration 424

g03746390

Blue DEF Tank Filler Cap

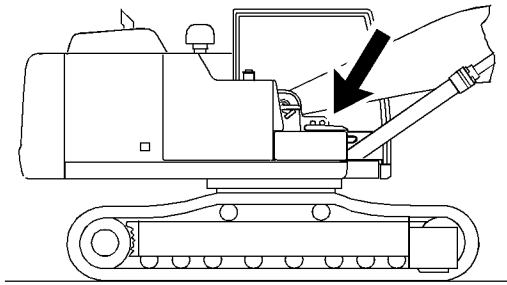


Illustration 425

g03419017

The DEF tank is located inside the storage box on the right side of the machine.

1. Clean the blue DEF tank filler cap and the surrounding area.
2. Remove the blue DEF tank filler cap.
3. Fill the tank with diesel exhaust fluid (DEF).

Note: Do not fill the DEF tank from a contaminated container or funnel.

Note: Do not over fill the tank. DEF can freeze and needs room for expansion.

4. Install the blue DEF tank filler cap.

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for more information on diesel exhaust fluid (DEF) guidelines.

i05900733

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-070; 1054-510

If a warning and a pictograph are displayed on the message display or if the exhaust is black, check the primary filter.

1. Open both access doors on the left side of the machine.

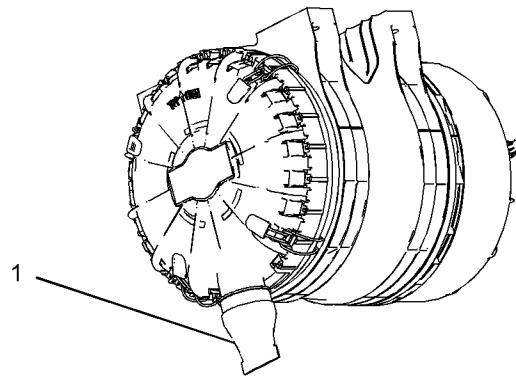


Illustration 426

g03716772

2. Squeeze the outlet tube (1) slightly in order to purge the dirt from the outlet tube.

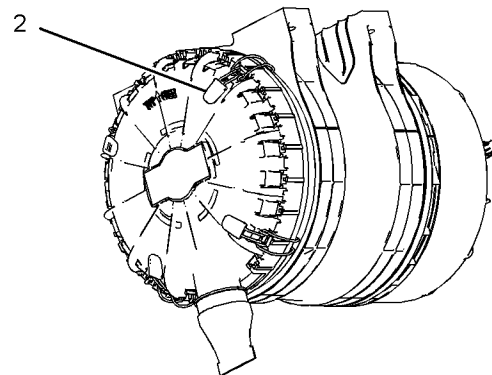


Illustration 427

g03716773

3. Loosen the cover latches (2) and remove the air cleaner cover.

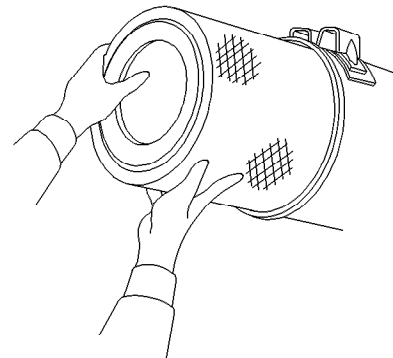


Illustration 428

g00101415

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

Maintenance Section
Engine Air Filter Primary Element - Clean/Replace

5. Clean the air cleaner cover and the inside of the air cleaner housing.
6. Inspect the O-ring seal on the air cleaner cover.
Replace the O-ring seal if the O-ring seal is worn or damaged.
7. Install the clean primary filter.

Note: Refer to “Cleaning Primary Air Filter Elements”.

8. Install the air cleaner cover and close the latches securely.

Note: Install the air cleaner cover properly. The outlet tube must point downward.

9. Change the filter if any of the following conditions occurs:
 - Restricted Air Filter indicator on the monitor panel still comes on.
 - Exhaust smoke is still black after the installation of a primary filter.

10. Close the access doors.

Cleaning Primary Air Filter Elements

NOTICE

Caterpillar recommends certified air filter cleaning services available at participating Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

When the primary air filter element is cleaned, check for rips or tears in the filter material. Replace the primary air filter element after the primary air filter element has been cleaned six times. The primary air filter element should be replaced at least one time per year. This replacement should be performed regardless of the number of cleanings.

NOTICE

Do not clean the air filter elements by bumping or tapping. This could damage the seals. Do not use elements with damaged pleats, gaskets, or seals. Damaged elements will allow dirt to pass through. Engine damage could result.

Visually inspect the primary air filter elements before cleaning. Inspect the air filter elements for damage to the seal, the gaskets, and the outer cover. Discard any damaged air filter elements.

There are two common methods that are used to clean primary air filter elements:

- Pressurized air
- Vacuum cleaning

Pressurized Air

Pressurized air can be used to clean primary air filter elements that have not been cleaned more than two times. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

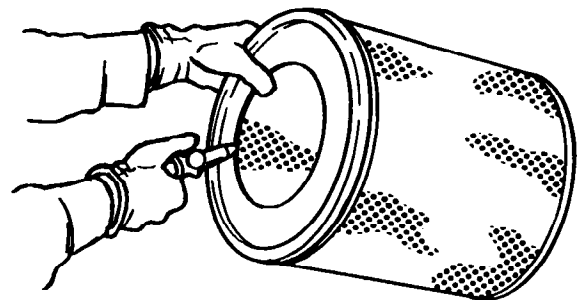


Illustration 429

g00281692

Note: When the primary air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Aim the hose so that the air flows inside the element along the length of the filter in order to help prevent damage to the paper pleats. Do not aim the stream of air directly at the primary air filter element. Dirt could be forced further into the pleats.

Vacuum Cleaning

Vacuum cleaning is another method for cleaning primary air filter elements which require daily cleaning because of a dry, dusty environment. Cleaning with pressurized air is recommended prior to vacuum cleaning. Vacuum cleaning will not remove deposits of carbon and oil.

Inspecting the Primary Air Filter Elements

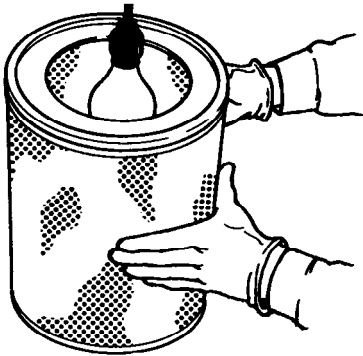


Illustration 430

g00281693

Inspect the clean, dry primary air filter element. Use a 60 watt blue light in a dark room or in a similar facility. Place the blue light in the primary air filter element. Rotate the primary air filter element. Inspect the primary air filter element for tears and/or holes. Inspect the primary air filter element for light that may show through the filter material. If it is necessary in order to confirm the result, compare the primary air filter element to a new primary air filter element that has the same part number.

Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets or seals. Discard damaged primary air filter elements.

Storing Primary Air Filter Elements

If a primary air filter element that passes inspection will not be used, the primary air filter element can be stored for future use.

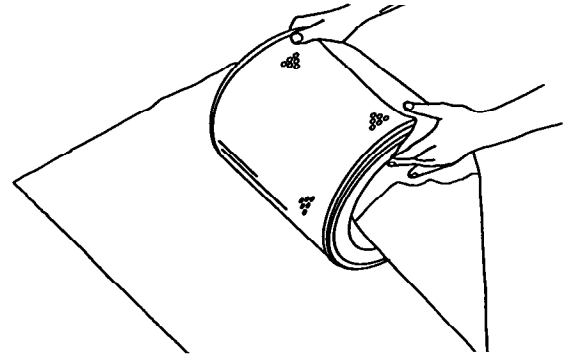


Illustration 431

g00281694

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An air flow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the primary air filter element into a box for storage. For identification, mark the outside of the box and mark the primary air filter element. Include the following information:

- Date of cleaning
- Number of cleanings

Store the box in a dry location.

i05770379

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510

NOTICE

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

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

The secondary filter element should also be replaced if the air filter restriction warning appears on the message display after the installation of a clean primary filter element.

1. Open the access door on the front left side of the machine.
2. See Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace". Remove the air cleaner cover from the air cleaner housing. Remove the primary filter element from the air cleaner housing.

Maintenance Section
Engine Oil Level - Check

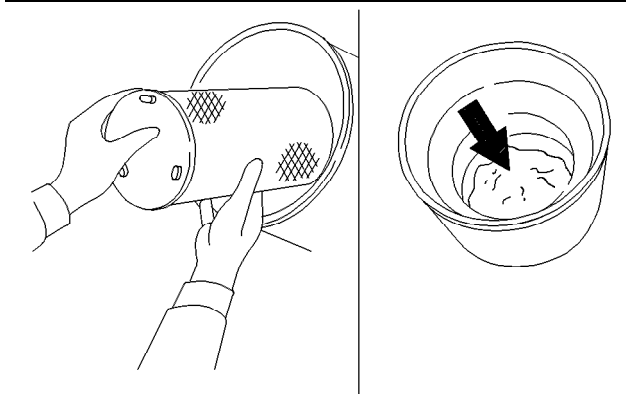


Illustration 432

g00101451

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

i04365872

Engine Oil Level - Check

SMCS Code: 1000-535

WARNING

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

NOTICE

Do not overfill the crankcase. Engine damage can result.

Note: This machine is equipped with both an automated function for checking fluid levels and a dipstick. Refer to Operation and Maintenance Manual, "Monitoring System" regarding the automated system. If the machine is on an incline or the engine has been stopped only for a short time, the engine oil does not return to the crankcase and the fluid level cannot be properly checked by either method. Park the machine on level ground. The engine oil level can be checked after the engine has been stopped for at least 30 minutes.

Check the oil level while the engine is stopped. Do not check the oil level while the engine is running.

1. Open the engine hood.

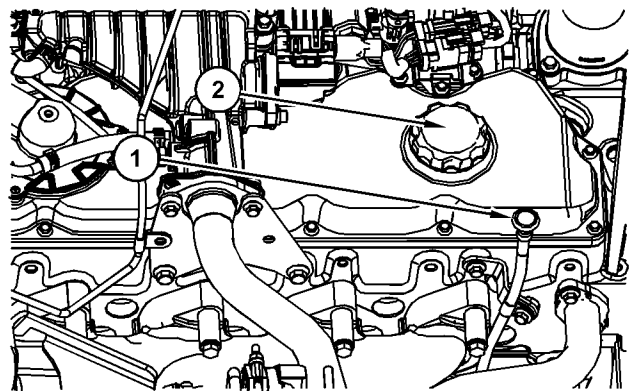


Illustration 433

g02519379

2. Remove dipstick (1). Wipe the oil off the dipstick and reinsert the dipstick.

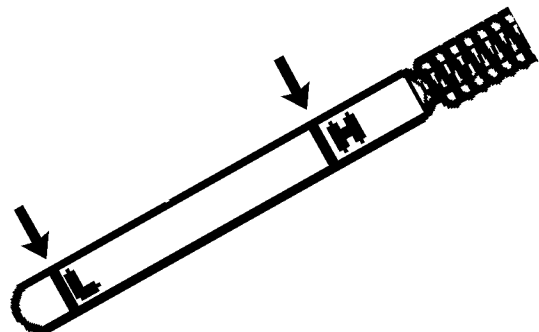


Illustration 434

g02153764

3. Remove the dipstick and check the dipstick. The oil level should be between the "L" mark and the "H" mark.

NOTICE

Operating your engine when the oil level is above the "H" mark could cause the crankshaft to dip into the oil. This could lead to excessively high oil temperatures which can reduce the lubricating characteristics of the oil, lead to bearing damage, and could result in loss of engine power.

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

4. Remove oil filler plug (2) in order to add oil, if necessary. See Operation and Maintenance Manual, "Lubricant Viscosities".

Note: If the oil is deteriorated or badly contaminated, change the oil regardless of the maintenance interval.

5. Clean the oil filler plug. Install the oil filler plug.
6. Close the engine hood.

i03996813

Engine Oil Sample - Obtain

SMCS Code: 1000; 1000-008; 1348-008; 1348-554-SM; 7542-554-OC; 7542-008; 7542-554-SM

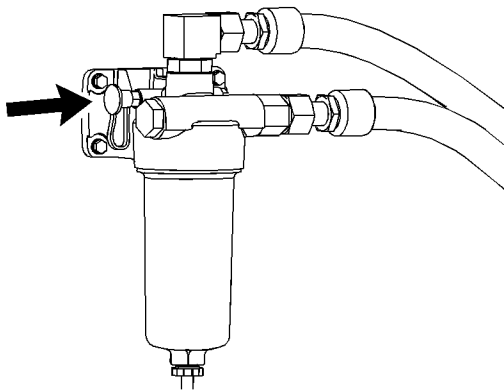


Illustration 435

g02174550

Obtain a sample of the engine oil from the engine oil sampling valve that is located on the engine oil filter housing. Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the engine oil. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining a sample of the engine oil.

i07144898

Engine Oil and Filter - Change

SMCS Code: 1318-510

Selection of the Oil Change Interval

Note: Customers with a fuel burn average of 11.3 L (3 US gal) per hour or less may extend engine oil and filter interval from 500 hours to 1000 hours when utilizing Cat[®] fluids, filters and S·O·S Services.

Required oil sampling interval is every 250 hours.

Initial engine oil and filter change at 500 hours is required for engine break-in.

Procedure for Changing Engine Oil and Filter

WARNING

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

Note: If the sulfur content in the fuel is greater than 1.5 percent by weight, use an oil that has a TBN of 30 and reduce the oil change interval by one-half.

Note: Drain the crankcase while the oil is warm. Warm oil allows waste particles that are suspended in the oil to drain. As the oil cools, the waste particles will settle to the bottom of the crankcase. The particles will not be removed by draining the oil and the particles will recirculate in the engine lubrication system with the new oil.

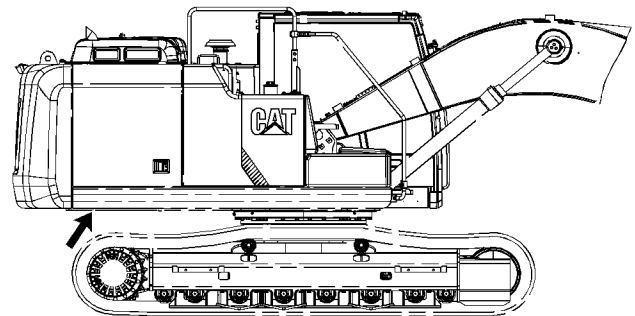


Illustration 436

g06018391

The drain valve for the engine crankcase oil is located under the rear of the upper structure.

Maintenance Section
Engine Oil and Filter - Change

1. Park the machine on a level surface. Stop the engine.

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

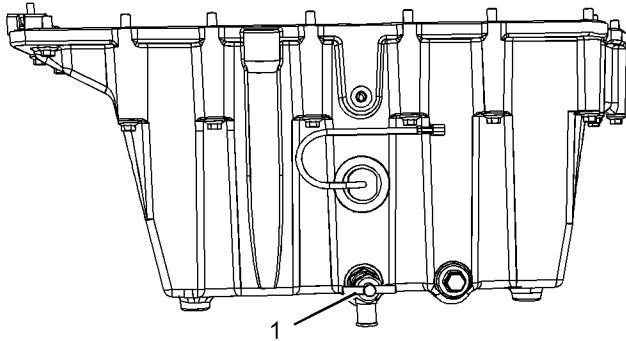


Illustration 437

g03886606

2. Open the crankcase drain valve (1). Allow the oil to drain into a suitable container.

Note: Discard any drained fluids according to local regulations.

3. Close the drain valve.
4. Open the access door at the right side of the machine.

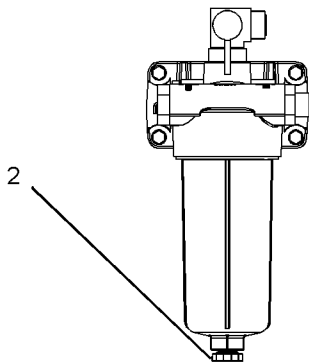


Illustration 438

g02157804

5. Loosen drain valve (2) and allow the oil to drain out of the housing.
6. After all the oil has been removed, tighten the drain.

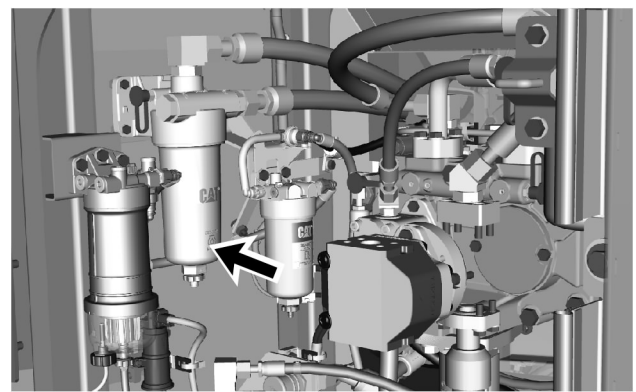


Illustration 439

g03886609

7. Remove the oil filter housing. See Operation and Maintenance Manual, "Oil Filter - Inspect". Dispose of the used filter according to local regulations.

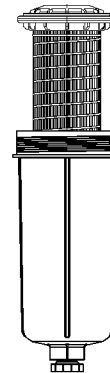


Illustration 440

g02157806

8. Remove the filter from the housing.
9. Clean the filter housing and the base.
10. Install the new filter element into the housing.
11. Apply a thin coat of engine oil to the gasket of the filter.
12. Install the engine oil filter by hand until the filter housing contacts the base.
13. Close the access door.
14. Unlatch the engine hood and raise the engine hood.

