



# Operation and Maintenance Manual

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## **279C, 289C and 299C Compact Track Loaders**

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MBT1-Up (279C)  
JMP1-Up (289C)  
JSP1-Up (299C)

## Important Safety Information

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

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

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

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

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



### **WARNING**

The meaning of this safety alert symbol is as follows:

**Attention! Become Alert! Your Safety is Involved.**

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

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 the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.**

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



### **WARNING**

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

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

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**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

### Literature Information

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

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

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

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

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

### Safety

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

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

### Operation

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

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

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

### Maintenance

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

### Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the maintenance intervals chart might be necessary.

Perform service on items at multiples of the original requirement. For example, at every 500 service hours or 3 months, also service those items listed under every 250 service hours or monthly and every 10 service hours or daily.

### California Proposition 65 Warning

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

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

### Certified Engine Maintenance

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

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

## Machine Capacity

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

## Caterpillar Product Identification Number

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

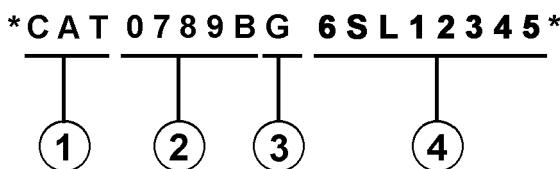


Illustration 1

g00751314

Where:

1. Caterpillar's World Manufacturing Code (characters 1-3)
2. Machine Descriptor (characters 4-8)

3. Check Character (character 9)

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

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

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

## Safety Section

i02919553

### 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 legible. When you clean the safety messages, use a cloth, water and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety messages. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the safety message. Loose adhesive will allow the safety message to fall.

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

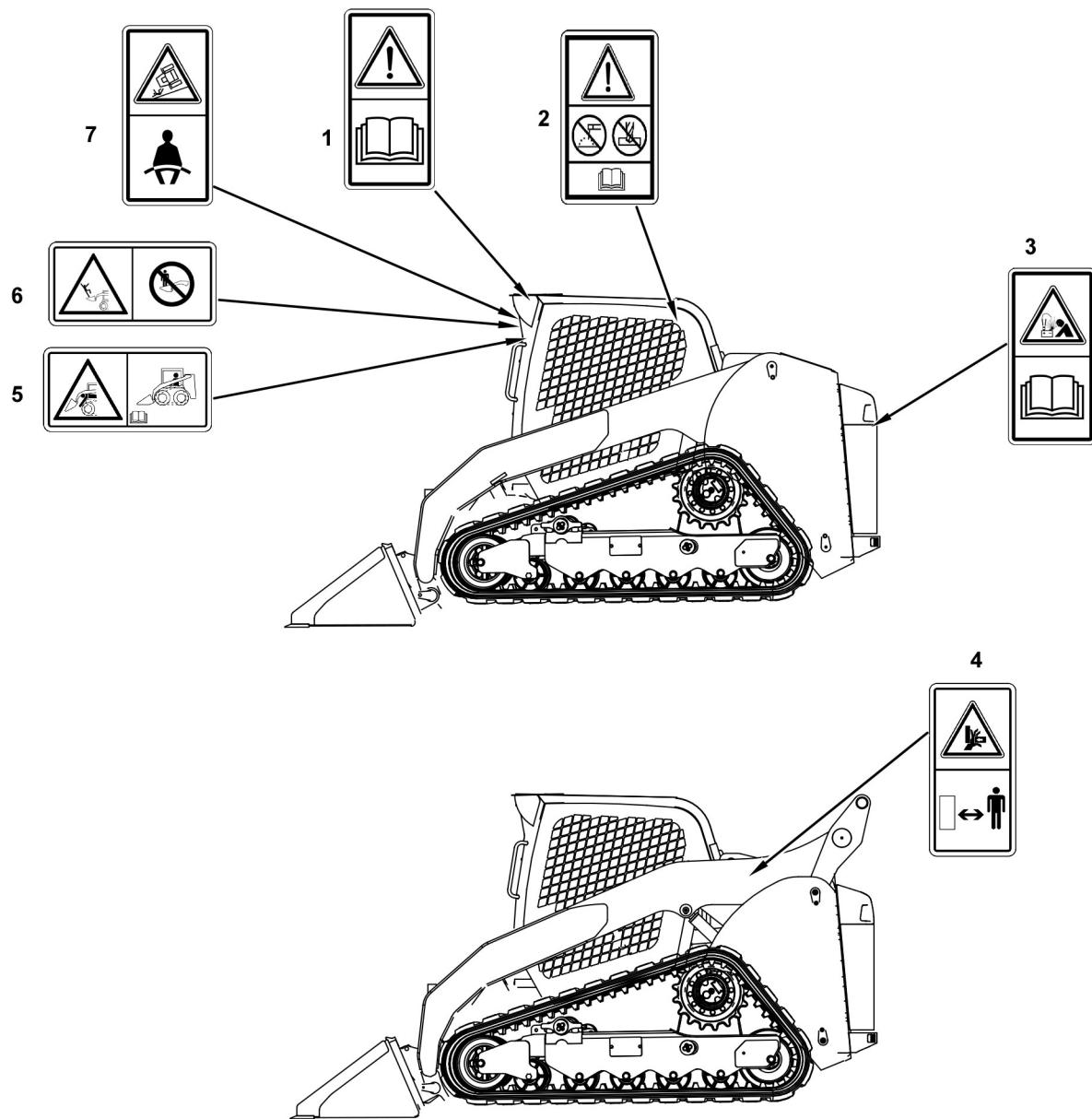


Illustration 2

g01451237

(1) Do Not Operate.  
(2) Rollover Protective Structure/Falling Object Protective Structure

(3) Jump Starting  
(4) Crushing Hazard  
(5) Stay Inside Operator Station

(6) Never Permit Riders.  
(7) Seat Belt

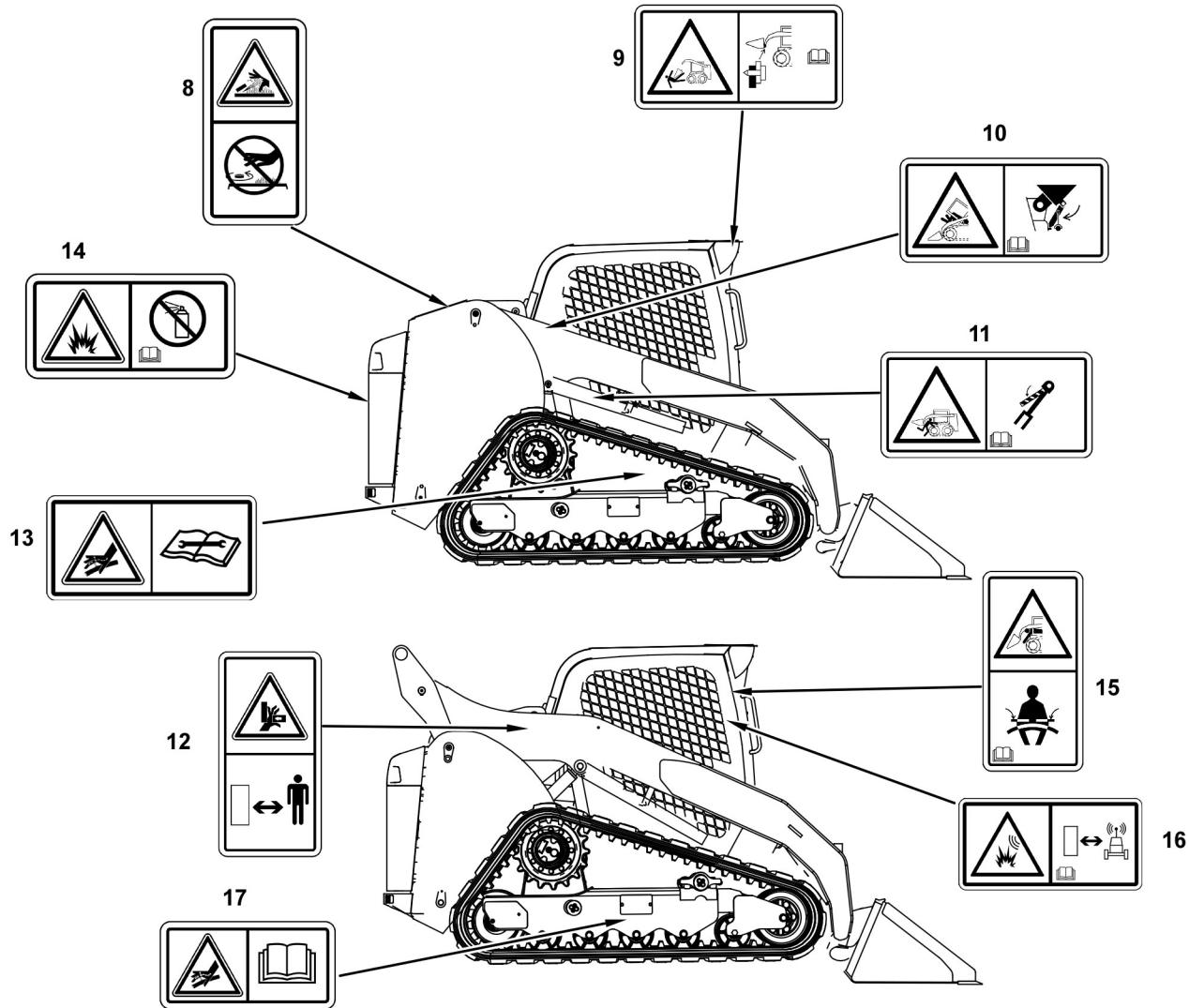


Illustration 3

g01451239

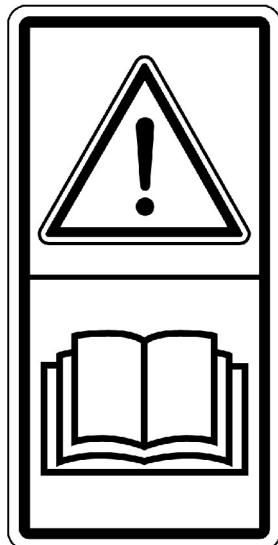
- (8) Pressurized System
- (9) Work Tool Coupler
- (10) Cab Support
- (11) Brace for the Loader Lift Arms

- (12) Crushing Hazard
- (13) Accumulator
- (14) Aerosol Starting Aid
- (15) Armrests

- (16) Product Link
- (17) High Pressure Oil

## Do Not Operate (1)

This warning message is located on the front panel by the rear view mirror.



g01379128

### **⚠ WARNING**

**Read and understand the instructions and warnings in the operation and maintenance manuals. Contact any Caterpillar dealer for replacement manuals. Proper care is your responsibility.**

**Be alert! Know work conditions. Note and avoid all hazards and obstructions. Keep by-standers away when operating.**

**Fasten seat belt and lower armrest.**

**Make certain all controls are in neutral position and start engine.**

**Disengage parking brake.**

**Machine controls are active.**

**Failure to follow the instructions or heed the warnings could result injury or death.**

## Rollover Protective Structure/ Falling Object Protective Structure (2)

This warning film and the certification film are located inside the cab on the rear left side.



g01212168

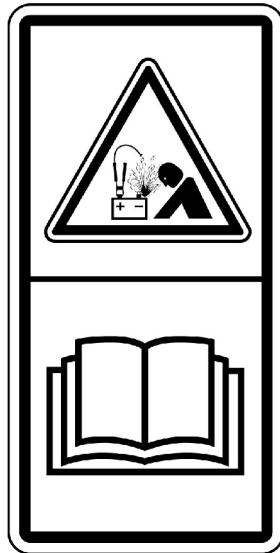
### **⚠ WARNING**

**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.**

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 film.

## Batteries (3)

This warning message is located on the rear door on the left side of the machine near the positive cable terminal.



g01409730

### ⚠ WARNING

Improper jumper cable connections can cause explosion resulting in personal injury. Batteries may be located in separate compartments, always connect positive (+) cable to positive (+) terminal of battery connected to starter solenoid and negative (-) cable from external source to engine block or frame.

## Crush Hazard (4) & (12)

This warning is located on the loader arms of the machines that are equipped with vertical lift.



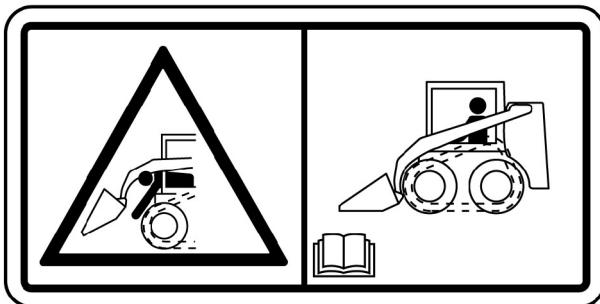
g01378775

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Stay Inside Operator Station (5)

This warning message is located on the front panel by the rear view mirror.



g01427449

### ⚠ WARNING

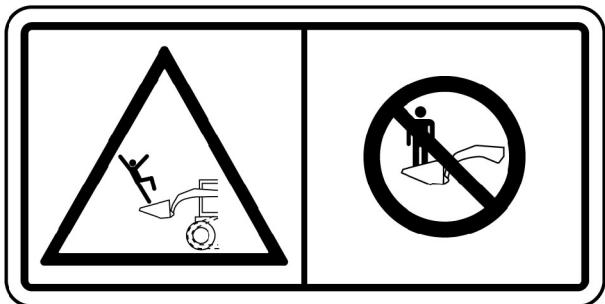
Keep your body inside the operator station while operating the loader.

Never work with your arms, feet or legs beyond the operator station.

Failure to follow the instructions or heed the warnings will result in injury or death.

## Never Permit Riders (6)

This warning message is located inside the cab on the right side by the gauges.



g01427444

### ⚠ WARNING

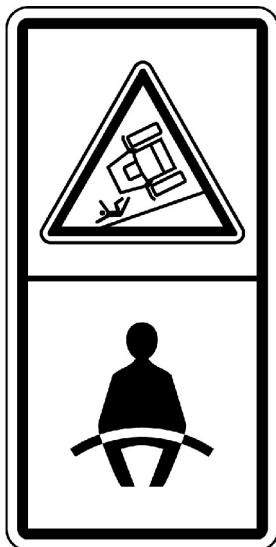
Never permit riders.

Never use work tool for a work platform.

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

## Seat Belt (7)

This warning message is located on the ROPS post on the right side .



g01371636

### ⚠ WARNING

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

Refer to Operation and Maintenance Manual, "Seat Belt" for more information.

## Pressurized System (8)

This warning message is located on the right side of the radiator by the radiator cap.