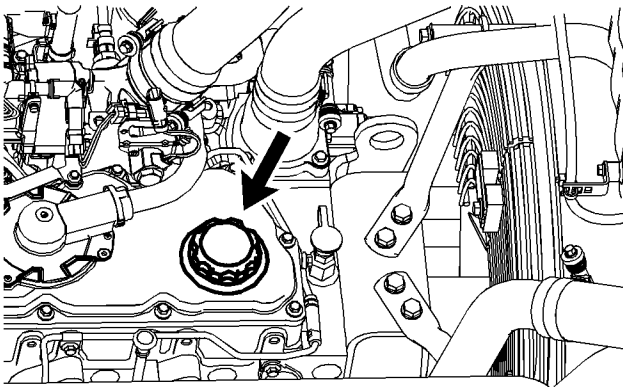


Illustration 441

g02240935

- 15.** Remove the oil filler plug . Fill the crankcase with new oil. See Operation and Maintenance Manual, "Capacities (Refill)". Clean the oil filler plug and install the oil filler plug.

NOTICE

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

- 16.** Start the engine and allow the oil to warm. Check the engine for leaks. Stop the engine.

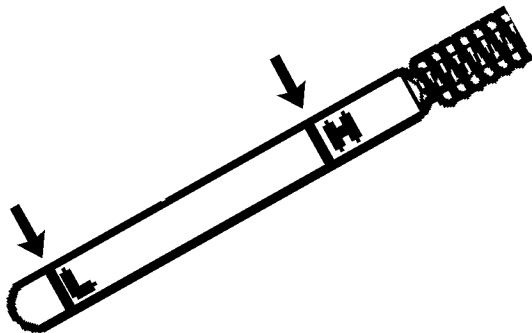


Illustration 442

g02153764

- 17.** Wait for 30 minutes to allow the oil to drain back into the crankcase. Check the oil level with the dipstick. Maintain the oil between the "L" and "H" marks on the dipstick. If necessary, add oil.

- 18.** Close the engine hood and latch the engine hood.

Fast Fill

If your machine is equipped with a deluxe service center, you may drain the engine oil through the fast fill port. You may also add the engine oil through a fast fill port.

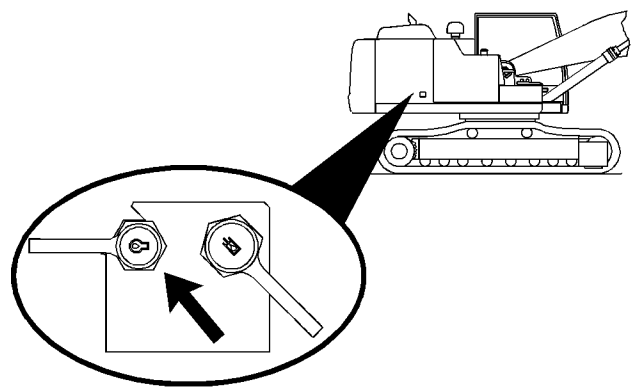


Illustration 443

g02240936

1. Open the access door on the right side of the machine.
2. Remove the dust cover.
3. Attach a hose that is equipped with a 126 - 7539 Nozzle.

Note: Make sure that the nozzle and the receiver are free from debris before attaching.

4. Drain the oil or add the oil, as needed.

5. Install the dust cover.

i07051358

Ether Starting Aid Cylinder - Replace (If Equipped)

SMCS Code: 1456-510-CD

WARNING

Breathing ether vapors or repeated contact of ether with skin can cause personal injury. Personal injury may occur from failure to adhere to the following procedures.

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.

The ether cylinder is located inside the rear access door on the left side of the machine.

Refer to Operation and Maintenance, "Fire Prevention and Explosion Prevention" before you replace the ether cylinder.

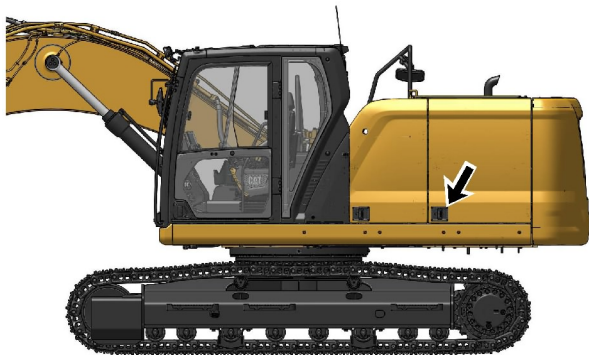


Illustration 444

g06179792

1. Open the rear access door at the left side of the machine.

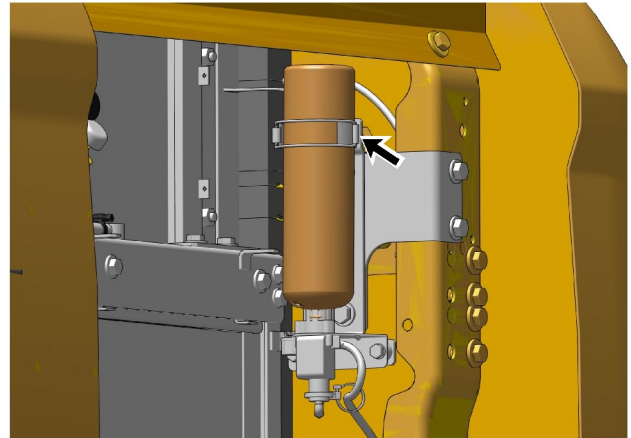


Illustration 445

g06211094

2. Loosen the cylinder retaining clamp.

3. Unscrew the empty ether starting aid cylinder and remove the empty ether starting aid cylinder.

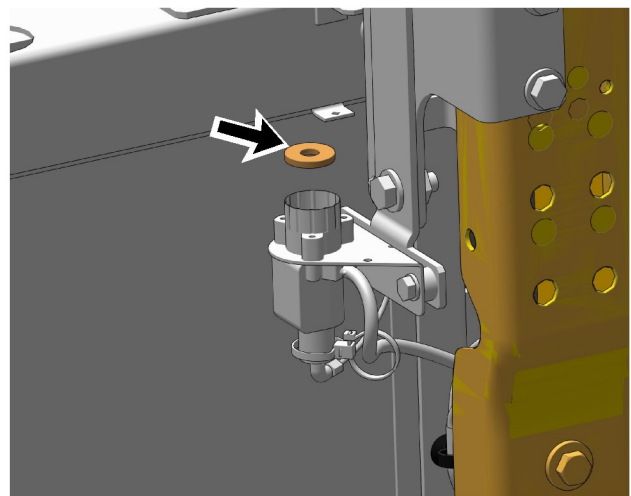


Illustration 446

g06211096

4. Remove the used gasket.

5. Install a new gasket.

Note: A new gasket and O-ring is provided with each new ether starting aid cylinder.

6. Install the new ether starting aid cylinder.

7. Tighten the ether starting aid cylinder hand tight.

- 8. Tighten the cylinder retaining clamp securely.
- 9. Close the access door.

i07681009

Film (Product Identification) - Clean

SMCS Code: 7405-070; 7557-070

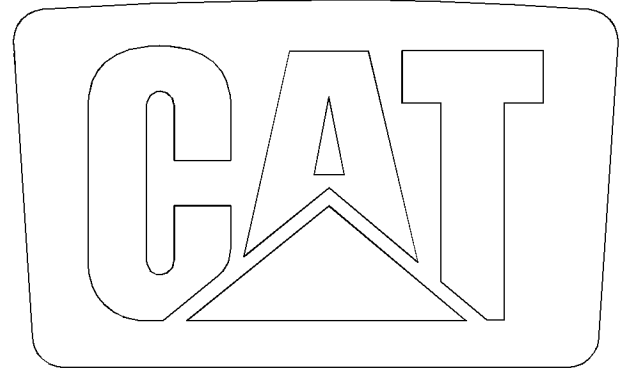


Illustration 447

g02174985

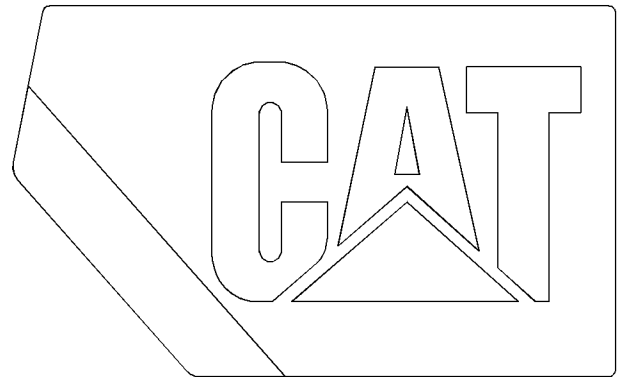


Illustration 448

g02175297



Illustration 449

g06394021

Typical example of the Product Identification Films.

Cleaning of the Films

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

Hand Washing

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

Power Washing

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

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

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

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

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

i06882903

Final Drive Oil - Change

SMCS Code: 4050-044-FLV

WARNING

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

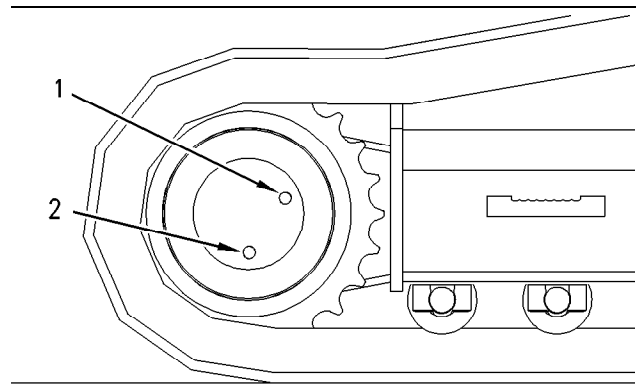


Illustration 450

g00822278

- (1) Oil level plug
(2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

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

2. Remove drain plug (2) and level plug (1). Allow the oil to drain into a suitable container.
3. Clean the plugs and inspect the O-ring seals. If wear or damage is evident, replace the drain plug, the level plug, and/or the O-ring seals.
4. Install drain plug (2).
5. Fill the final drive to the bottom of the opening on level plug (1). See Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

6. Install level plug (1).
7. Perform Step 1 to Step 6 on the other final drive.
Use a different container for the oil so that the oil samples from the final drives will be separate.
8. Completely remove the oil that has spilled onto surfaces.
9. Start the machine and allow the final drives to run through several cycles.
10. Stop the machine. Check the oil level.
11. Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Cat dealer.
12. Properly dispose of the drained material. Obey local regulations for the disposal of the material.

i03914051

Final Drive Oil Level - Check

SMCS Code: 4050-535-FLV

WARNING

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

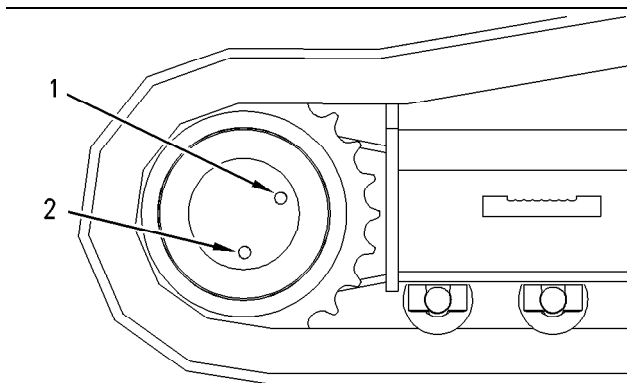


Illustration 451

g00822278

- (1) Oil level plug
(2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

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

2. Remove oil level plug (1).
3. Check the oil level. The oil should be near the bottom of the level plug opening.
4. Add oil through the level plug opening, if necessary. See Operation and Maintenance, "Lubricant Viscosities".

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive in order to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

5. Clean oil level plug (1). Inspect the O-ring seal. Replace the O-ring seal if the O-ring seal is worn or damaged.
6. Install oil level plug (1).
7. Repeat the procedure for the other final drive.

i03756611

Final Drive Oil Sample - Obtain

SMCS Code: 4011-008; 4050-008; 4050-SM; 7542-008

WARNING

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

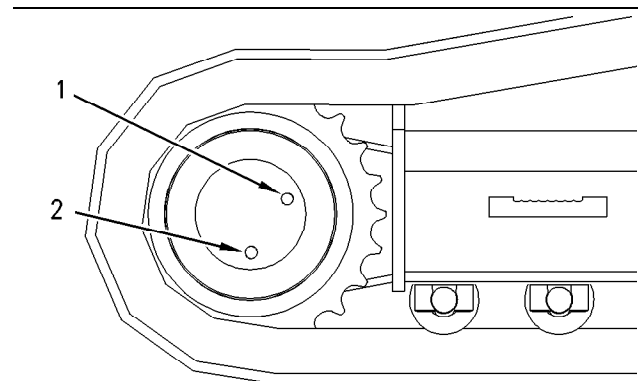


Illustration 452

g00822278

- (1) Oil level plug
(2) Oil drain plug

Maintenance Section
Fuel Lift Pump Strainer - Replace

1. Position the final drive so that oil drain plug (2) is at the bottom.

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

2. Remove oil level plug (1).
3. Obtain a sample of the final drive oil through the hole for the oil level plug.
4. Install oil level plug (1).

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "S·O·S Oil Analysis" for more information on obtaining a sample of the final drive oil. For additional information about taking an oil sample, refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample".

i04255791

Fuel Lift Pump Strainer - Replace

SMCS Code: 1256-510-STR; 1256

WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

NOTICE

Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

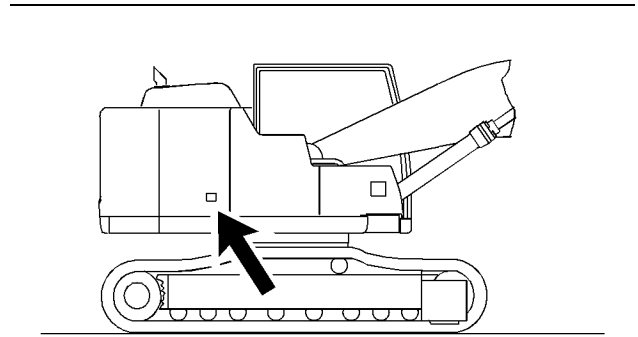


Illustration 453

g02415322

The fuel lift pump strainer is located behind the access door on the right side of the machine.

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

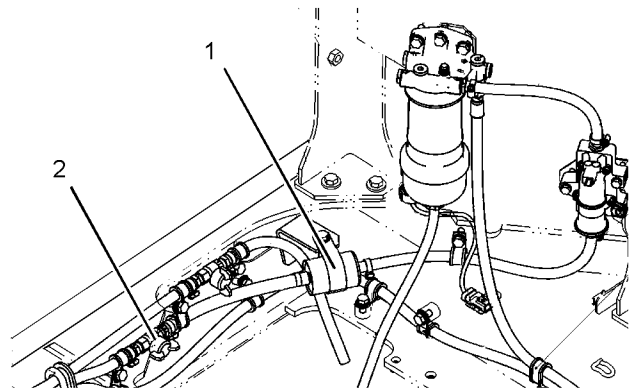


Illustration 454

g02426516

2. Close the fuel shut off valve (2) by turning the valve clockwise.
3. Disconnect the hoses from the strainer (1) and remove the strainer.
4. Replace the strainer.
5. Reconnect the hoses.
6. Open the fuel shut off valve (2) by turning the valve counterclockwise.
7. Replace the access cover that is underneath the fuel tank

i07318401

Fuel System - Prime

SMCS Code: 1250-548

WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

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

Refer to Special Publication, NENG2500, "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 loosen the fuel lines at the fuel manifold. The fittings may be damaged and/or a loss of priming pressure may occur when the fuel lines are loosened.

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.

Prime the fuel system to fill the fuel filter, and prime the fuel system to purge trapped air. The fuel system should be primed under the following conditions:

- The fuel tank is running low.
 - The machine has been stored.
 - The fuel filter is being replaced.
 - The fuel system has been repaired.
1. Turn the engine start switch to the ON position. Leave the engine start switch in the ON position for 4 minutes.
 2. Verify that the water separator is full of fuel.

3. If the water separator is not full of fuel, turn the engine start switch OFF and then turn the engine start switch ON. Turning the engine start switch off and on will cycle the fuel priming pump again.
4. When the water separator is full of fuel, attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate at low idle until the engine is running smoothly. If the engine cannot be started, or if the engine continues to misfire or smoke, repeat Step 1.

i06944065

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1263-510-FQ

WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

NOTICE

Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

The primary filter/water separator is located behind the access door on the right side of the machine.

1. Open the access door on the right side of the machine.
2. Shut off the fuel supply. Refer to this Operation and Maintenance Manual, "Fuel Tank Shutoff and Drain Control" for additional information.

Maintenance Section
Fuel System Secondary Filter - Replace

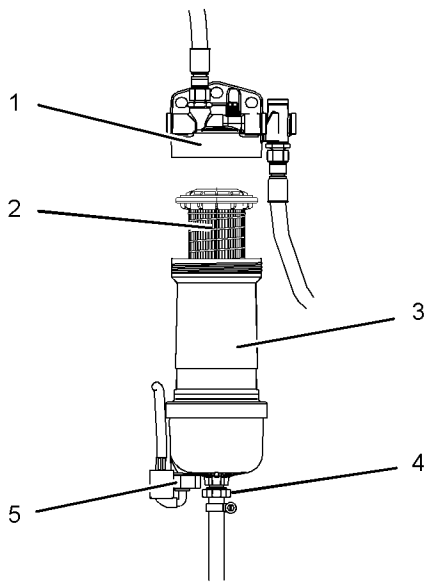


Illustration 455

g02241153

- (1) Filter base
- (2) Filter
- (3) Filter housing
- (4) Drain valve
- (5) Sensor

3. Turn drain valve (4) counterclockwise to open. The drain valve is located on the bottom of the water separator.

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

4. Drain the water and the sediment into a suitable container.

Note: Dispose of used fluids according to local regulations.