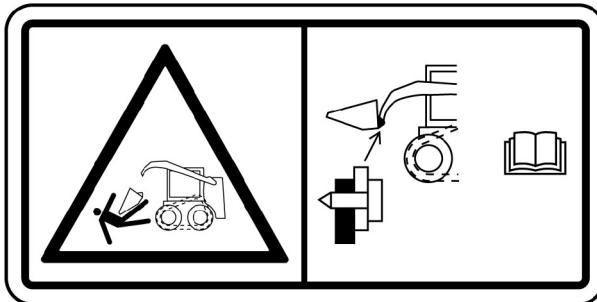
g01378799

### ⚠ 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.

## Work Tool Coupler (9)

This warning message is located inside the cab on the left side by the gauges.



g01427447

### **⚠ WARNING**

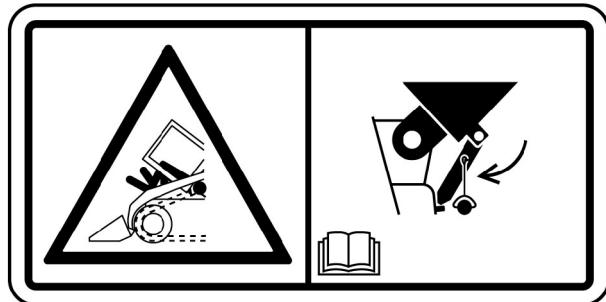
**Improper Attachment of the Work Tool could result in injury or death.**

**Do not operate the machine without confirmation that the coupler pins are fully engaged. Follow the operating procedures in the Operation and Maintenance Manual.**

Refer to Operation and Maintenance Manual, "Work Tool Coupler Operation" for the proper procedure for the work tool coupler.

## Cab Support (10)

This warning message is located on the right side of the machine near the cab support lever.



g01427441

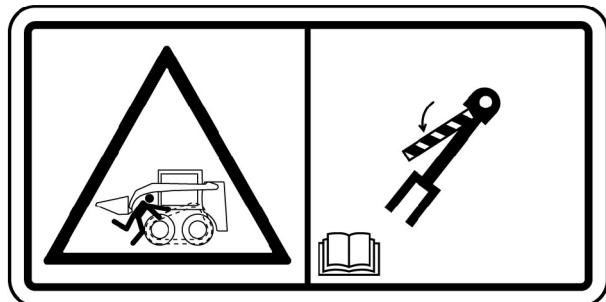
### **⚠ WARNING**

**Do not go beneath cab unless cab is empty and support lever is engaged.**

**Failure to follow the instructions or heed the warnings could result in injury or death.**

## Brace for the Loader Lift Arms (11)

This warning message is located on the right hand side on the brace for the loader lift arms.



g01427443

### **⚠ WARNING**

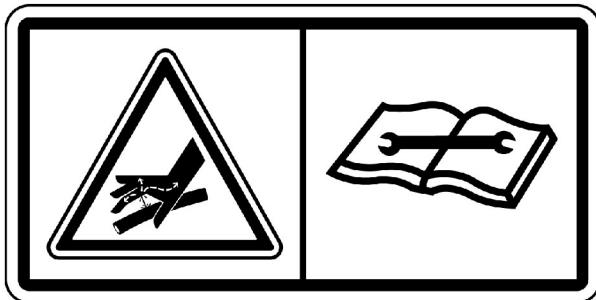
**Loader lift arm brace must be in place when working under raised lift arms.**

**Failure to follow the instructions or heed the warnings could result in injury or death.**

Refer to Operation and Maintenance Manual, "Loader Lift Arm Brace Operation" for operating information.

## Accumulator (13)

This warning message is located near the accumulator underneath the cab. If your machine is equipped with ride control, there will be an additional accumulator in this location.



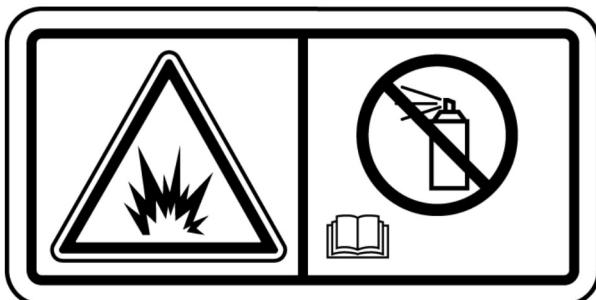
g01372252

### **⚠ WARNING**

Accumulator may contain high pressure oil. Do not service the accumulator or any hydraulic lines until all of the pressure has been relieved. See the Service Manual for proper procedures. Failure to heed this warning could result in injury or death.

## Aerosol Starting Aid (14)

This warning message is located on the side of the air cleaner housing.



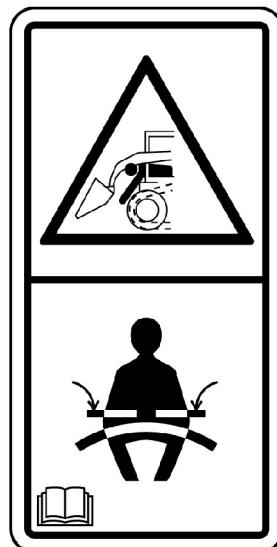
g01372254

### **⚠ WARNING**

Do not use ether. This machine is equipped with glow plugs. Using ether can create explosions or fires that can cause personal injury or death. Read and follow the engine starting procedure in the Operation and Maintenance Manual.

## Armrests (15)

This warning message is located inside the cab on the right side by the gauges.



g01427454

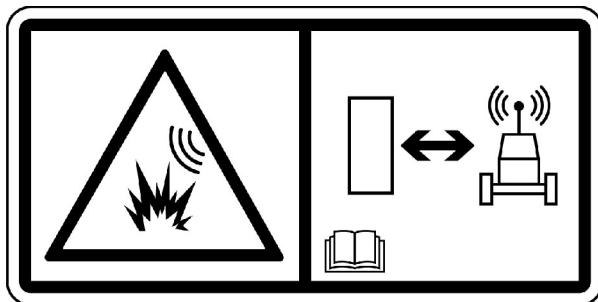
### **⚠ WARNING**

Crush/Ejection Hazard! Could cause serious injury or death.

Always wear seatbelt and lower both armrests while operating machine. Read the Operation and Maintenance Manual.

## Product Link (16)

This safety message is located inside the cab on the right hand window.



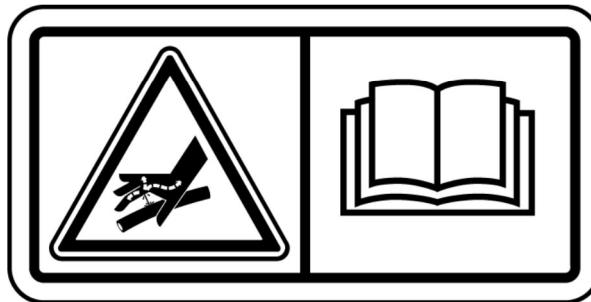
g01370917

### **⚠ WARNING**

**This machine is equipped with a Caterpillar Product Link communication device which must be deactivated within 12 m (40 ft) of a blast zone. Failure to do so could result in serious injury or death.**

## High Pressure Grease (17)

This safety message is located on the undercarriage by the access panel.



g01371642

### **⚠ WARNING**

**Personal injury can result from grease under high pressure.**

**The adjuster cylinder for the track is under high hydraulic pressure. Grease under high pressure can cause injury.**

**Do not visually inspect the adjuster cylinder to see if grease is released when the valve is opened. Look to see that the track has loosened.**

Refer to Operation and Maintenance Manual, "Track - Inspect/Adjust (Detension the Track)" for more information.

i02811655

## Safety Messages (Work Tools)

**SMCS Code: 7000; 7405**

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

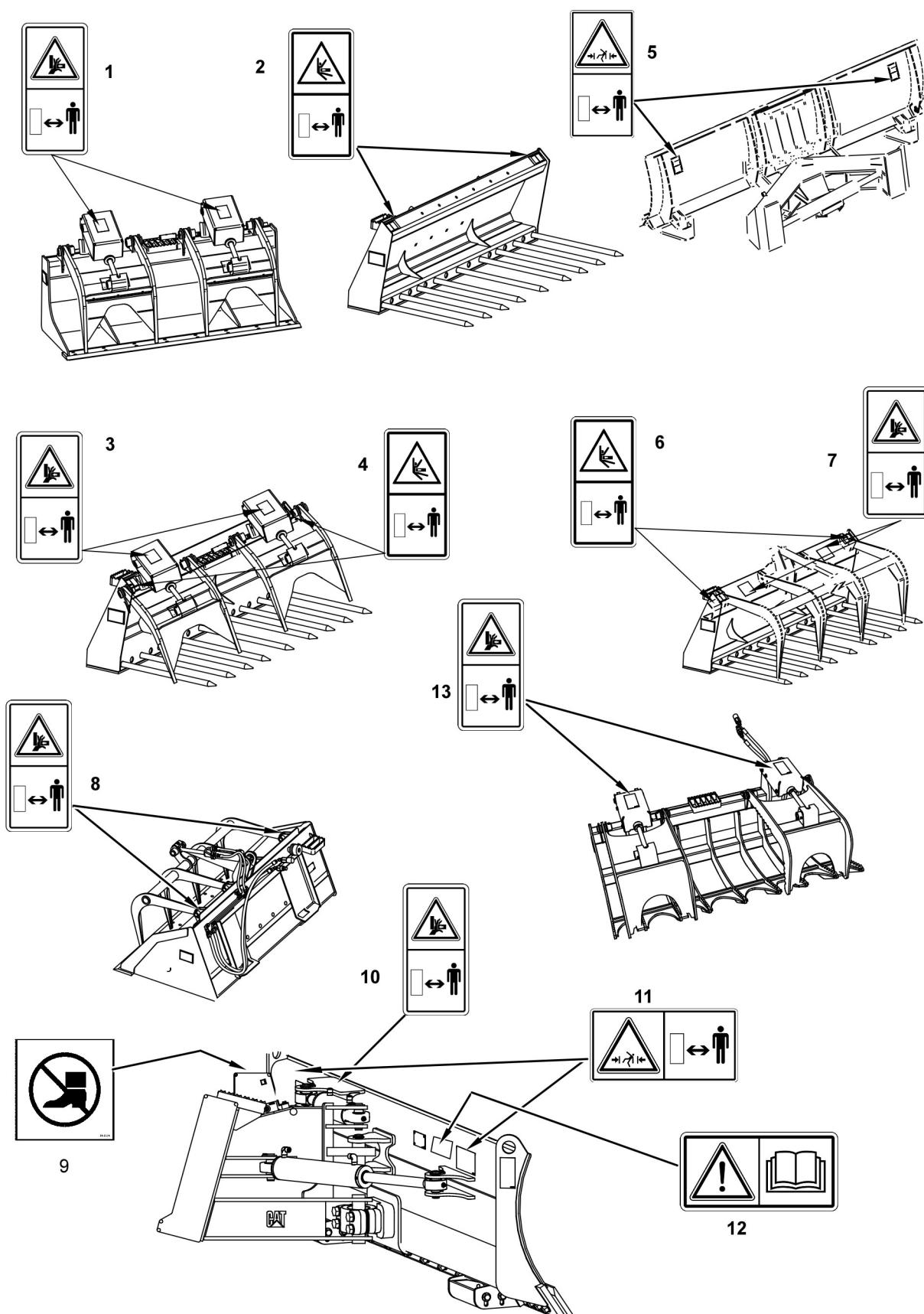
## Safety Section

### Safety Messages

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

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



## Industrial Grapple Bucket (1)

These warning messages are located on top of the guards for the grapple cylinders.



g01378775

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Utility Fork (2)

These warning messages are located on top of the fork carriage.



g01389170

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from impalement could occur. Stay away from the work tool while it is in operation.

## Industrial Grapple Fork (3)

These warning messages are located on the guards for the grapple cylinders.



g01378775

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Industrial Grapple Fork (4)

These warning messages are located on top of the fork carriage.



g01389170

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from impalement could occur. Stay away from the work tool while it is in operation.

## Angle Blade (5)

These warning messages are located on the back side of the blade.



g01377717

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Utility Grapple Fork (6)

These warning messages are located on top of the fork carriage.



g01389170

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from impalement could occur. Stay away from the work tool while it is in operation.

## Utility Grapple Fork (7)

These warning messages are located on top of the grapple frame.



g01378775

### **⚠ WARNING**

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Utility Grapple Bucket (8)

These warning messages are located on top of the grapple frame.



g01378775

### **⚠ WARNING**

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Dozer Blade (9)

This warning message is located on top of the dozer blade.



124-2456

g00946617

### **⚠ WARNING**

Falling Hazard - Area may be oily and slippery. Do not step on cylinders. Serious injury or death could occur from a fall.

## Dozer Blade (10)

This warning message is located on top of the dozer blade.



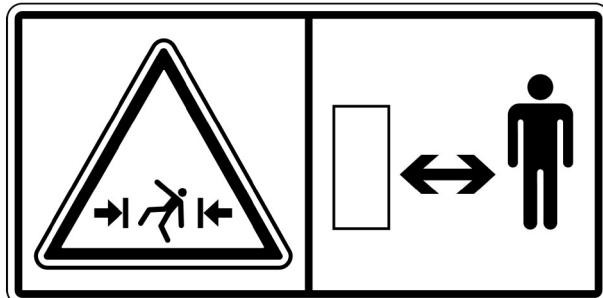
g01378775

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Dozer Blade (11)

These warning messages are located on the back side of the blade.



g01371644

### ⚠ WARNING

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

## Dozer Blade (12)

This warning is located on right hand side on the back of the blade.



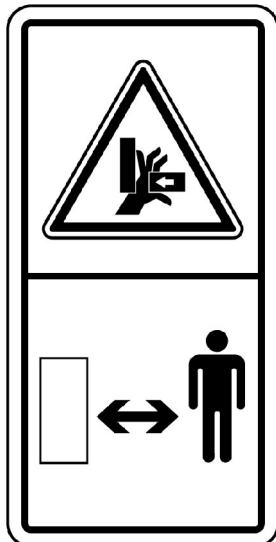
g01370904

### ⚠ WARNING

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

## Grapple Rake (13)

These warning messages are located on top of the grapple frame.



g01378775

### **WARNING**

No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.

i02900018

## Additional Messages

**SMCS Code:** 7000; 7405

There are several specific messages on this machine. Please become familiarized with all messages.

Make sure that all of the messages are legible. Clean the messages or replace the messages if you cannot read the words.

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 the illustrations if the illustrations are not legible. 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.

Consult your Caterpillar dealer for replacement of messages.

## Product Link (If Equipped)

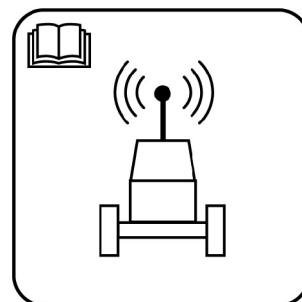


Illustration 5

g01418953

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

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

i04010649

## General Hazard Information

**SMCS Code:** 7000

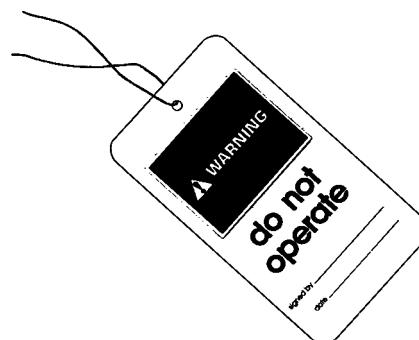


Illustration 6

g00104545

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

### **⚠ WARNING**

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

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

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

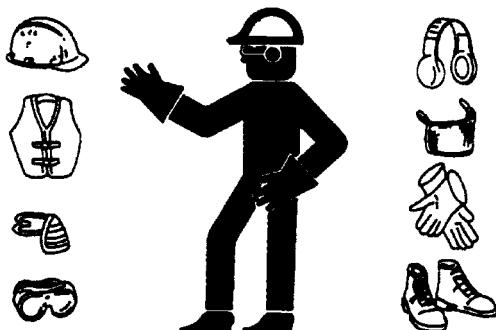


Illustration 7

900702020

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).