5. Close drain valve (4).

6. If equipped, remove the wiring harness from sensor (5) located on the bottom of the clear bowl.

Note: Do not attempt to remove the sediment bowl from the housing. The sediment bowl is permanently attached to the housing. Attempting to remove the sediment bowl may damage the bowl.

7. Remove filter housing (3) from filter base (1). A filter wrench may be used to loosen the filter housing.

8. Remove filter (2) from filter housing (3). Discard the used filter.

9. Clean the inside surfaces of the filter base and the filter housing.

10. Inspect the seal for damage. Replace the seal if the seal is damaged.

11. Lubricate the seal on the new filter with clean diesel fuel or lubricate the seal with clean motor oil.

12. Install the new filter into the filter housing (3). Tighten the filter housing to 10 N·m (7 lb ft), approximately 1/6 of a turn. Do not use tools to tighten the filter housing to the filter base.

13. If equipped, ensure that sensor (5) is in the correct position and install the wiring harness.

14. Close the access door.

15. Turn on the fuel supply. Refer to this Operation and Maintenance Manual, "Fuel Tank Shutoff and Drain Control" for additional information.

Note: Do not start the engine until all service to the fuel system is complete. For instructions about priming the fuel system, refer to Operation and Maintenance Manual, "Fuel System - Prime".

i06517795

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510

WARNING

Personal injury or death can result from a fire.

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

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

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

NOTICE

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

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.

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

i06939612

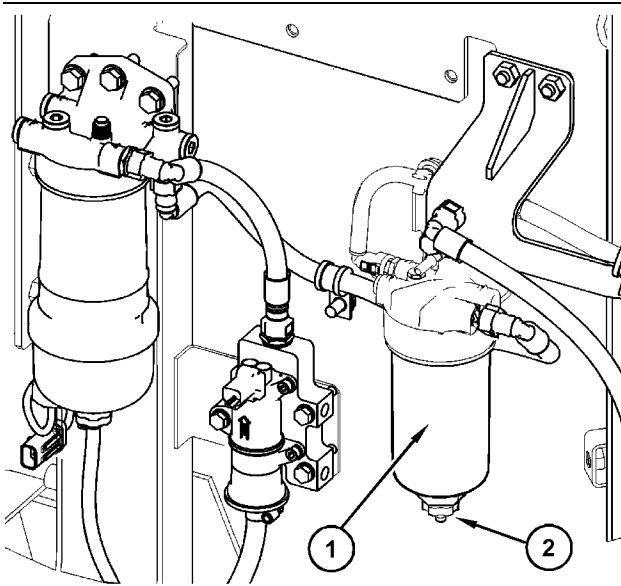


Illustration 456

g03700825

2. Loosen drain valve (2) and allow the fuel to drain out of the housing.

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

3. After all the fuel has been removed, tighten the drain.
4. Remove the secondary fuel filter housing (1) from the base.
5. Remove the filter element from the housing.
6. Clean the filter housing and the base.
7. Install the new filter element into the housing.
8. Apply a thin coat of clean diesel fuel to the sealing surface of the new fuel filter.
9. Install the new filter by hand until the filter housing contacts the base.
10. Prime the fuel system. See Operation and Maintenance Manual, "Fuel System - Prime" for instructions.
11. Close the access door.

Fuel System Water Separator - Drain

SMCS Code: 1263

1. Open the access door on the right side of the machine.
2. Provide a suitable container for used fluid.

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

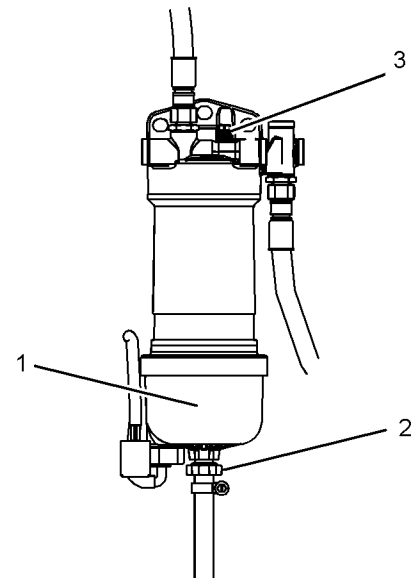


Illustration 457

g03049541

- (1) Bowl
- (2) Drain valve
- (3) Breather valve

Note: Do not attempt to remove the sediment bowl from the housing. The sediment bowl is permanently attached to the housing. Attempting to remove the sediment bowl may damage the bowl.

3. Check bowl (1) in the bottom of the water separator. Open drain valve (2). Drain the water and sediment from the bowl.

Note: Dispose of used fluids according to local regulations.

Note: If the water is hard to drain, loosen breather valve (3) on the filter base.

4. Close drain valve (2).
5. Close the access door.

i04421489

Fuel Tank Cap Filter - Replace

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

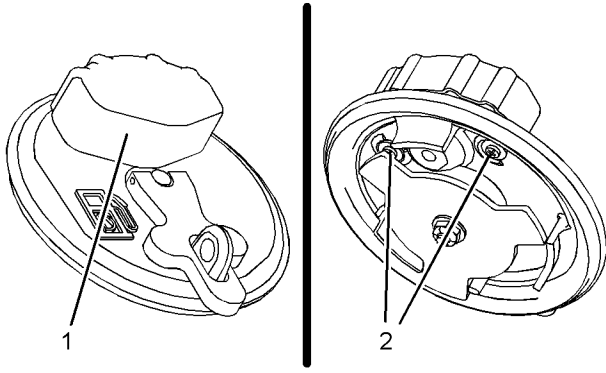


Illustration 458

g02612539

1. Remove the fuel cap.
2. Remove filter element screws (2) from the underside of the fuel cap and remove old filter element (1).
3. Wash the fuel tank cap in a clean, nonflammable solvent.
4. Install a new fuel cap filter element.
5. Install filter element screws (2) in order to secure filter element (1) to the fuel cap.
6. Install the fuel tank cap

i04462462

Fuel Tank Strainer - Clean

SMCS Code: 1273-070-STR

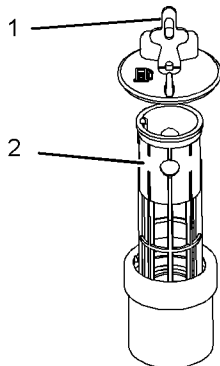


Illustration 459

g02609604

1. Remove fuel tank cap (1).

2. Remove strainer (2) from the filler opening.
3. Wash the strainer in a clean, nonflammable solvent.
4. Install the strainer into the filler opening.
5. Install the fuel tank cap.

i04363385

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543

Refer to this Operation and Maintenance Manual, "Fuel Tank Shutoff and Drain Control" for the exact location of the fuel tank drain valve

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

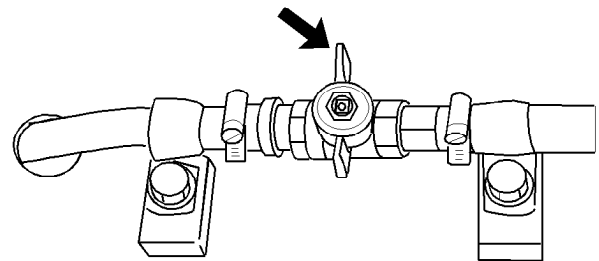


Illustration 460

g01043694

Typical example

1. Open the drain valve by turning the valve counterclockwise. Allow the water and the sediment to drain into a suitable container.

Note: Dispose of drained fluids according to local regulations.

2. Close the drain valve by turning the valve clockwise.

i03957056

i05841401

Fumes Disposal Filter Element - Replace

SMCS Code: 1074

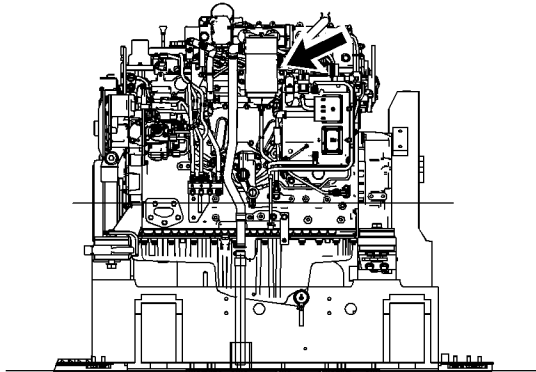


Illustration 461

g02159619

Note: Perform the maintenance while the engine is off.

1. Open the engine hood.
2. Remove the lid that holds the canister to the filter base assembly.
3. Remove the filter element. Dispose of the used element properly.
4. Install the new filter.
5. Install the lid.
6. Close the engine hood.

Fuses - Replace

SMCS Code: 1417-510

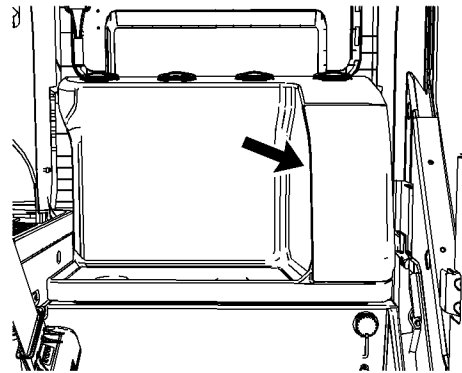


Illustration 462

g02110353

The fuse panel is located on the left side of the interior storage box. Remove the cover in order to access the fuses.



Fuses – Fuses protect the electrical system from damage that is caused by overloaded circuits. Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and/or repair the circuit.

NOTICE

Always replace fuses with the same type and capacity fuse that was removed. Otherwise, electrical damage could result.

NOTICE

If it is necessary to replace fuses frequently, an electrical problem may exist.

Contact your Cat dealer.

To replace a fuse, use the puller that is stored in the fuse panel.

The following list identifies the circuits that are protected by each fuse. The amperage for each fuse is included with each circuit.

Maintenance Section
Fuses - Replace

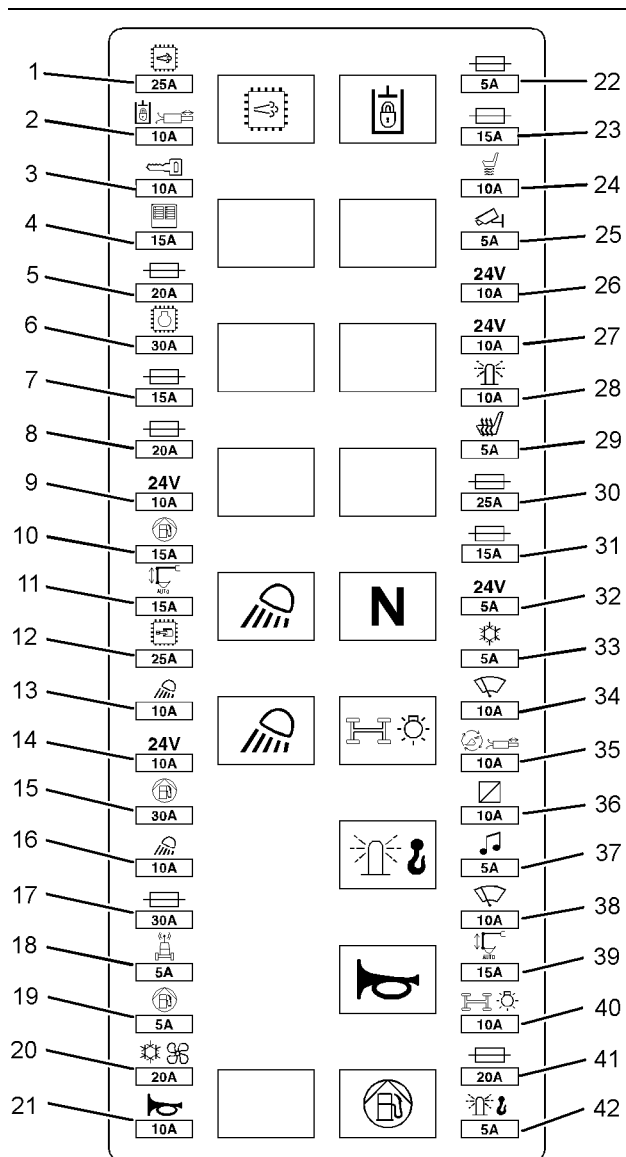


Illustration 463

g03693509

- (1) Engine Emission System ECM – 25 Amp
- (2) Hydraulic Lock – 10 Amp
- (3) Engine Start Switch – 10 Amp
- (4) Monitor – 15 Amp
- (5) Spare – 20 Amp
- (6) Engine Electronic Control Module (ECM) – 30 Amp
- (7) Spare – 15 Amp
- (8) Spare – 20 Amp
- (9) 24V Radio – 10 Amp
- (10) Electric Refueling Pump – 15 Amp

- (11) Cat Grade Control – 15 Amp
- (12) Machine Electronic Control Module – 25 Amp
- (13) Cab Light – 10 Amp
- (14) Auxiliary Hydraulic Circuit – 10 Amp
- (15) Electric Refueling Pump – 30 Amp
- (16) Boom Light – 10 Amp
- (17) Spare – 30 Amp
- (18) Product Link – 5 Amp
- (19) Lifting Pump – 5 Amp
- (20) Heater and Air Conditioner Blower Fan – 20 Amp
- (21) Horn – 10 Amp
- (22) Spare – 5 Amp
- (23) Spare – 15 Amp
- (24) Air Suspension Seat – 10 Amp
- (25) Camera – 5 Amp
- (26) Auxiliary Hydraulic Circuit – 10 Amp
- (27) 24V Radio – 10 Amp
- (28) Beacon – 10 Amp
- (29) Seat Heater – 5 Amp
- (30) Spare – 25 Amp
- (31) Spare – 15 Amp
- (32) Alternator – 5 Amp
- (33) Air Conditioner – 5 Amp
- (34) Lower Window Wiper – 10 Amp
- (35) Attachment Solenoid – 10 Amp
- (36) 12V Converter – 10 Amp
- (37) Radio – 5 Amp
- (38) Window Wiper – 10 Amp
- (39) Cat Grade Control – 15 Amp
- (40) Chassis Light – 10 Amp
- (41) Spare – 20 Amp
- (42) Warning Light – 5 Amp

Relays

i08067436

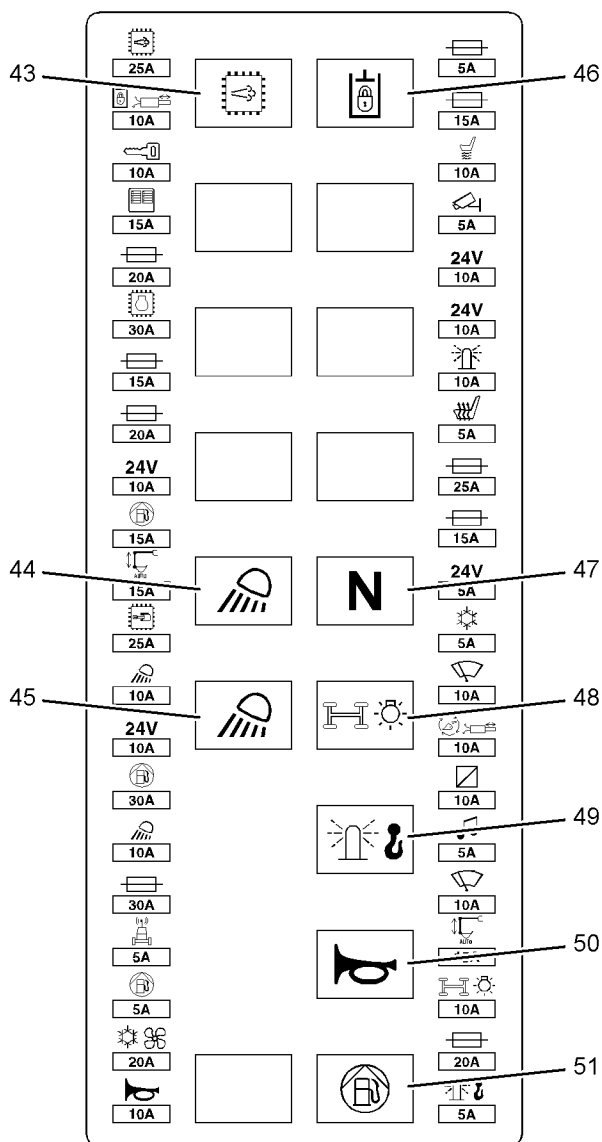


Illustration 464

g03693574

(43) Engine Emission System – Relay

(44) Cab Light – Relay

(45) Boom Light – Relay

(46) Hydraulic Lock – Relay

(47) Neutral Start – Relay

(48) Chassis Light – Relay

(49) Warning Light – Relay

(50) Horn – Relay

(51) Lifting Pump – Relay

High Intensity Discharge Lamp (HID) - Replace (If Equipped)

SMCS Code: 1434-510

⚠ WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

⚠ WARNING

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

NOTICE

Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

1. Prepare the machine for maintenance. Refer to Operation and Maintenance Manual, "Prepare the Machine for Maintenance".
2. Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least 5 minutes, to ensure that the bulb is cool.
3. Disassemble the housing for the HID lamp to have access to the bulb.

Note: On some HID lamps, the bulb is a part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

4. Remove the bulb from the HID lamp.
5. Install the replacement bulb in the HID lamp.

If the bulb is a part of the lens assembly, install the replacement lens assembly in the HID lamp.

Note: 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.

6. Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly for the HID lamp's mounting position on the machine.
7. Reattach the electrical power to the HID lamp.
8. Check the HID lamp for proper operation.

Note: Consult your Cat dealer for additional information on HID lamps.

i07106908

Hydraulic System Oil - Change

SMCS Code: 5056-044

Cat HYDO Advanced 10 Oil Change Interval

The standard Cat HYDO Advanced 10 oil change interval is every 6000 service hours or 3 years.