## **Trapped Pressure**

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

## Fluid Penetration

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

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

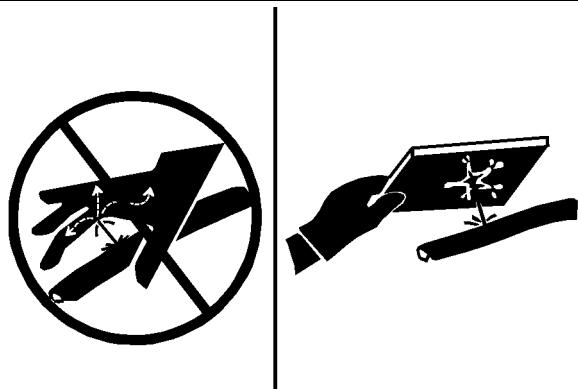


Illustration 8

g00687600

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

## Containing Fluid Spillage

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

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

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

Obey all local regulations for the disposal of liquids.

## Inhalation

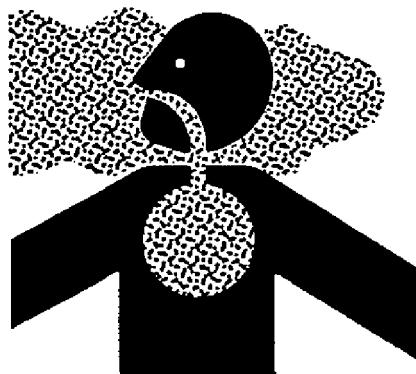


Illustration 9

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".
- Obey environmental regulations for the disposal of asbestos.
- Stay away from areas that might have asbestos particles in the air.

## Dispose of Waste Properly

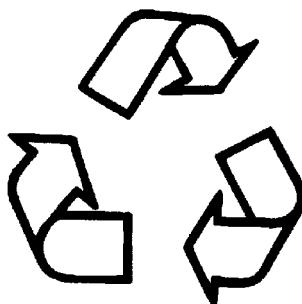


Illustration 10

g00706404

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

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

i01359664

## Crushing Prevention and Cutting Prevention

**SMCS Code:** 7000

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

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

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

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

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

Stay clear of all rotating and moving parts.

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

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

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

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

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

i04760300

## Burn Prevention

**SMCS Code:** 7000

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

## Coolant

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

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

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

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

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

## Oils

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

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

## Batteries

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

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

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

i04218233

# Fire Prevention and Explosion Prevention

**SMCS Code:** 7000



## General

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

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

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

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

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

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

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

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

Do not operate the machine near any flame.

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

Do not weld or flame cut on tanks or lines that contain flammable fluids or flammable material. Empty and purge the lines and tanks. Then clean the lines and tanks with a nonflammable solvent prior to welding or flame cutting. Ensure that the components are properly grounded in order to avoid unwanted arcs.

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

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

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

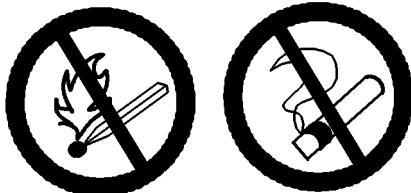


Illustration 12

g00704059

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

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

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

- Fraying
- Abrasion
- Cracking

## Battery and Battery Cables

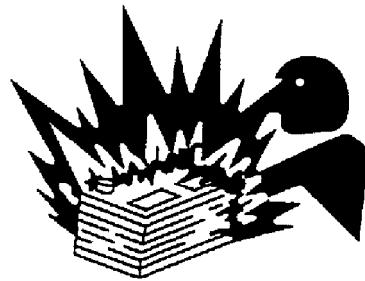


Illustration 13

g02298225

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

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

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

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

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

Never check the battery charge by placing a metal object across the terminal posts. Use a voltmeter in order to check the battery charge.

- 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.

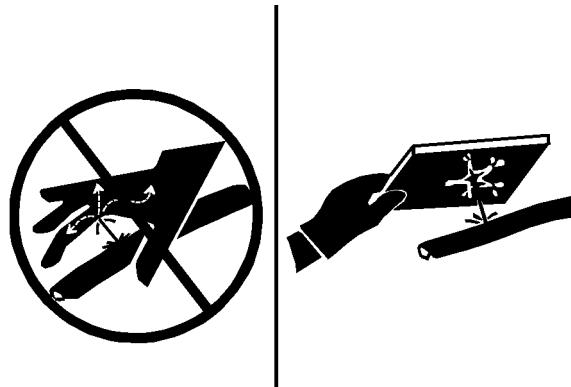


Illustration 14

g00687600

Check lines, tubes, and hoses carefully. Wear Personal Protection Equipment (PPE) in order to check for leaks. Always use a board or cardboard when you check for a leak. Leaking fluid that is under pressure can penetrate body tissue. Fluid penetration can cause serious injury and possible death. A pin hole leak can cause severe injury. If fluid is injected into your skin, you must get treatment immediately. Seek treatment from a doctor that is familiar with this type of injury.

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

- End fittings are damaged or leaking.
- Outer coverings are chafed or cut.
- Wires are exposed.
- Outer coverings are swelling or ballooning.
- Flexible parts of the hoses are kinked.
- Outer covers have exposed embedded armoring.
- End fittings are displaced.

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

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

## Ether

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

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

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

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

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

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

## Fire Extinguisher

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

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

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

i04025591

## Fire Safety

**SMCS Code:** 1000; 6700; 7000

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

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

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

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

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

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

Notify emergency personnel of the fire and your location.

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

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

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

1. Pull the pin.
2. Aim the extinguisher or nozzle at the base of the fire.
3. Squeeze the handle and release the extinguishing agent.
4. Sweep the extinguisher from side to side across the base of the fire until the fire is out.

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

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

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

## Fire Extinguisher Location

**SMCS Code:** 7000; 7419

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

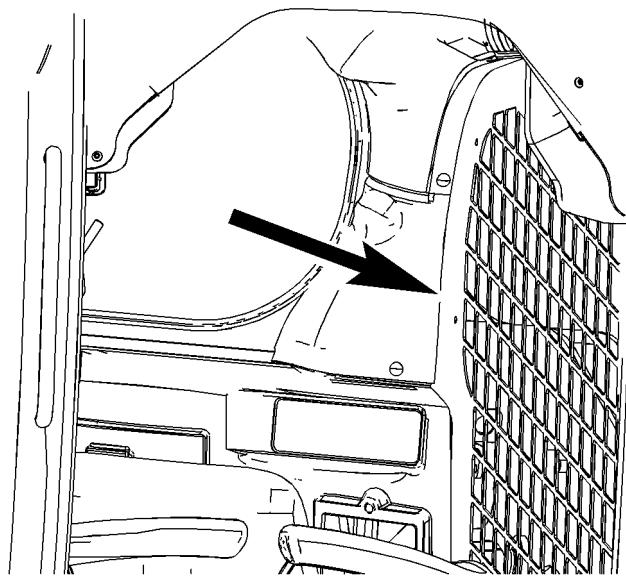


Illustration 15

g01289762

Mount the fire extinguisher on the left side of the cab behind the seat. Consult your Caterpillar dealer for the proper procedure for mounting the fire extinguisher.

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.

i03162317

## Visibility Information

**SMCS Code:** 7000

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

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

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

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

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

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

i02578915

## Engine Starting

**SMCS Code:** 1000; 7000

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

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

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

i02680030

## Before Operation

**SMCS Code:** 7000

Video tapes and safety information are available in English for the machine. A list of some of the material is available in the Operation and Maintenance Manual, "Reference Material". Consult your Caterpillar dealer in order to obtain copies of the material. The information should be reviewed by every person that operates the machine.

Clear all personnel from the machine and from the area.

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

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

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

Fasten the seat belt securely. Lower the armrests.

i03713960

## Operation

**SMCS Code:** 7000

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

Before you move the machine, you must be certain that no one will be endangered.

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

Do not allow riders on the machine. Never use the work tool for a work platform.

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

Use Caterpillar Approved Work Tools on this machine. Obey all the lift restrictions. Refer to Operation and Maintenance Manual, "Caterpillar Approved Work Tools" for the approved work tools and the lift restriction information.

Carry work tools low. Lower the lift arms fully. Tilt back the work tool in order to keep the work tool off of the ground. Do not go close to the edge of a cliff, an excavation, or an overhang.

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

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

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

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

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

Know the maximum dimensions of your machine.

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

This machine is designed to operate in the ambient temperature range of -32 °C (-25 °F) to 43 °C (109.4 °F).

Observe all applicable local government regulations when you use the Skid Steer Loader to lift heavy objects.

i01115299

## Work Tools

**SMCS Code:** 6700

Only use work tools that are approved by Caterpillar for use on Caterpillar machines. Refer to the Operation and Maintenance Manual, "Caterpillar Approved Work Tools".

If you are in doubt about the compatibility of a particular work tool with your machine, consult your Caterpillar 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. Always wear protective glasses. Always wear the protective equipment that is recommended in the work tool's operation manual. 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.

i02518481

## Parking

**SMCS Code:** 7000

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

1. Move the joystick control slowly to the NEUTRAL position in order to stop the machine.
2. Move the governor control lever to the LOW IDLE position.
3. Lower the loader arms and tilt the linkage so that the work tool rests firmly on the ground.
4. Move the hydraulic controls to the NEUTRAL position.
5. Turn the engine start switch key to OFF position and remove the key.
6. Raise the armrests and exit the machine.

i03745198

## Slope Operation

**SMCS Code:** 7000

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

i01329161

## Equipment Lowering with Engine Stopped

**SMCS Code:** 7000

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

i03064142

## Sound Information and Vibration Information

**SMCS Code:** 7000

### Sound Level Information

The operator Equivalent Sound Pressure Level (Leq) is 87 dB(A) when "ANSI/SAE J1166 OCT 98" is used to measure the value for an enclosed cab. This is a work cycle sound exposure level. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

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

The average exterior sound pressure level is 75 dB(A) when the "SAE J88Apr95 - Constant Speed Moving Test" procedure is used to measure the value for the standard machine. The measurement was conducted under the following conditions: distance of 15 m (49.2 ft) and "the machine moving forward in an intermediate gear ratio".

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

The dynamic operator sound pressure level is 85 dB(A) when "ISO 6396:1992" is used to measure the value for an enclosed cab. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

## **"European Physical Agents Directive (Vibration) 2002/44/EC"**

### **Vibration Data for Multi Terrain Loaders**

#### **Information concerning hand/arm vibration level**

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

#### **Information concerning whole body vibration level**

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

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

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

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

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

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

Table 1

<b>"ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment."</b>							
<b>Machine Type</b>	<b>Typical Operating Activity</b>	<b>Vibration Levels</b>			<b>Scenario Factors</b>		
		<b>X axis</b>	<b>Y axis</b>	<b>Z axis</b>	<b>X axis</b>	<b>Y axis</b>	<b>Z axis</b>
Compact Track Loader	v-shape motion	1,21	1,00	0,82	0,30	0,84	0,32

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

The Caterpillar suspension seat meets the criteria of "ISO 7096". This represents vertical vibration level under severe operating conditions. This seat is tested with the input "spectral class EM9". The seat has a transmissibility factor of "SEAT<0.9".

The whole body vibration level of the machine varies. There is a range of values. The low value is 0.5 meter per second squared. The machine meets the short term level for the design of the seat in "ISO 7096". The value is 1.59 meter per second squared for this machine.

#### **Guidelines for Reducing Vibration Levels on Earthmoving Equipment**

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

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer's recommendations.
  - a. Tire pressures
  - b. Brake and steering systems
  - c. Controls, hydraulic system and linkages
3. Keep the terrain in good condition.
  - a. Remove any large rocks or obstacles.
  - b. Fill any ditches and holes.
  - c. Provide machines and schedule time in order to maintain the conditions of the terrain.

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

- c. Provide breaks in order to reduce long periods of sitting.
- d. Avoid jumping from the cab.
- e. Minimize repeated handling of loads and lifting of loads.
- f. Minimize any shocks and impacts during sports and leisure activities.

## Sources

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

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

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

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

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

Use the web site in order to find your local dealer.

Caterpillar, Inc.  
[www.cat.com](http://www.cat.com)

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## Guards (Operator Protection)

**SMCS Code:** 7150-MCH; 7325

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

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

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

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

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

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

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

## Other Guards (If Equipped)

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

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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. Consult your Caterpillar dealer for additional information.

# Product Information Section

## General Information

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### Rated Load

**SMCS Code:** 6001; 6136; 6542; 7000

### Bucket Rated Load

#### **WARNING**

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

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

#### **WARNING**

**Machine stability is affected by many factors, including the type of work tool and the position of a work tool.**

**Machine stability and machine control can be significantly affected if a work tool is not installed. Operating a machine without a work tool can lead to loss of control or tipping of the machine which could result in serious injury or death.**

**When you operate a machine without a work tool, avoid the following conditions:**

- excessive speed
- sharp turns
- abrupt implement movement
- slopes and uneven ground

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

- Lubricants

- Full fuel tank
- Caterpillar bucket
- 75 kg (165 lb) operator

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

The rated operating load for Skid Steer Loaders that are equipped with rubber tires is defined by the SAE standard "J818:2007" and by the "EN 474-3:2006" as 50% of the full static tipping load. The ground is hard and the ground is level. The rated operating load for machines that are equipped with steel tracks is defined by the SAE standard "J818:2007" and by the "EN 474-3:2006" as 35% of the full static tipping load. The ground is soft and the ground is not level.

The corresponding dump clearance is given for each bucket at maximum lift height and at a 40 degree dump angle. The reach is given for each bucket at maximum lift height and at a 40 degree dump angle. Clearance is measured from the ground to the bucket edge in order to dump the load. The reach is measured from the front of the track to the bucket edge.

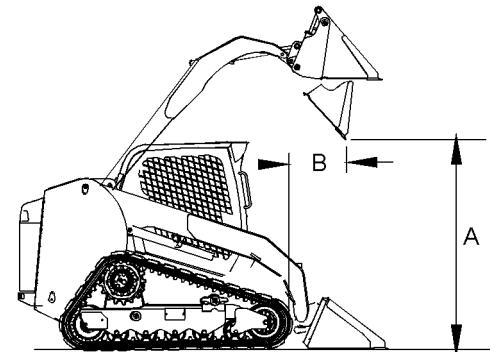


Illustration 16

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

The following tables provide the Rated Operating Capacity (ROC) for the standard machine configuration with a bucket.