But a 6000 service hour or 3-year maintenance interval for hydraulic oil (change) is recommended with S·O·S monitoring of the hydraulic oil after 3000 service hours. The interval for S·O·S monitoring is every 500 hours. The Oil change is recommended when the oil deterioration or contamination is detected. The maintenance interval for the hydraulic oil filter is not changed.

Machines with hammers are not included in the 6000 service hour or 3-year maintenance interval. Machines with hammers must use the intervals that are listed in the Maintenance Interval Schedule. Machines that are used in severe conditions are not included in the 6000 service hour or 3-year maintenance interval. Machines that are used in severe conditions must use the interval in the Maintenance Interval Schedule.

Procedure to Change the Hydraulic Oil

WARNING

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

NOTICE

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

Refer to Special Publication, NENG2500, "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.

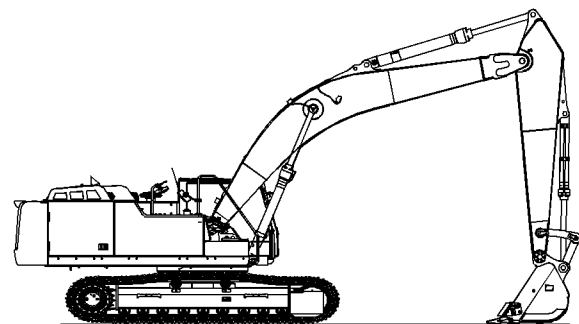


Illustration 465

g02022844

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.
2. Open the engine access cover.

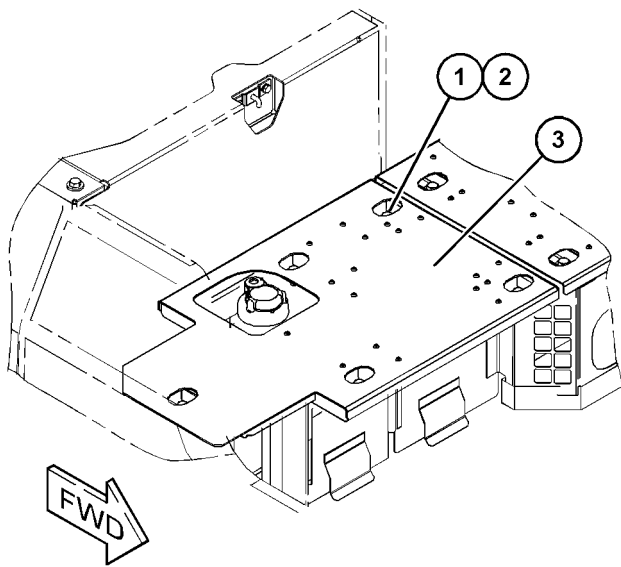


Illustration 466

g06018342

3. Remove bolts (1), washers (2), and cover (3) from the top of the hydraulic tank.

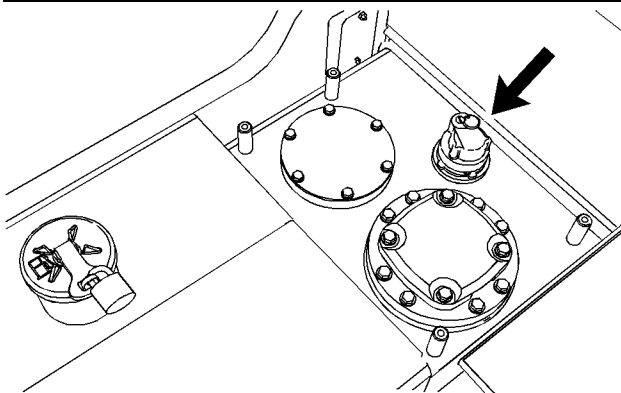


Illustration 467

g02243876

4. Clean the area thoroughly in order to keep dirt out of the screen cover. Clean the area thoroughly in order to keep dirt out of the filler cap.

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

5. Relieve the internal pressure from the hydraulic tank by slowly turning the tank cap approximately 1/8 of a turn until the cap reaches the secondary stop. After the tank pressure is relieved, then push down on the cap and continue turning until the cap can be removed.

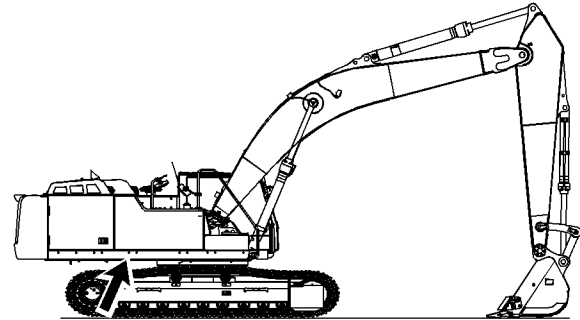


Illustration 468

g02022853

The oil drain valve is located under the hydraulic tank.

6. Remove the hydraulic tank access cover that is located under the upper structure. Removing the cover will allow access to the drain valve.

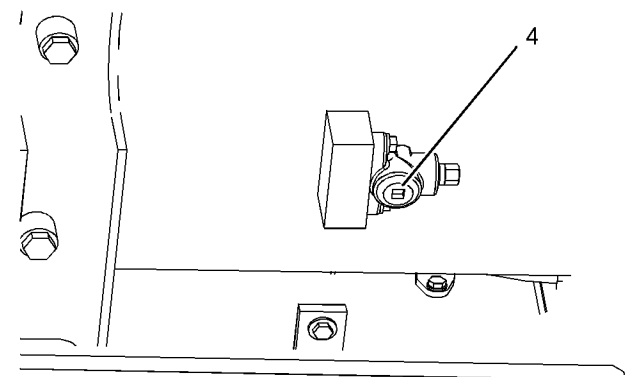


Illustration 469

g01124017

(4) Plug

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

7. Remove plug (4).
8. Inspect the O-ring. Replace the O-ring if wear or damage is evident.

Maintenance Section
Hydraulic System Oil - Change

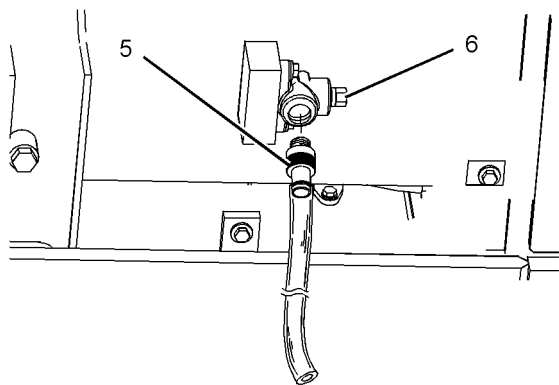


Illustration 470

g01124018

- (5) Swivel hose
(6) Drain plug

9. Install swivel hose (5) with clear plastic tubing.
10. Loosen drain plug (6) in order to drain the oil.
11. Drain the oil into a suitable container.
12. After the oil has been drained, tighten drain plug (7) to 110 ± 15 N·m (81 ± 11 lb ft).
13. Remove the swivel hose.
14. Clean plug (4) and install the plug. Tighten the plug to a 75 ± 5 N·m (55 ± 3.7 lb ft).
15. Open the access door on the right side of the machine.
16. Clean the pump, the hydraulic lines, and the hydraulic tank.

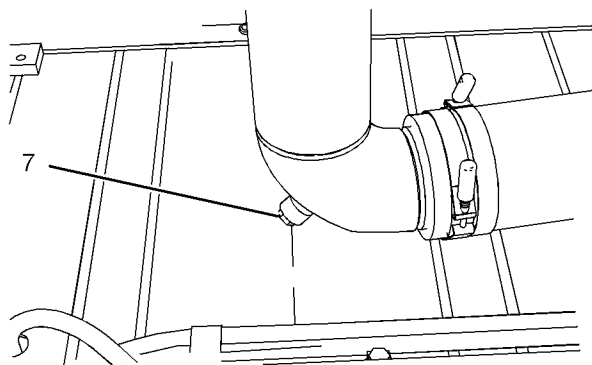


Illustration 471

g02144193

17. Remove plug (7) from the tube. Allow the oil to drain into a container.

Note: Dispose of used filters and used fluids according to local regulations.

18. Inspect the O-ring. Replace the O-ring if wear or damage is evident.

19. Clean the plug. Install the plug and the O-ring into the drain port.

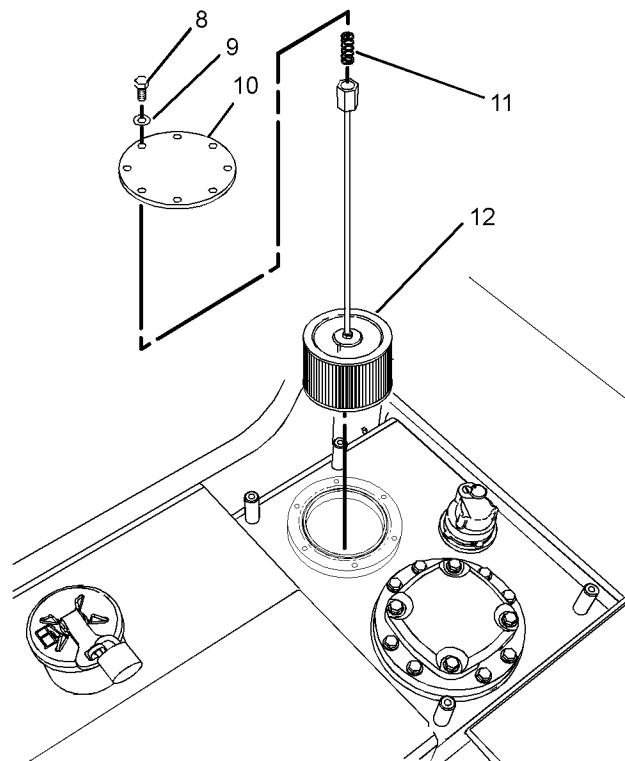


Illustration 472

g02243878

- (8) Bolts
(9) Washers
(10) Cover
(11) Spring
(12) Screen

20. Remove bolts (8), washers (9), and cover (10).

Note: Dispose of used filters and used fluids according to local regulations.

Note: Do not allow spring (11) to fall back into the tank.

21. Remove spring (11) and screen (12).

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

22. Wash the screen in a clean nonflammable solvent. Allow the screen to dry. Inspect the screen. Replace the screen, if the screen is damaged.

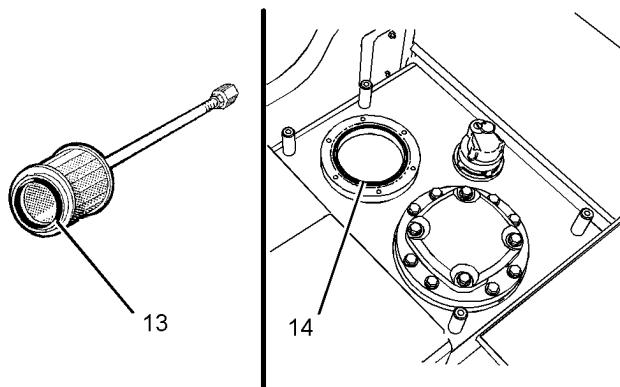


Illustration 473

g02243880

- (13) O-ring seal
(14) O-ring seal

23. Remove O-ring seal (13) from the screen.
24. Inspect O-ring seals (13) and (14). Replace the O-ring seals if wear or damage is evident.
25. Install O-ring seal (13) on screen (12).
26. Install screen (12) and spring (11). Then install cover (10), washers (9), and bolts (8).

Note: Make sure that the O-ring seals and the spring are properly positioned during installation.

27. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, "Capacities (Refill)".
28. Inspect the O-ring seal on the filler cap for damage. Replace the O-ring, if necessary. Clean the filler cap. Install the filler cap.

NOTICE

When the main hydraulic pump has been serviced or the hydraulic oil has been replaced, the air in the hydraulic system must be purged. Do not start the engine until the main hydraulic pump has been filled with oil.

Operating the hydraulic pump without proper lubrication will damage the pump and other hydraulic components.

29. When the hydraulic oil has been replaced, the air must be removed from the hydraulic oil system. To remove the air from the hydraulic oil system, follow Step 29a through Step 29g.

- a. Access the hydraulic pump. The hydraulic pump is located behind the right side access door.

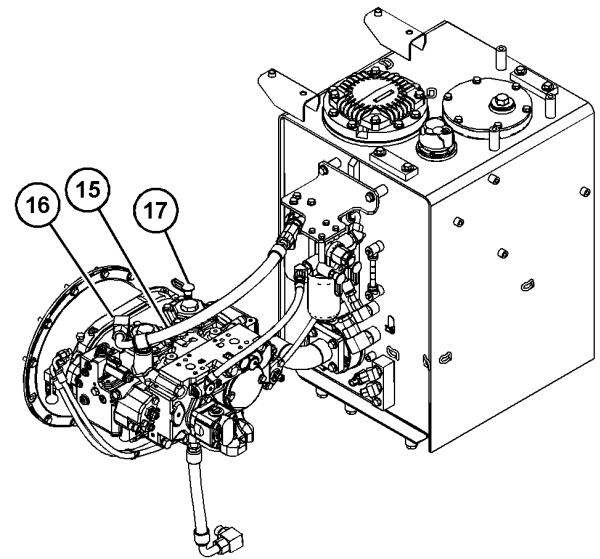


Illustration 474

g06226748

- (15) Drain hose
(16) Connector
(17) Fitting

- b. While the engine is stopped, remove drain hose (15) and connector (16) from the top of the pump. Add hydraulic oil through the opening.

Note: Check the condition of the O-ring seals on connector (16). If the seals are damaged, replace the seals.

- c. After the pump has been filled with oil, install drain hose (15) and connector (16) to the original locations.
 - d. Start the engine. When the engine is at low idle, fully raise the boom. Hold the boom in this position.
 - e. Stop the engine and slowly lower the boom until the work tool is on the ground. The hydraulic tank will pressurize.
 - f. Slowly loosen fitting (17) until the hydraulic oil flows out of the opening. This indicates that the air has been released from the pump.
 - g. Tighten fitting (17).
30. Start the engine. Operate the engine at idling speed for 5 minutes.

Maintenance Section
Hydraulic System Oil Filter (Case Drain) - Replace

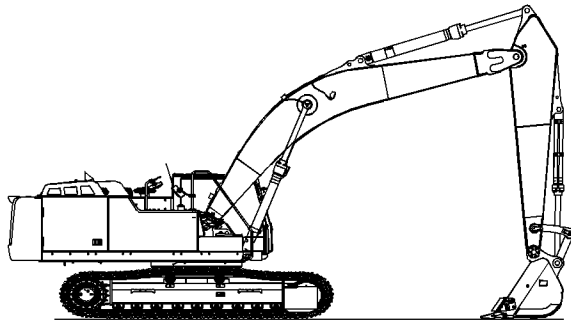


Illustration 475

g02022844

31. Operate the joysticks in order to circulate the hydraulic oil. Lower the bucket to the ground so that the stick is vertical to the ground. Stop the engine.

32. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

33. Close the access door.

34. Close the engine hood and latch the engine hood.

Fast Fill

If your machine is equipped with a deluxe service center, you may drain the hydraulic oil through the fast fill port. You may also add the hydraulic oil through a fast fill port.

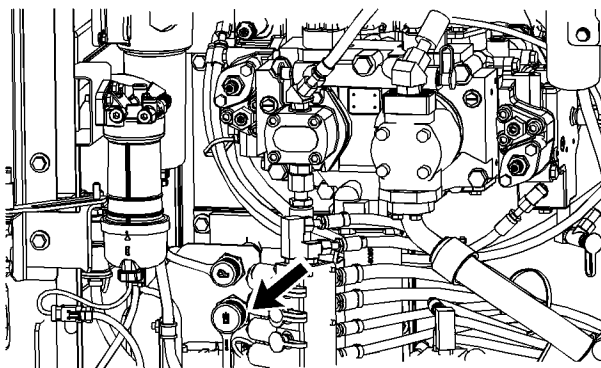


Illustration 476

g02710758

1. Remove the dust cover.

2. Attach the hose to the male coupling.

3. Drain the oil or add the oil, as needed.

i06546626

Hydraulic System Oil Filter (Case Drain) - Replace

SMCS Code: 5068-510; 5091-510

WARNING

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

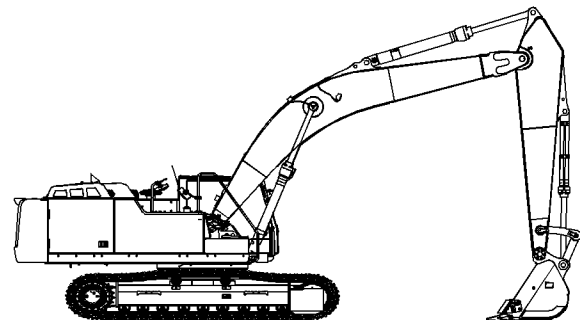


Illustration 477

g02022844

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.

2. Move the hydraulic lockout control to the UNLOCKED position.

3. Turn the engine start switch to the ON position.

4. Move the joysticks and the travel levers/pedals to the full stroke positions in order to relieve the pressure in the pilot lines.

5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

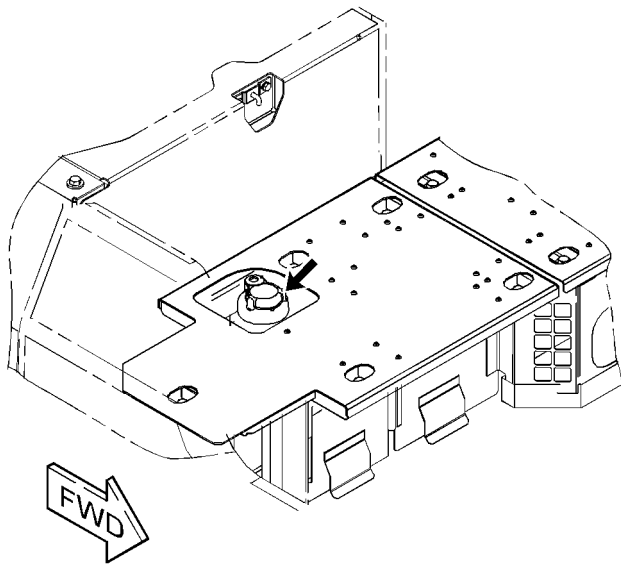


Illustration 478

g06018334

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

6. Relieve the internal pressure from the hydraulic tank by slowly turning the tank cap approximately 1/8 of a turn until the cap reaches the secondary stop. After the tank pressure is relieved, then push down on the cap and continue turning until the cap can be removed.
7. After the pressure is relieved, tighten the filler cap.
8. Open the access door on the right side of the machine.