Table 2

Dirt Buckets with Bolt on Edge						
Models	P/N	279-5441		285-6090		268-4083
	Weight	232 kg	511 lb	248 kg	546 lb	264 kg
	Bucket	1676 mm	66 in	1829 mm	72 in	1981 mm
279C	R.O.C. 35%	1012 kg	2230 lb	1006 kg	2218 lb	1001 kg
	Dump Clearance	2397 mm	94 in	2397 mm	94 in	2397 mm
	Reach	605 mm	24 in	605 mm	24 in	605 mm
289C	R.O.C. 35%	1205 kg	2656 lb	1199 kg	2644 lb	1194 kg
	Dump Clearance	2507 mm	99 in	2507 mm	99 in	2507 mm
	Reach	920 mm	36 in	920 mm	36 in	920 mm
299C	R.O.C. 35%	1302 kg	2871 lb	1296 kg	2859 lb	1292 kg
	Dump Clearance	2554 mm	101 in	2554 mm	101 in	2554 mm
	Reach	923 mm	36 in	923 mm	36 in	923 mm

Table 3

General Purpose Buckets									
Models	P/N	279-5368		279-5372		279-5376		292-9271	
	Weight	221 kg	487 lb	234 kg	516 lb	247 kg	544 lb	279 kg	614 lb
	Bucket	1676 mm	66 in	1829 mm	72 in	1981 mm	78 in	2134 mm High Capacity	84 High Capacity
279C	R.O.C. 35%	1002 kg	2210 lb	998 kg	2201 lb	993 kg	2190 lb	962 kg	2122 lb
	Dump Clearance	2391 mm	94 in	2391 mm	94 in	2391 mm	94 in	2330 mm	92 in
	Reach	633 mm	25 in	633 mm	25 in	633 mm	25 in	703 mm	28 in
289C	R.O.C. 35%	1192 kg	2628 lb	1188 kg	2619 lb	1182 kg	2607 lb	1146 kg	2527 lb
	Dump Clearance	2502 mm	99 in	2502 mm	99 in	2502 mm	99 in	2440 mm	96 in
	Reach	948 mm	37 in	948 mm	37 in	948 mm	37 in	1018 mm	40 in
299C	R.O.C. 35%	1288 kg	2840 lb	1284 kg	2831 lb	1279 kg	2819 lb	1240 kg	2734 lb
	Dump Clearance	2549 mm	100 in	2549 mm	100 in	2549 mm	100 in	2487 mm	98 in
	Reach	951 mm	37 in	951 mm	37 in	951 mm	37 in	1021 mm	40 in

Table 4

<b>Multipurpose Buckets</b>									
<b>Models</b>	<b>P/N</b>	<b>279-5390</b>		<b>279-5398</b>		<b>279-5403</b>		<b>293-0139</b>	
	<b>Weight</b>	355 kg	782 lb	374 kg	824 lb	393 kg	866 lb	393 kg	866 lb
	<b>Bucket</b>	1676 mm	66 in	1829 mm	72 in	1981 mm	78 in	2134 mm	84 in
<b>279C</b>	<b>R.O.C. 35%</b>	946 kg	2086 lb	939 kg	2071 lb	938 kg	2068 lb	931 kg	2054 lb
	<b>Dump Clearance</b>	2384 mm	94 in						
	<b>Reach</b>	636 mm	25 in						
<b>289C</b>	<b>R.O.C. 35%</b>	1132 kg	2496 lb	1125 kg	2481 lb	1125 kg	2480 lb	1119 kg	2467 lb
	<b>Dump Clearance</b>	2495 mm	98 in						
	<b>Reach</b>	951 mm	37 in						
<b>299C</b>	<b>R.O.C. 35%</b>	1227 kg	2705 lb	1220 kg	2690 lb	1220 kg	2690 lb	1214 kg	2676 lb
	<b>Dump Clearance</b>	2542 mm	100 in						
	<b>Reach</b>	954 mm	38 in						

Table 5

<b>Multipurpose Buckets with Bolt On Edge and Debris Guard</b>									
<b>Models</b>	<b>P/N</b>	<b>325-7050</b>		<b>325-7060</b>		<b>325-7070</b>		<b>325-7080</b>	
	<b>Weight</b>	397 kg	876 lb	421 kg	928 lb	444 kg	979 lb	468 kg	1031 lb
	<b>Bucket</b>	1676 mm	66 in	1829 mm	72 in	1981 mm	78 in	2134 mm	84 in
<b>279C</b>	<b>R.O.C. 35%</b>	918 kg	2024 lb	909 kg	2004 lb	905 kg	1995 lb	896 kg	1976 lb
	<b>Dump Clearance</b>	2358 mm	93 in						
	<b>Reach</b>	651 mm	26 in						
<b>289C</b>	<b>R.O.C. 35%</b>	1100 kg	2426 lb	1091 kg	2406 lb	1088 kg	2399 lb	1080 kg	2381 lb
	<b>Dump Clearance</b>	2469 mm	97 in						
	<b>Reach</b>	965 mm	38 in						
<b>299C</b>	<b>R.O.C. 35%</b>	1195 kg	2634 lb	1185 kg	2613 lb	1182 kg	2607 lb	1174 kg	2589 lb
	<b>Dump Clearance</b>	2516 mm	99 in						
	<b>Reach</b>	968 mm	38 in						

Table 6

Utility Buckets					
Models	P/N	285-6099		285-6102	
	Weight	224 kg	494 lb	239 kg	526 lb
	Bucket	1676 mm	66 in	1829 mm	72 in
279C	R.O.C. 35%	1005 kg	2216 lb	1000 kg	2206 lb
	Dump Clearance	2366 mm	93 in	2366 mm	93 in
	Reach	667 mm	26 in	667 mm	26 in
289C	R.O.C. 35%	1195 kg	2636 lb	1190 kg	2625 lb
	Dump Clearance	2477 mm	98 in	2477 mm	98 in
	Reach	982 mm	39 in	982 mm	39 in
299C	R.O.C. 35%	1291 kg	2846 lb	1286 kg	2836 lb
	Dump Clearance	2524 mm	99 in	2524 mm	99 in
	Reach	985 mm	39 in	985 mm	39 in

Table 7

Light Material Buckets									
Models	P/N	279-5421		279-5424		279-5429 (Bolt On Edge)		296-7597 (Bolt On Edge)	
	Weight	266 kg	587 lb	280 kg	618 lb	338 kg	744 lb	368 kg	811 lb
	Bucket	1829 mm	72 in	1981 mm	78 in	2082 mm	84 in	2438 mm	96 in
279C	R.O.C. 35%	1046 kg	2307 lb	1041 kg	2294 lb	1006 kg	2219 lb	911 kg	2009 lb
	Dump Clearance	2335 mm	92 in	2335 mm	92 in	2305 mm	91 in	2305 mm	91 in
	Reach	697 mm	27 in	697 mm	27 in	709 mm	28 in	709 mm	28 in
289C	R.O.C. 35%	1251 kg	2757 lb	1245 kg	2745 lb	1208 kg	2663 lb	1090 kg	2404 lb
	Dump Clearance	2445 mm	96 in	2445 mm	96 in	2415 mm	95 in	2415 mm	95 in
	Reach	1012 mm	40 in	1012 mm	40 in	1024 mm	40 in	1024 mm	40 in
299C	R.O.C. 35%	1349 kg	2974 lb	1343 kg	2961 lb	1305 kg	2878 lb	1183 kg	2609 lb
	Dump Clearance	2492 mm	98 in	2492 mm	98 in	2462 mm	97 in	2462 mm	97 in
	Reach	1015 mm	40 in	1015 mm	40 in	1027 mm	40 in	1027 mm	40 in

Table 8

Industrial Grapple Buckets <sup>(1)</sup>						
Models	P/N	157-7224		157-7225		217-6229
	Weight	425 kg	937 lb	440 kg	970 lb	459 kg
	Bucket	1676 mm	66 in	1829 mm	72 in	1981 mm
279C	R.O.C. 35%	985 kg	2172 lb	980 kg	2161 lb	974 kg
	Dump Clearance	2392 mm	94 in	2392 mm	94 in	2392 mm
	Reach	636 mm	25 in	636 mm	25 in	636 mm
289C	R.O.C. 35%	1187 kg	2617 lb	1182 kg	2606 lb	1176 kg
	Dump Clearance	2502 mm	99 in	2502 mm	99 in	2502 mm
	Reach	951 mm	37 in	951 mm	37 in	951 mm
299C	R.O.C. 35%	1286 kg	2835 lb	1280 kg	2823 lb	1274 kg
	Dump Clearance	2550 mm	100 in	2550 mm	100 in	2550 mm
	Reach	954 mm	38 in	954 mm	38 in	954 mm

<sup>(1)</sup> The rated capacity is calculated with a full bucket of dirt. Grasping objects with the grapple will lower the rated capacity.