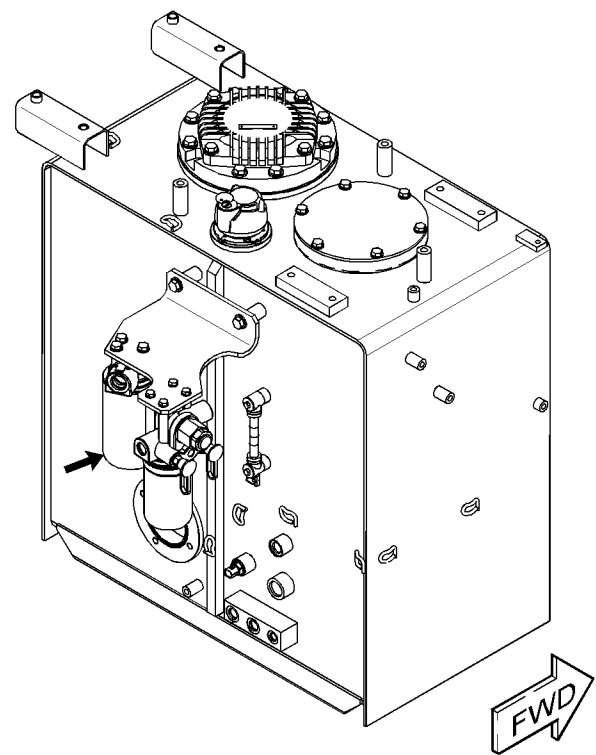


Illustration 479

g06018372

The case drain filter is located near the pilot oil filter.

9. Clean the area in order to keep dirt out of the filter base.

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

10. Remove the used case drain filter from the filter base.

Note: Used filters should always be disposed of according to local regulations.

11. Clean the filter base.

i06546623

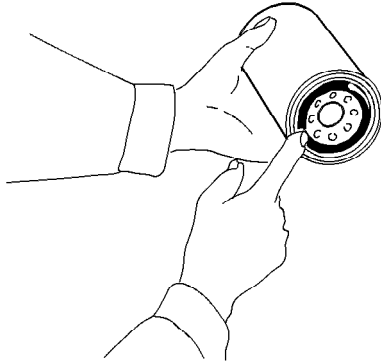


Illustration 480

g00101502

12. Coat the seal of a new case drain filter with clean hydraulic oil.

13. Install the new oil filter by hand.

Instructions for the installation of the filter are printed on the side of each Cat spin-on filter. For filters that are not Cat branded, refer to the installation instructions that are provided by the supplier of the filter.

14. Start the engine and operate the machine slowly for 10 to 15 minutes. Move each cylinder evenly through several cycles.

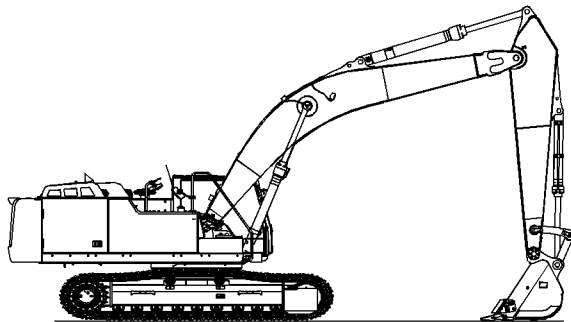


Illustration 481

g02022844

15. Return the machine to the position that is shown in Illustration 481. Check the machine for oil leaks.

16. Stop the engine.

17. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

18. Close the access door.

Hydraulic System Oil Filter (Pilot) - Replace

SMCS Code: 5068-510-PS; 5068-510; 5092-510

WARNING

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

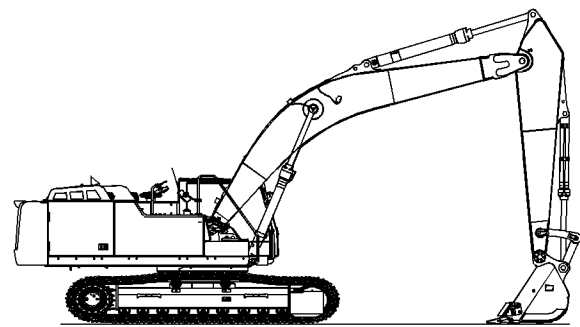


Illustration 482

g02022844

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.
2. Move the hydraulic lockout control to the UNLOCKED position.
3. Turn the engine start switch to the ON position.
4. Move the joysticks and the travel levers/pedals to the full stroke positions in order to relieve the pressure in the pilot lines.
5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

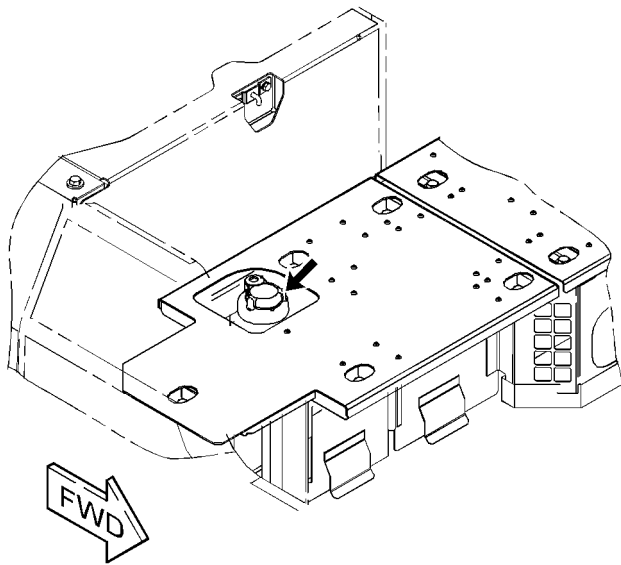


Illustration 483

g06018334

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

6. Relieve the internal pressure from the hydraulic tank by slowly turning the tank cap approximately 1/8 of a turn until the cap reaches the secondary stop. After the tank pressure is relieved, then push down on the cap and continue turning until the cap can be removed.
7. After the pressure is relieved, tighten the filler cap.
8. Open the access door on the right side of the machine.

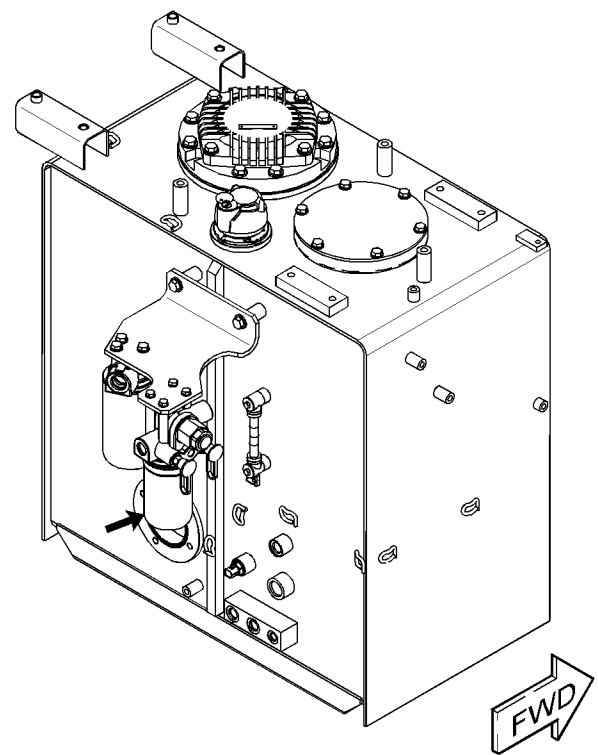


Illustration 484

g06018360

9. Clean the area in order to keep dirt out of the filter base.

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

10. Remove the used pilot filter element from the filter base.

Note: Used filters should always be disposed of according to local regulations.

11. Clean the filter base.

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace

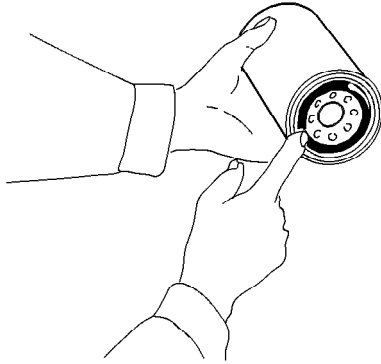


Illustration 485

g00101502

12. Coat the seal of a new pilot filter with clean hydraulic oil.

13. Install the new oil filter by hand.

Instructions for the installation of the filter are printed on the side of each Cat spin-on filter. For filters that are not Cat branded, refer to the installation instructions that are provided by the supplier of the filter.

14. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

15. Close the access door.

i06546614

Hydraulic System Oil Filter (Return) - Replace

SMCS Code: 5068-510-RJ

WARNING

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

The return filter is a cartridge type filter. The amount of foreign material that enters the hydraulic system is reduced when the filter element is replaced.

Two different filters are available for the return filter. One filter is used for standard applications such as digging and normal use of a hammer. The second filter is used for an application such as demolishing a ceiling in a tunnel with a hammer.

Note: If the message display shows that the hydraulic return filter is plugged, turn off the machine. After you make sure that the warning has disappeared, start the machine and run the machine on level ground for approximately 10 minutes. If the warning still appears in the message display, inspect the filter and replace the filter, if necessary.

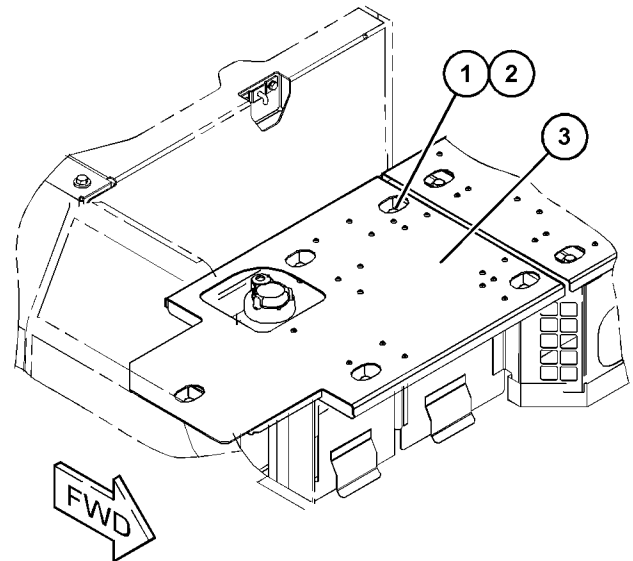


Illustration 486

g06018342

1. Remove the bolts (1), washers (2), and the cover (3) from the top of the hydraulic tank.
2. Clean the area thoroughly in order to keep dirt out of the return filter. Clean the area thoroughly in order to keep dirt out of the filler cap.

WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

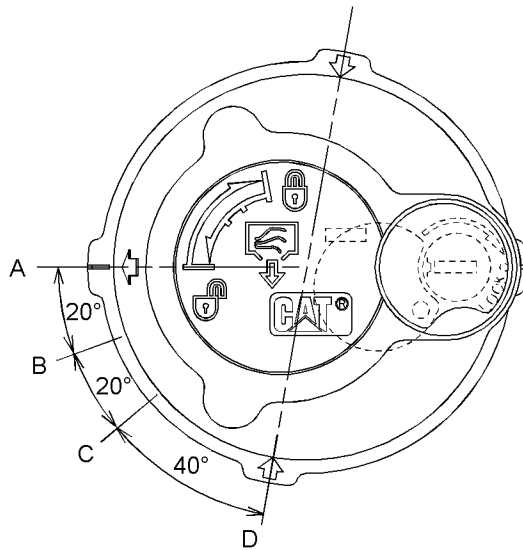


Illustration 487

g02275615

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

3. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 487 for filler cap positions.

- a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
- b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
- c. Push the filler cap down and move the arrow from position (C) to position (D).
- d. After the tank pressure is relieved, tighten the filler cap on the hydraulic tank to position (A).

4. Check the hydraulic system oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

5. Remove the filter cartridge. Perform the following steps in order to remove the filter cartridge.

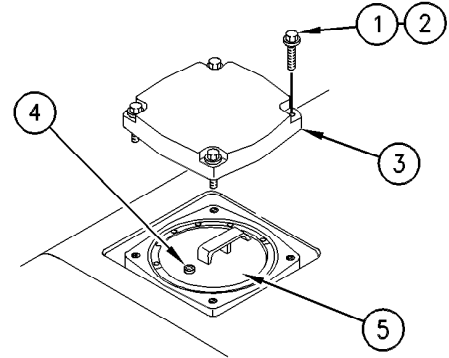


Illustration 488

g00102211

- (1) Bolts
- (2) Washers
- (3) Cover
- (4) Plug
- (5) Filter cartridge

a. Remove bolts (1), washers (2), and cover (3).

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

b. Remove plug (4) in order to release the pressure in filter cartridge (5).

Note: When plug (4) is removed the oil level in the return filter drops to the level of the hydraulic tank.

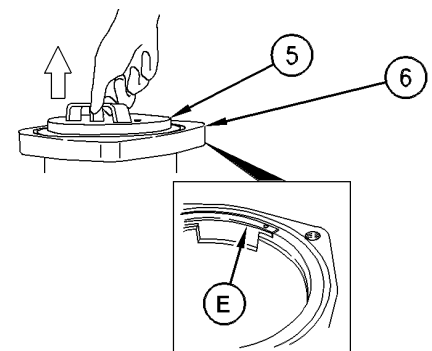


Illustration 489

g02515262

- (5) Filter cartridge
- (6) Filter case
- (E) Guide

c. Pull up the handle at the top of filter cartridge (5) until the filter cartridge contacts guide (E) on filter case (6).

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace

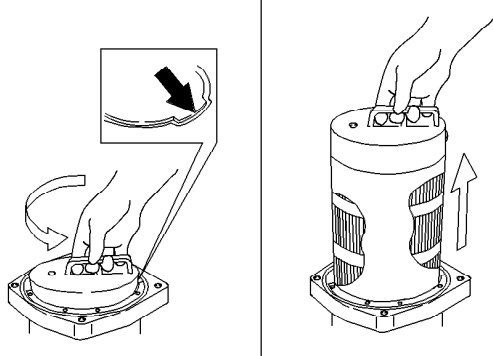


Illustration 490

g00102214

- d. Turn the filter cartridge counterclockwise by 180 degrees in order to align the projection of the filter cartridge with the notch of the filter case. Pull out the filter cartridge.

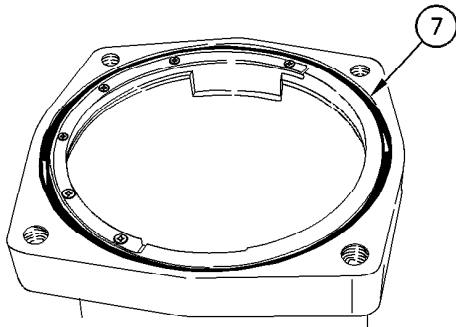


Illustration 491

g00102219

(7) O-ring

- e. Inspect the cover and O-ring (7). If either part is damaged, replace the part.
- f. Inspect the filter cartridge for debris and for damage. If necessary, replace the filter cartridge.
- 6.** Remove the filter element. Perform Step 6a through Step 6f in order to remove the filter element.

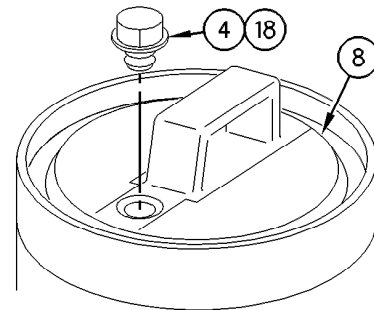


Illustration 492

g00104507

(4) Plug
(8) Plate
(18) O-ring

- a. Make sure that plug (4) is removed. Make sure that all of O-ring (18) is removed from plate (8).

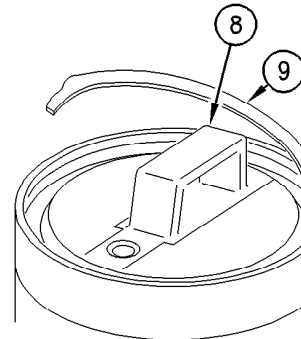


Illustration 493

g00918893

(8) Plate
(9) Spiral retaining ring

- b. Remove spiral retaining ring (9).

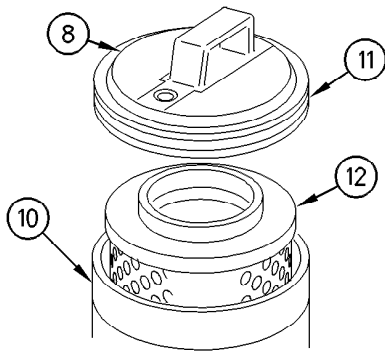


Illustration 494

g00104510

- (8) Plate
- (10) Shell
- (11) O-ring
- (12) Filter element

- c. Hold the filter cartridge with one hand. Grasp the grip of plate (8) with your other hand. Lift plate (8) in order to separate plate (8) from the filter cartridge.
- d. Remove O-ring (11) from plate (8).
- e. Lift filter element (12) from shell (10).
- f. Pour the remaining oil into a suitable container.

Note: Dispose of used oil according to local regulations.

- g. Repeat Step 6a through Step 6f for the other filter groups.

7. Clean the shell of the filter cartridge. Perform Step 7a through Step 7d in order to clean the shell of the filter cartridge.

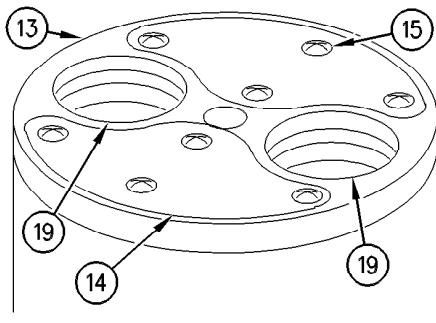


Illustration 495

g00104511

- (13) Slide plate
- (14) Pads
- (15) Screws
- (19) Port

- a. Turn shell (10) upside-down.

- b. Remove screws (15).
- c. Remove Pads (14) from slide plate (13).
- d. Wash the following parts in a clean nonflammable solvent: plug (4), plate (8), spiral retaining ring (9), shell (10) and Pads (14). Dry the parts.

8. Install the filter elements. Perform Step 8a through Step 8k in order to install the filter elements.

Note: Consult a Caterpillar dealer for the Service Kit that is needed to install the filter element and the filter cartridge.

- a. Apply spray type oil to the inside of shell (10) in order to prevent rust.
- b. Apply grease to a new O-ring (11).
- c. Plate (8) will contact the inside of shell (10). Apply grease to this point.
- d. Apply grease to O-rings inside ports (19) at the bottom of shell (10).
- e. Install new Pads (14). Tighten the screws to a torque of 0.4 N·m (3.5 lb in).
- f. Apply spray type oil into the clearance between shell (10) and slide plate (13).

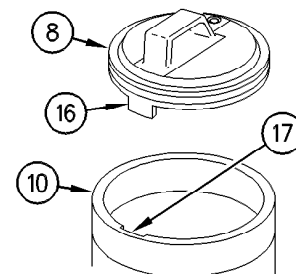


Illustration 496

g00104512

- (8) Plate
- (10) Shell
- (16) Boss
- (17) Notch

- g. Turn over shell (10). Apply grease to the two O-rings on new element (12). Install element (12) into shell (10).
- h. Move boss (16) in alignment with notch (17). Install plate (8) into shell (10).
- i. Install spiral retaining ring (9) into the groove in shell (10).

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace

j. Apply grease to new O-ring (18). Install O-ring (18) on plug (4).

k. Install plug (4) into plate (8).

9. Install the filter cartridge. Perform Step 9a through Step 9e in order to install the filter cartridge.

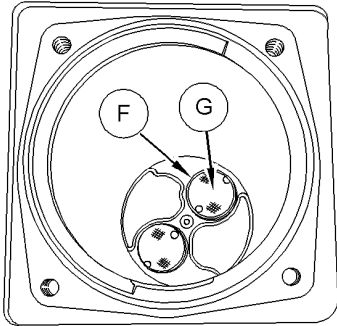


Illustration 497

g02515259

(F) Port
(G) Slide plate

a. Check that ports (F) at the bottom of the filter case are closed.

Note: If the ports are open, rotate slide plate (G) counterclockwise to the stopper in order to fully close the ports. When the ports are fully closed, any remaining oil in the filter case should be completely removed.

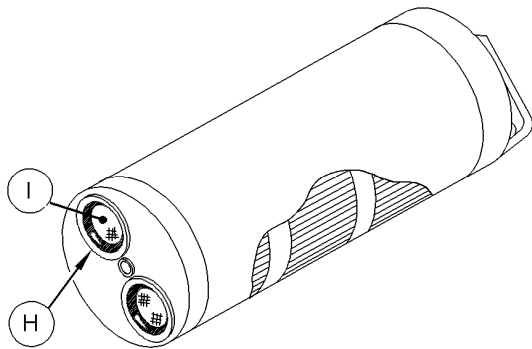


Illustration 498

g02515258

(I) Slide plate
(H) Port

b. Check that ports (H) of the filter cartridge are fully closed.

Note: The filter cartridge cannot be installed unless the ports are fully closed. If the ports are open, rotate slide plate (I) counterclockwise to the stopper in order to fully close the ports.

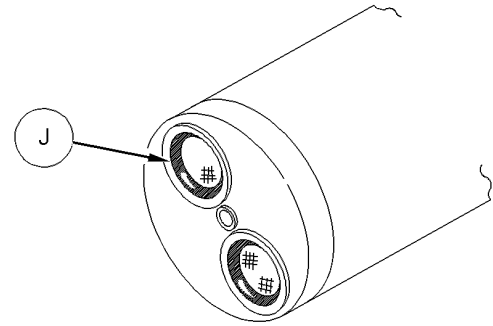


Illustration 499

g02515257

(J) O-rings

c. Check that O-rings (J) have been installed and that oil has been applied to O-rings (J).

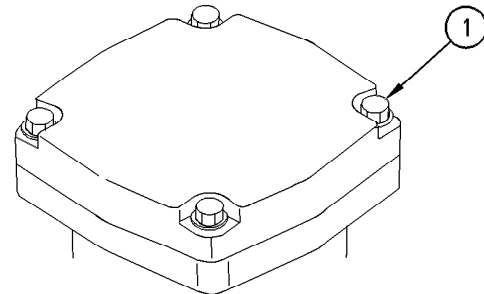


Illustration 500

g00102225

(1) Bolts

d. Install the filter cartridge into the filter case. Turn the filter cartridge clockwise by 180 degrees and push down the filter cartridge when the filter cartridge contacts guide (E).

e. Install plug (4), cover (3), washers (2), and bolts (1). Tighten bolts (1) to a torque of 29 ± 5 N·m (22 ± 4 lb ft).

10. Check the hydraulic system oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

i06546602

Hydraulic System Oil Level - Check

SMCS Code: 5050-535

WARNING

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

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.

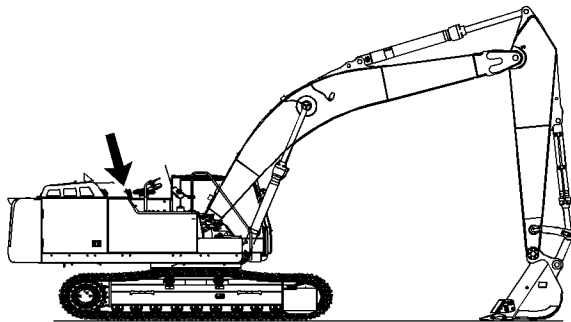


Illustration 501

g02280453

The hydraulic oil tank is on the right side of the machine.

1. Park the machine on level ground. Lower the bucket to the ground with the stick in a vertical position, as shown.
2. Open the access door on the right side of the machine.

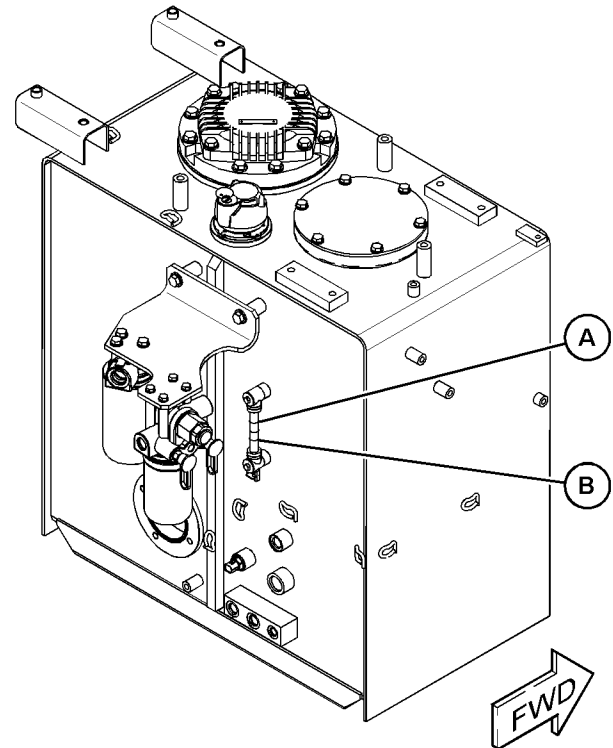


Illustration 502

g06018326

- (A) High temperature range
(B) Low temperature range

3. For a cold machine, maintain the hydraulic oil level in the low temperature range (B). For a machine that is at normal operating temperature, maintain the hydraulic oil level in the high temperature range (A).

4. Close the access door.

Note: Perform Step 5 through Step 8 if the oil level is low.

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

WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

Maintenance Section
Hydraulic System Oil Sample - Obtain

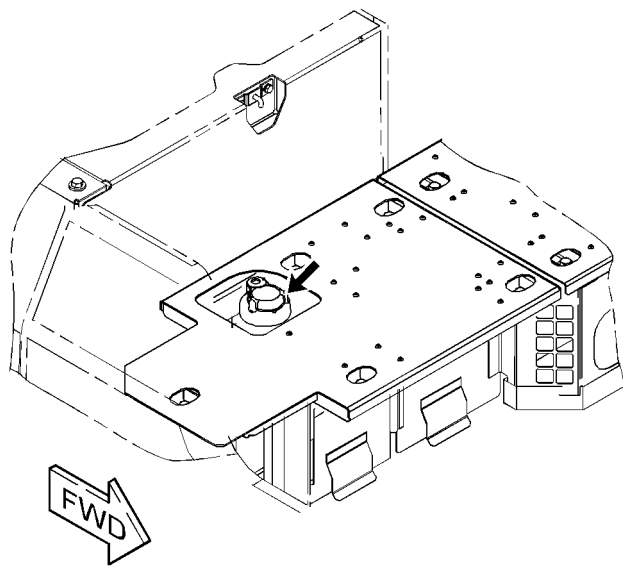


Illustration 503

g06018334

- b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Push the filler cap down and move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, remove the filler cap.
6. Add oil if necessary. See Operation and Maintenance, "Lubricant Viscosities"
 7. Check the O-ring seal of the filler cap. Replace the O-ring seal if the O-ring seal is damaged.
 8. Clean the filler cap. Tighten the filler cap on the hydraulic tank to position (A).

i05970646

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008-OC; 5095-SM; 5095-008; 7542-008; 7542

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 6000 hours. S·O·S services after 3,000 hour is strongly Recommended. Consult your Cat dealer for details.

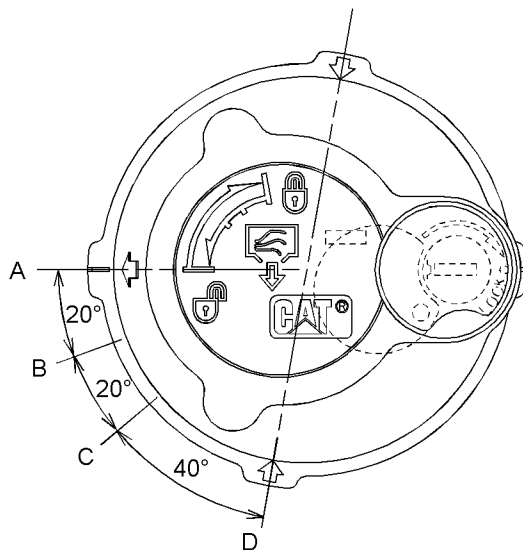


Illustration 504

g02275615

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

5. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 504 for filler cap positions.
 - a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

i07051364

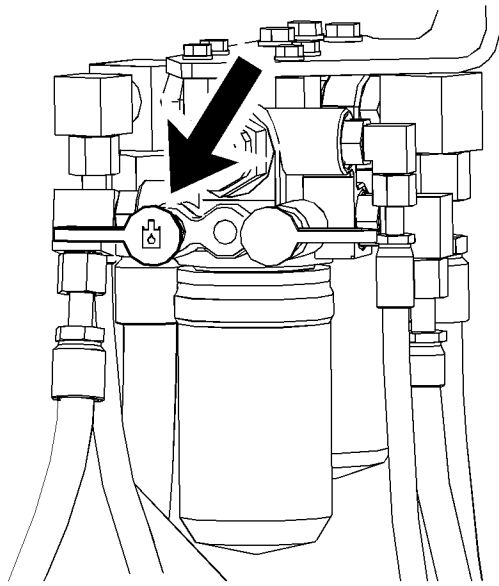


Illustration 505

g02881456

The hydraulic oil sampling valve is near the pilot filter. Obtain a sample of the hydraulic oil from the hydraulic oil sampling valve that is located on the hydraulic oil filter housing. Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the hydraulic oil. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining a sample of the hydraulic oil.

i03753191

Indicators and Gauges - Test

SMCS Code: 7450-081; 7490-081

1. Look for broken lenses on the gauges, broken indicator lights, broken switches, and other broken components in the cab.
2. Start the engine.
3. Look for inoperative gauges.
4. Turn on all machine lights. Check for proper operation.
5. Move the machine forward. Release the travel levers and the travel pedals. The machine should stop.
6. Stop the engine.
7. Make any repairs that are required before operating the machine.

Oil Filter (Hydraulic Hammer) - Replace

SMCS Code: 5068-510

WARNING

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

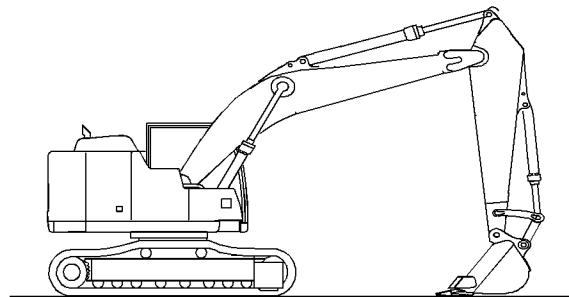


Illustration 506

g02419476

1. Park the machine on level ground in the service position as shown.
2. Move the hydraulic lockout control to the UNLOCKED position.
3. Turn the engine start switch to the ON position.
4. Move the joysticks and the travel levers/pedals to the full stroke positions to relieve the pressure in the hydraulic lines.
5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

Maintenance Section
Oil Filter (Hydraulic Hammer) - Replace

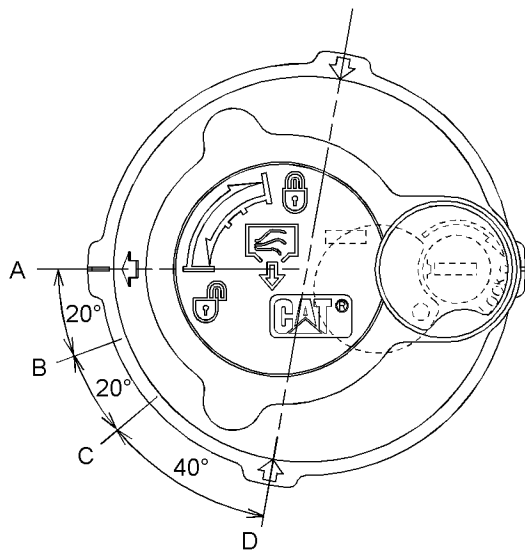


Illustration 507

g02275615

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

6. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 507 for filler cap positions.
 - a. Turn the filler cap counterclockwise, with no downward force applied, and move the arrow from position (A) to position (B).
 - b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Push the center of the filler cap down. Without tilting the filler cap, move the arrow from position (C) to position (D).
 - d. The hydraulic tank pressure is relieved. Tighten the filler cap on the hydraulic tank to position (A).

7. The oil filter for the hammer is located near the base of the boom.

Note: Some configurations may invert the hammer filter installation.

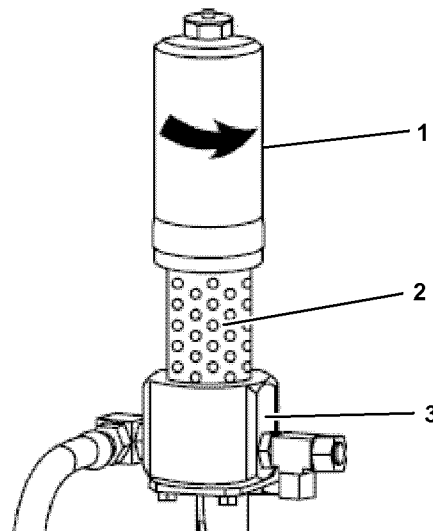


Illustration 508

g02902799

- (1) Filter case
- (2) Filter element
- (3) Filter base

8. Position a suitable container to contain the oil.

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

9. Loosen filter case (1).
10. Lift filter case (1) to remove filter element (2).
11. Remove the used filter element from filter base (3).

Note: The element cannot be reused.

Note: Used filter elements should always be disposed of according to local regulations.

12. Clean filter case (1) and inspect the O-ring for damage. Replace the O-ring if necessary.
13. Install the new filter element.

i02106227

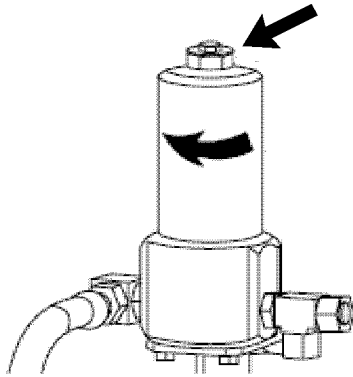


Illustration 509

g02909599

- 14.** Assemble filter case (1). Tighten the nut on the filter case to a torque of $100 \pm 10 \text{ N}\cdot\text{m}$ ($74 \pm 7 \text{ lb ft}$).

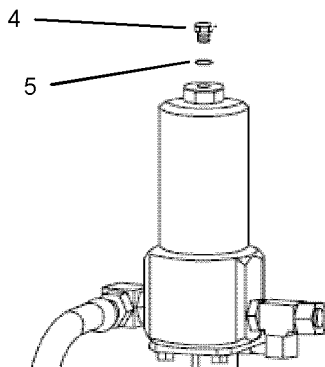


Illustration 510

g02909737

- 15.** Remove plug (4) and inspect O-ring (5) for damage. Replace the O-ring if necessary. Tighten plug (4) to a torque of $60 \pm 5 \text{ N}\cdot\text{m}$ ($44 \pm 3.5 \text{ lb ft}$)
- 16.** Start the engine and operate the machine slowly for 10 to 15 minutes. Move each cylinder evenly through several cycles and operate the hammer.
- 17.** Return the machine to the service position.
Check the machine for oil leaks.
- 18.** Stop the engine.
- 19.** Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

Oil Filter - Inspect

SMCS Code: 1308-507; 5068-507

Inspect a Used Filter for Debris

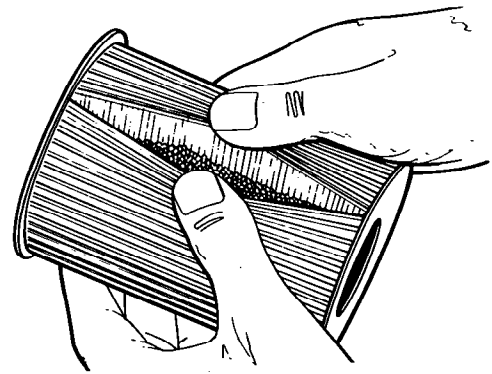


Illustration 511

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.

i04535400

Radiator, Aftercooler and Oil Cooler Cores - Clean

SMCS Code: 1063-070-KO; 1353-070-KO; 1374-070-KO

WARNING

Personal injury can result from air pressure.

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

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

1. Open the access door on the left side of the machine.

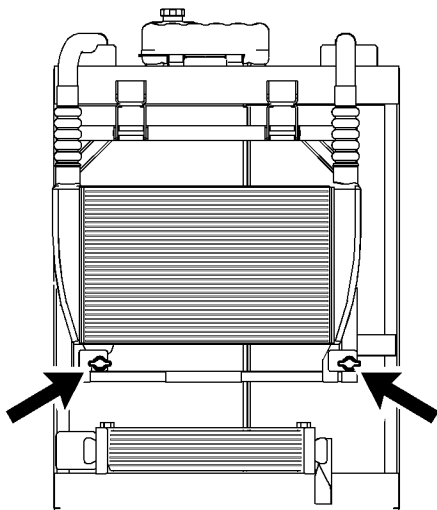


Illustration 512

g02257254

2. Unlatch the after cooler and A/C condenser core.

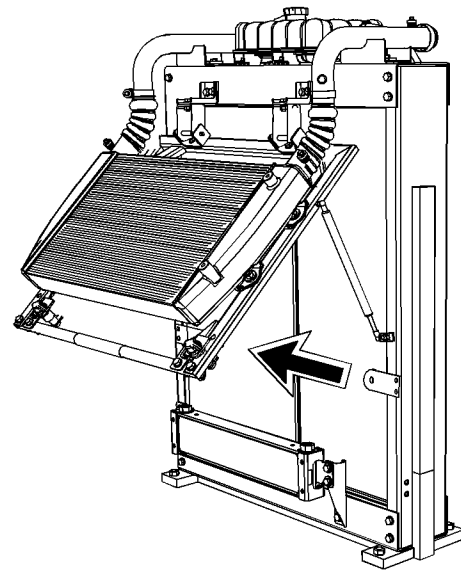


Illustration 513

g02256553

3. Swing the after cooler/AC condenser upward.

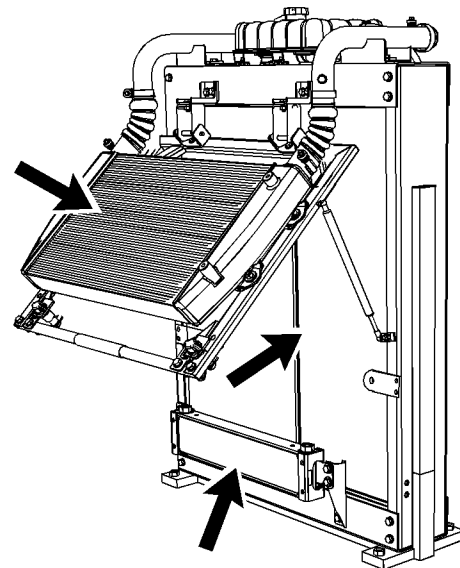


Illustration 514

g02258615

4. Remove dust and debris from all of the core fins.

Compressed air is preferred, but high-pressure water or steam can be used to remove dust and general debris from a core.

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

5. Close and latch the cooler/condenser.

6. Close the access door on the left side of the machine.

i05252974

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-710; 7322-510

i05805860

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: 7323-040; 7325-040

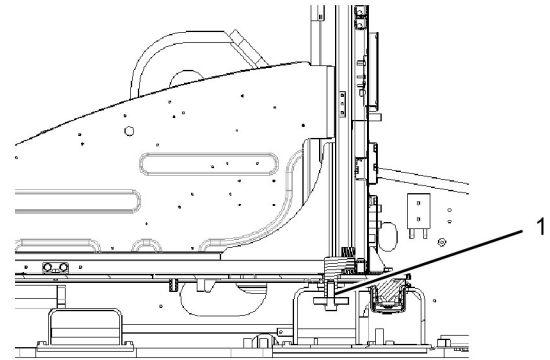


Illustration 515

g01973183

Consult your Caterpillar dealer for repair of any cracks in the ROPS.

Inspect the ROPS for loose bolts or for damaged bolts. Replace any damaged bolts or missing bolts with original equipment parts only. Tighten the M24 bolt (1) to $425 \pm 50 \text{ N}\cdot\text{m}$ ($315 \pm 40 \text{ lb}\cdot\text{ft}$).

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

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

Consult your Cat dealer for inspection of any potential damage or repair of any damage to any operator protective structure. (Including ROPS, FOPS, TOPS, OPS, and OPG) Refer to Special Instruction, SEHS6929, "Inspection, Maintenance, and Repair of Operator Protective Structures (OPS) and Attachment Installation Guidelines for All Earthmoving Machinery"

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.

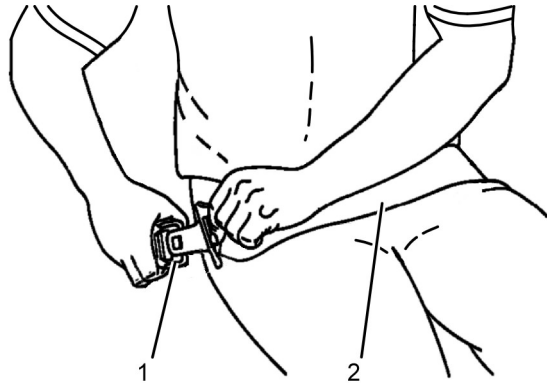


Illustration 516

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).

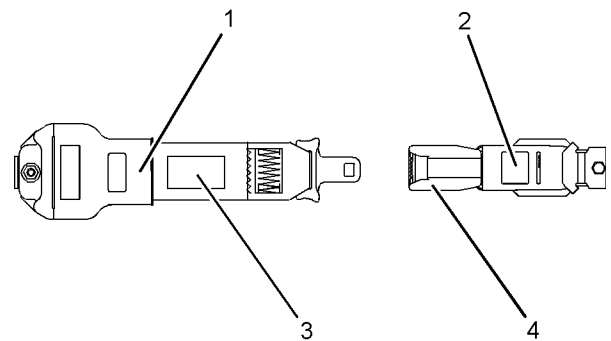


Illustration 517

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.

i04046887

Swing Bearing - Lubricate**SMCS Code:** 7063-086

Note: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on grease.

Note: Do not overgrease the swing bearings. Do not grease more than the recommended maintenance interval. Refer to Operation and Maintenance Manual, "Maintenance Interval Schedule" for more information.

Wipe the fittings before you lubricate the swing bearing.

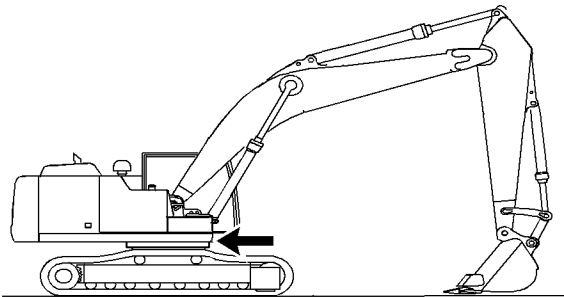


Illustration 518

g02258953

The swing bearing is located under the base of the boom.

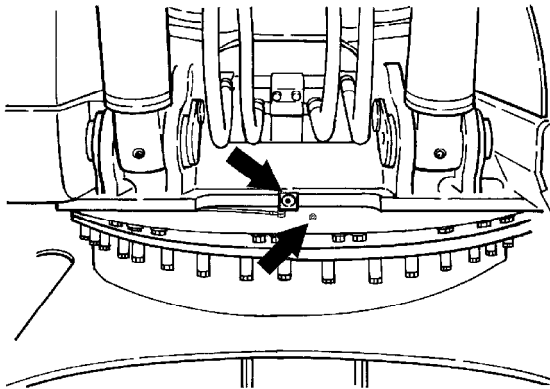


Illustration 519

g00687903

Apply lubricant through the fittings until the lubricant overflows the bearing seals.

i03966033

Swing Drive Oil - Change

SMCS Code: 5459-044

WARNING

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

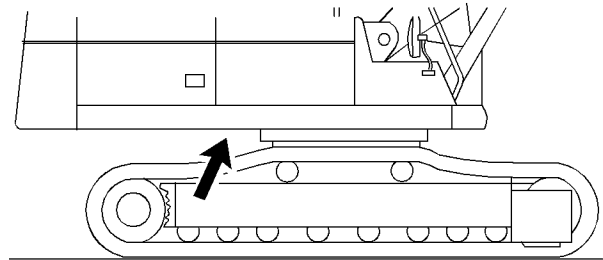


Illustration 520

g02110675

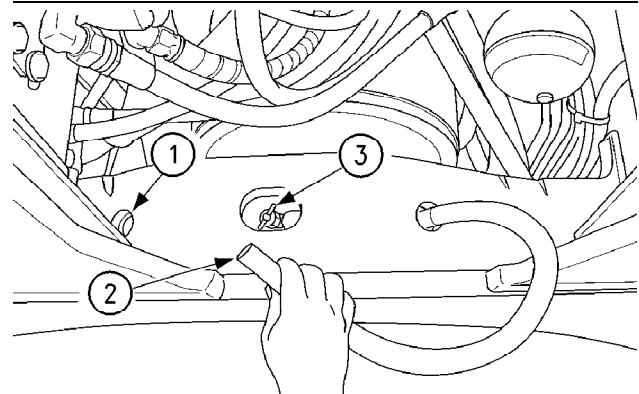


Illustration 521

g00834920

1. Remove the access cover that is located below the swing drives.

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

2. Remove drain hose (2) from holder (1) on the upper frame. Face the end of the hose toward the container.

3. Use a universal joint with a socket extension to loosen the drain valve in hole (3). Drain the oil into a suitable container.

Note: Drained fluids should always be disposed of according to local regulations.

Maintenance Section
Swing Drive Oil Level - Check

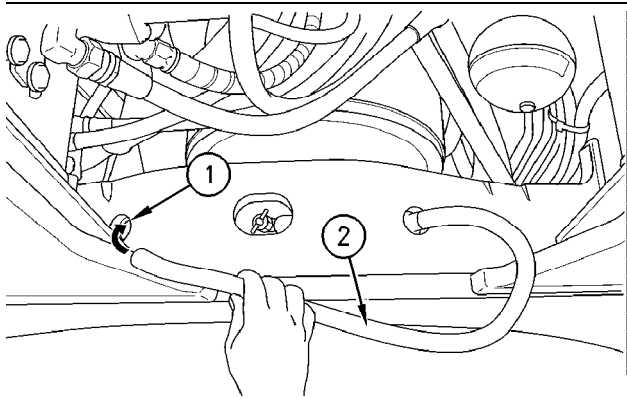


Illustration 522

g00834927

4. Tighten the drain valve. Hook the drain hose (2) to the holder (1). Make sure that the end of the hose is facing upward.

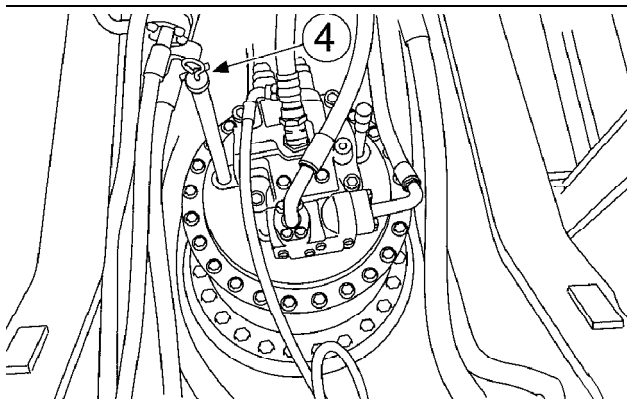


Illustration 523

g00834933

5. Remove dipstick (4).
6. Add the specified quantity of oil through the dipstick tube. See Operation and Maintenance, "Capacities (Refill)".

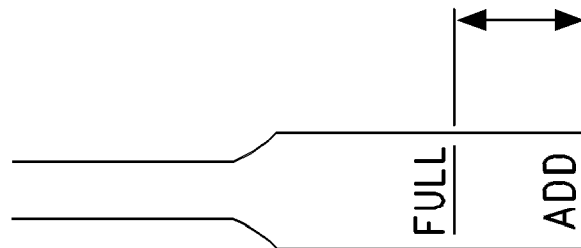


Illustration 524

g01049757

7. Maintain the oil level between the tip of the dipstick and the mark on the dipstick (4).
8. Check the oil that has been drained for metal chips or metal particles. Consult your Caterpillar dealer if any metal chips or metal particles are found.
9. Drained materials should always be disposed of according to local regulations.

i02582101

Swing Drive Oil Level - Check

SMCS Code: 5459-535-FLV

WARNING

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

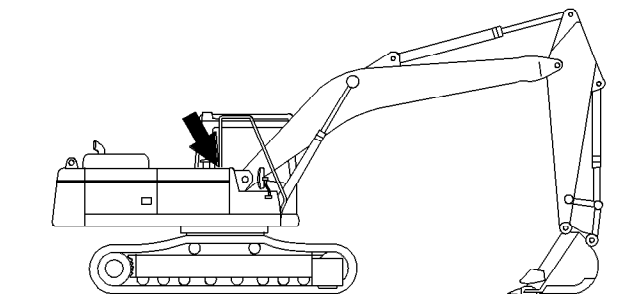


Illustration 525

g00101622

The dipstick for the swing drive oil is on the swing drive at the rear base of the boom.

i03754129

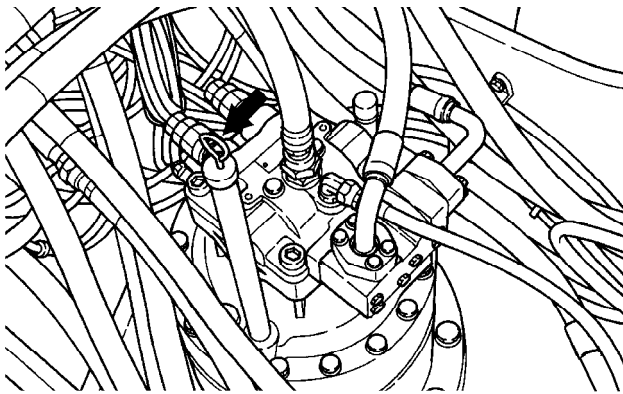


Illustration 526

g00684917

1. Remove the dipstick.

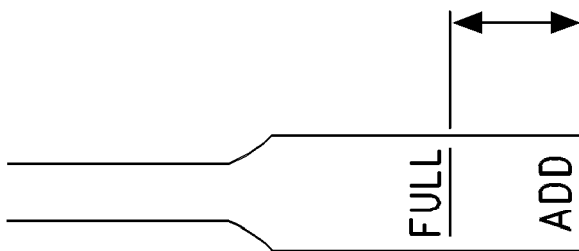


Illustration 527

g01049757

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

2. Check the dipstick. Maintain the oil level between the marks on the dipstick. Add oil through the dipstick tube, if necessary. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" when you select an oil. If the oil level is above the "FULL" line, then remove oil from the system. Restore the oil to the correct level position.
3. Insert the dipstick.

Swing Drive Oil Sample - Obtain

SMCS Code: 5459-OC; 5459-008-OC; 5459-554-OC; 5459-008; 7542-008

WARNING

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

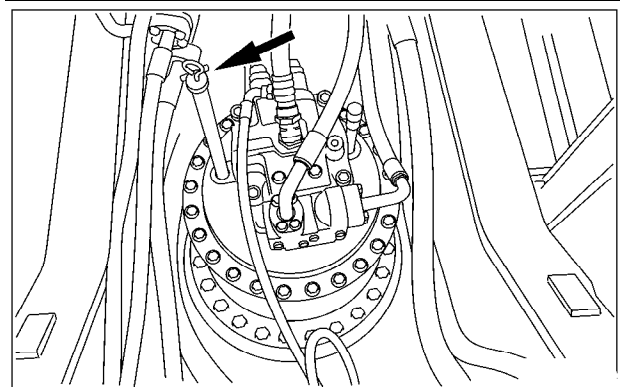


Illustration 528

g00831846

Obtain an oil sample of the swing drive oil through the opening for the dipstick. Refer to Special Publication, SEBU6250, "S-O-S Oil Analysis" for information that pertains to obtaining an oil sample from the swing drive housing. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample from the swing drive housing.

i04607289

Swing Gear - Lubricate

SMCS Code: 7063-086

Note: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on grease.

Maintenance Section
Swing Gear - Lubricate

NOTICE

Improper lubrication can cause damage to machine components.

To avoid damage, make sure that the proper amount of grease is applied to the swing drive.

When the amount of grease in the compartment becomes too large, the agitation loss becomes large, thereby accelerating grease deterioration.

Grease deterioration can cause damage to the pinion gear of the swing drive and swing internal gear.

Not enough grease will result in poor gear lubrication.

Remove the inspection cover that is located near the boom base. Inspect the grease.

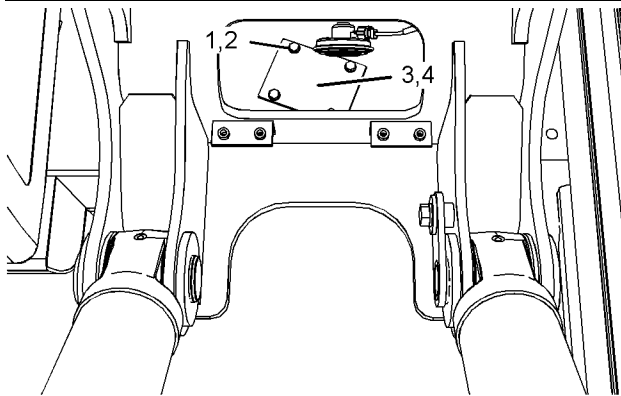


Illustration 529

g02723118

Typical example

- (1) Bolts
- (2) Washers
- (3) Cover
- (4) Gasket

1. Remove bolts (1) and washers (2). Remove cover (3) and gasket (4).

2. Inspect gasket (4). Replace the gasket if damage is evident.

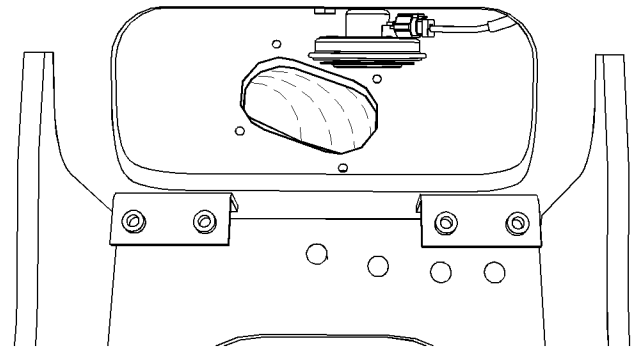


Illustration 530

g02723116

Typical example

3. Check the level of grease. The level of grease is correct when:

- Waves of grease are present from the rotating swing drive pinion.
- The grease is evenly distributed on the floor of the pan.

Note: Smearred or waveless areas are evidence for a lack of grease.

Note: Add grease, as needed. Remove grease, as needed. Too much grease will result in the deterioration of the grease because of excessive movement of the grease. Too little grease will result in poor lubrication of the swing gear.

Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the size of the pan.

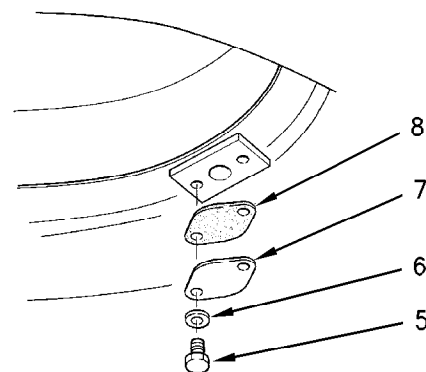


Illustration 531

g00688063

- (5) Bolts
- (6) Washers
- (7) Cover
- (8) Gasket

4. Check for contamination and for discolored grease.
5. If the grease is contaminated or discolored with water, change the grease. Remove bolts (5), washers (6), cover (7), and gasket (8) in order to allow the water to drain. When you reinstall cover (7), inspect gasket (8). Replace the gasket if damage is evident.

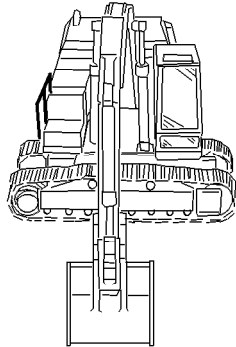


Illustration 532

g00101644

6. Raise the boom and turn the upper structure by 1/4 turn. Lower the bucket to the ground.
7. Repeat Step 6 at every 1/4 turn in four places. Add grease, as needed.
8. Install gasket (4), cover (3), washers (2), and bolts (1).

i05647259

Track Adjustment - Adjust

SMCS Code: 4170-025

WARNING

Personal injury or death can result from grease under pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve one turn only.

If track does not loosen, close the relief valve and contact your Caterpillar dealer.

NOTICE

Keeping the track properly adjusted will increase the service life of the track and drive components.

Note: The track tension must be adjusted according to the current operating conditions. Keep the track as slack as possible if the soil is heavy.

Measuring Track Tension

1. Operate the machine in the direction of the idlers.

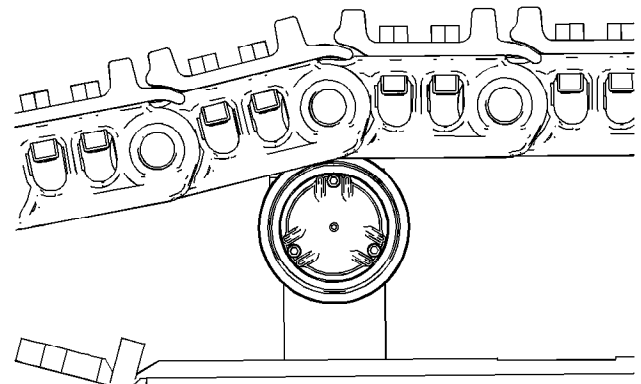


Illustration 533

g01103855

2. Stop with one track pin directly over the front carrier roller. Park the machine and turn off the engine.

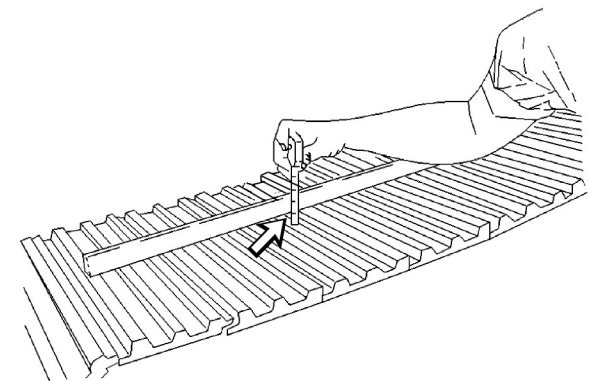


Illustration 534

g03472827

3. Place a straight edge on top of the track grousers between the front carrier roller and the idler. The straight edge should be long enough to reach from the front carrier roller to the idler.

Maintenance Section
Track Adjustment - Adjust

Note: If your machine is equipped with three carrier rollers, place a straight edge on the tracks between the carrier rollers. The straight edge should be long enough to reach from one carrier roller to another carrier roller.

4. Measure the maximum amount of sag in the track.
The sag is measured from the highest point of the track grouser to the bottom of the straight edge. A track that is properly adjusted will have a sag of 40.0 to 55.0 mm (1.57 to 2.17 inch).
5. If the track is too tight, or if the track is too loose, adjust the track tension according to the appropriate procedure below.

Adjusting Track Tension

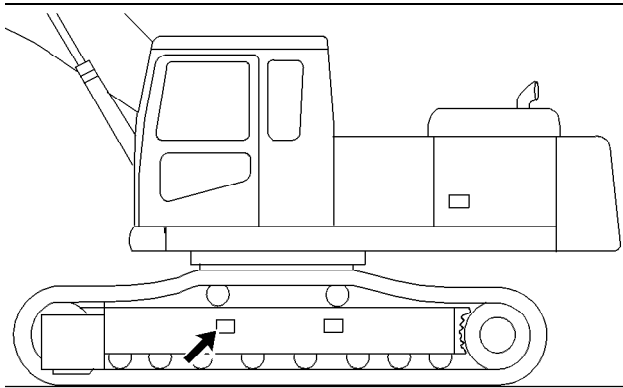


Illustration 535

g00270405

Typical example

The track adjuster is located on the track frame.

Tightening the Track

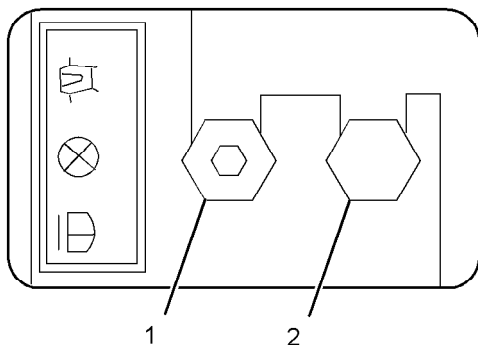


Illustration 536

g01091134

- (1) Grease fitting
- (2) Relief valve

Wipe the fitting before you add grease.

1. Add grease through grease fitting (1) until the correct track tension is reached.
2. Operate the machine back and forth in order to equalize the pressure.
3. Check the amount of sag. Adjust the track, as needed.

Loosening the Track

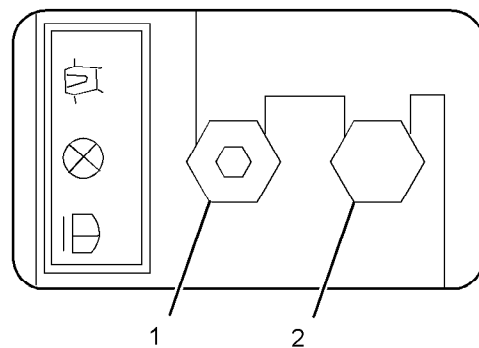


Illustration 537

g01091134

- (1) Grease fitting
- (2) Relief valve

1. Loosen relief valve (2) carefully until the track begins to loosen. One turn should be the maximum.
2. Tighten relief valve (2) to $34 \pm 5 \text{ N}\cdot\text{m}$ ($25 \pm 4 \text{ lb ft}$) when the desired track tension is reached.
3. Operate the machine back and forth in order to equalize the pressure.

4. Check the amount of sag. Adjust the track, as needed.

i01590290

Track Adjustment - Inspect

SMCS Code: 4170-040

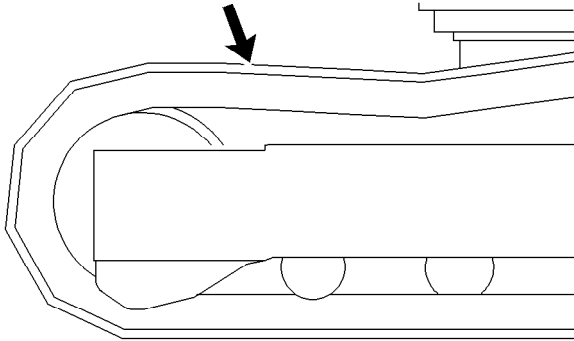


Illustration 538

g00824541

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

If the track appears to be too tight or too loose, refer to Operation and Maintenance Manual, "Track Adjustment - Adjust".

i04571216

Travel Alarm - Test (If Equipped)

SMCS Code: 7429-081

Move the machine in order to test the travel alarm.

1. Start the engine. Move the hydraulic lockout control to the UNLOCKED position.
2. Raise the work tool in order to avoid any obstacles. Make sure that there is adequate overhead clearance.

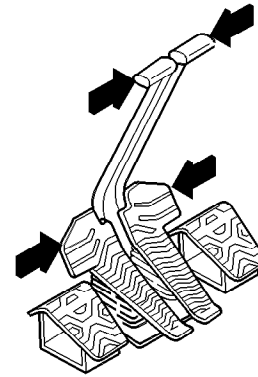


Illustration 539

g00560313

3. Use the travel levers or the travel pedals to move the machine forward. The travel alarm should sound.
4. Release the travel levers and the travel pedals in order to stop the machine.
5. Use the travel levers and the travel pedals to move the machine backward. The travel alarm should sound.

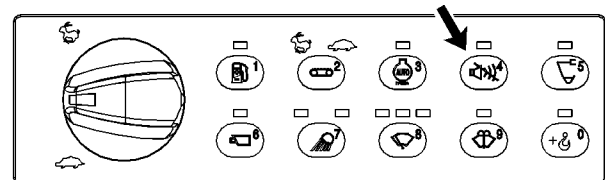


Illustration 540

g02730938

6. Push the alarm cancel switch. The travel alarm should shut off.
7. Stop the machine. Lower the work tool to the ground. Move the hydraulic lockout control to the LOCKED position. Stop the engine.

i03934011

Undercarriage - Check

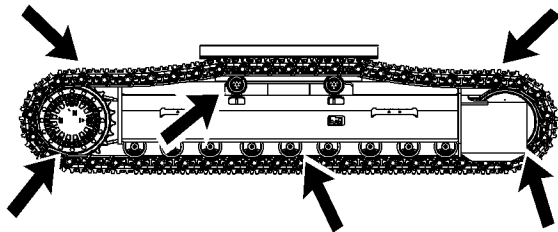
SMCS Code: 4150-535

Illustration 541

g02154815

1. Check the carrier rollers, the track rollers, and the idler wheels for possible leakage.
2. Check the surface of the track, the carrier rollers, the track rollers, the idler wheels, the track shoes, and the drive sprockets. Look for signs of wear and loose mounting bolts.
3. Listen for any abnormal noises while you are moving slowly in an open area.
4. If abnormal wear exists or abnormal noises or leaks are found, consult your Caterpillar dealer.

i01458697

Window Washer Reservoir - Fill

SMCS Code: 7306-544-KE

NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.

1. Open the access door on the left side of the machine.

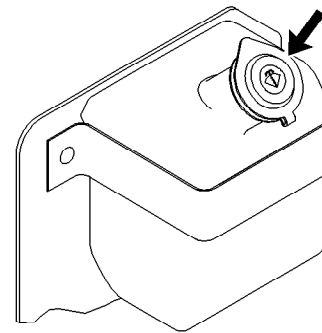


Illustration 542

g00688996

2. Remove the filler cap.
3. Fill the window washer reservoir with washer fluid through the filler opening.
4. Install the filler cap.
5. Close the access door.

i01258249

Window Wiper - Inspect/Replace

SMCS Code: 7305-040; 7305-510

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i03898951

Window - Check

SMCS Code: 7310-535

Check the polycarbonate windows of the cab for the following conditions.

- yellow or haze
- scratches on either side of the window that can be felt with a fingernail
- small cracks that come from the edges or mounting holes
- contact with fluids that result in haze or clouds on the window such as brake fluid

When any of the above conditions exist, contact your Caterpillar dealer for replacement.

i05867976

Windows - Clean

SMCS Code: 7310-070; 7340-070

Clean the outside of the windows from the ground, unless handholds are available.

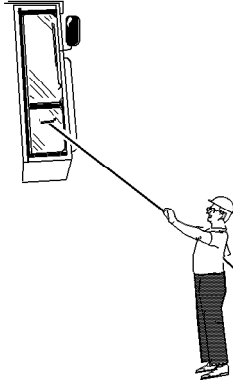


Illustration 543

g00566124

Typical example

Note: Naphtha or kerosene can be used in order to remove labels, films, paint, or marking pen from polycarbonate windows.

Note: Do not use abrasive, or highly alkaline cleaners. Do not use sharp instruments, such as squeegees or razor blades on polycarbonate windows. Do not clean polycarbonate windows in the hot sun or at elevated temperatures.

Cleaning Methods

Aircraft 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)

Special care is needed in order to clean polycarbonate windows.

Wash polycarbonate windows with mild soap and warm water that does not exceed 50° C (122° F). Use 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 cold water.

Warranty Section

Warranty Information

i06044323

Emissions Warranty Information

SMCS Code: 1000

The certifying engine manufacturer warrants to the ultimate purchaser and each subsequent purchaser that:

1. New non-road diesel engines and stationary diesel engines less than 10 liters per cylinder (including Tier 1 and Tier 2 marine engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the United States and Canada, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed by the United States Environmental Protection Agency (EPA) by way of regulation.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
2. New non-road diesel engines (including Tier 1 and Tier 2 marine propulsion engines < 37 kW and Tier 1 through Tier 4 marine auxiliary engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the state of California, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, to all applicable regulations adopted by the California Air Resources Board (ARB).
 - b. Free from defects in materials and workmanship which cause the failure of an emission-related component to be identical in all material respects to the component as described in the engine manufacturer's application for certification for the warranty period.

3. New non-road diesel engines installed in construction machines conforming to the South Korean regulations for construction machines manufactured after January 1, 2015, and operated and serviced in South Korea, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed in the Enforcement Rule of the Clean Air Conservation Act promulgated by South Korea MOE.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

The aftertreatment system can be expected to function properly for the lifetime of the engine (emissions durability period) subject to prescribed maintenance requirements being followed.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in a supplemental Special Publication. Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty and to obtain a copy of the applicable Special Publication.

Reference Information Section

Reference Materials

i07422648

Reference Material

SMCS Code: 1000; 7000

Additional literature regarding your product may be purchased from your local Cat dealer or by visiting publications.cat.com. Use the product name, sales model, and serial number to obtain the correct information for your product.

publications.cat.com

i07743978

Decommissioning and Disposal

SMCS Code: 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations.

Improperly disposing of waste can threaten the environment. Obey all local regulations for the decommissioning and disposal of materials.

Utilize appropriate personal protective equipment when decommissioning and disposing product.

Consult the nearest Cat dealer for additional information. Including information for component remanufacturing and recycling options.

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Product and Dealer Information

Note: For product identification plate locations, see the section "Product Identification Information" in the Operation and Maintenance Manual.

Delivery Date: _____

Product Information

Model: _____

Product Identification Number: _____

Engine Serial Number: _____

Transmission Serial Number: _____

Generator Serial Number: _____

Attachment Serial Numbers: _____

Attachment Information: _____

Customer Equipment Number: _____

Dealer Equipment Number: _____

Dealer Information

Name: _____ Branch: _____

Address: _____

Dealer Contact

Phone Number

Hours

Sales: _____

Parts: _____

Service: _____

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