Table 9

Utility Grapple Buckets <sup>(1)</sup>					
Models	P/N	285-6111		285-6110	
	Weight	363 kg	800 lb	379 kg	835 lb
	Bucket	1676 mm	66 in	1829 mm	72 in
279C	R.O.C. 35%	951 kg	2098 lb	946 kg	2085 lb
	Dump Clearance	2336 mm	92 in	2336 mm	92 in
	Reach	678 mm	27 in	678 mm	27 in
289C	R.O.C. 35%	1140 kg	2514 lb	1134 kg	2500 lb
	Dump Clearance	2446 mm	96 in	2446 mm	96 in
	Reach	993 mm	39 in	993 mm	39 in
299C	R.O.C. 35%	1235 kg	2724 lb	1230 kg	2711 lb
	Dump Clearance	2493 mm	98 in	2493 mm	98 in
	Reach	996 mm	39 in	996 mm	39 in

<sup>(1)</sup> The rated capacity is calculated with a full bucket of dirt. Grasping objects with the grapple will lower the rated capacity.

## Rated Loads for Forks

### WARNING

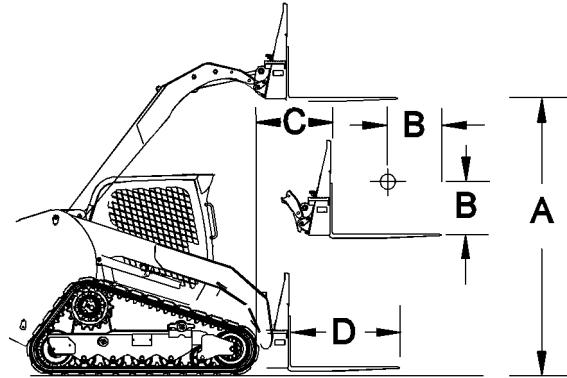
Failure to comply to the rated load can cause possible personal injury or property damage. Review the rated load of a particular work tool before performing any operation. Make adjustments to the rated load as necessary for non-standard configurations.

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

The rated operating load is defined by "SAE J1197" (October 2002) and "EN474". The rated operating load is the least amount of weight of the following conditions:

- 35% of the full static tipping load on a surface that is soft or a surface that is not level
- 50% of the full static tipping load on a surface that is hard and level

- The hydraulic lifting capacity
- 



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Illustration 17

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Dimension (A) represents the maximum fork height. Dimension (B) represents the load center. Dimension (C) represents the reach. Dimension (D) represents the fork tine length.

The maximum fork height (ground to top face of fork) is given for a pallet fork that is horizontal at maximum lift height. The reach (front of the tracks to the front face of the fork) is given for a pallet fork that is horizontal maximum reach.

The following tables provide the Rated Operating Capacity (ROC) for the standard machine configuration that is equipped with the following items:

- Full fuel tank
- Lubricants
- 75 kg (165 lb) operator
- Caterpillar fork

Table 10

<b>Pallet Fork</b>							
<b>Models</b>	<b>P/N</b>	<b>293-9427</b>		<b>293-9428</b>		<b>293-9429</b>	
	<b>Weight</b>	182 kg	401 lb	192 kg	423 lb	201 kg	444 lb
	<b>Fork</b>	914 mm	36 in	1067 mm	42 in	1219 mm	48 in
	<b>Load Center</b>	455 mm	18 in	535 mm	21 in	610 mm	24 in
<b>279C</b>	<b>R.O.C. 35%</b>	863 kg	1902 lb	811 kg	1787 lb	768 kg	1692 lb
	<b>Max Height of Fork</b>	3025 mm	119 in	3025 mm	119 in	3025 mm	119 in
	<b>Reach</b>	849 mm	33 in	849 mm	33 in	849 mm	33 in
<b>289C</b>	<b>R.O.C. 35%</b>	1012 kg	2231 lb	948 kg	2091 lb	896 kg	1976 lb
	<b>Max Height of Fork</b>	3130 mm	123 in	3130 mm	123 in	3130 mm	123 in
	<b>Reach</b>	743 mm	29 in	743 mm	29 in	743 mm	29 in
<b>299C</b>	<b>R.O.C. 35%</b>	1093 kg	2411 lb	1026 kg	2263 lb	971 kg	2141 lb
	<b>Max Height of Fork</b>	3177 mm	125 in	3177 mm	125 in	3177 mm	125 in
	<b>Reach</b>	730 mm	29 in	730 mm	29 in	730 mm	29 in

Table 11

<b>Utility Fork</b>					
<b>Models</b>	<b>P/N</b>	<b>285-6105</b>		<b>285-6110</b>	
	<b>Weight</b>	198 kg	436 lb	219 kg	484 lb
	<b>Fork</b>	1676 mm	66 in	1829 mm	72 in
	<b>Load Center</b>	314 mm	12 in	314 mm	12 in
<b>279C</b>	<b>R.O.C. 35%</b>	986 kg	2174 lb	980 kg	2162 lb
<b>289C</b>	<b>R.O.C. 35%</b>	1168 kg	2575 lb	1162 kg	2562 lb
<b>299C</b>	<b>R.O.C. 35%</b>	1259 kg	2776 lb	1253 kg	2764 lb

Table 12

<b>Utility Grapple Fork</b>					
<b>Models</b>	<b>P/N</b>	<b>285-6114</b>		<b>285-6115</b>	
	<b>Weight</b>	304 kg	671 lb	326 kg	718 lb
	<b>Fork</b>	1676 mm	66 in	1829 mm	72 in
	<b>Load Center</b>	314 mm	12 in	314 mm	12 in
<b>279C</b>	<b>R.O.C. 35%</b>	988 kg	2179 lb	981 kg	2164 lb
<b>289C</b>	<b>R.O.C. 35%</b>	1179 kg	2600 lb	1172 kg	2585 lb
<b>299C</b>	<b>R.O.C. 35%</b>	1273 kg	2806 lb	1266 kg	2791 lb

Table 13

Industrial Grapple Fork					
Models	P/N	279-5350		279-5360	
	Weight	502 kg	1106 lb	548 kg	1208 lb
	Fork	1676 mm	66 in	1829 mm	72 in
	Load Center	280 mm	11 in	280 mm	11 in
279C	R.O.C. 35%	940 kg	2072 lb	925 kg	2041 lb
289C	R.O.C. 35%	1134 kg	2501 lb	1121 kg	2471 lb
	R.O.C. 35%	1229 kg	2709 lb	1215 kg	2679 lb

## Rated Load with a Material Handling Arm

### WARNING

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

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

The maximum placement height (ground line to the chain hook) is given for the highest position of the material handling arm. The maximum reach (front of the machine to the chain hook) is the maximum horizontal reach of the material handling arm.

The rated operating capacity is the least amount of weight of the following conditions:

- 35% of the full static tipping load on a surface that is soft or a surface that is uneven
- 50% of the full static tipping load on a surface that is hard and level
- The hydraulic lifting capacity
- The material handling arm has a structural capacity of 907 kg (2000 lb).

The following tables provide the Rated Operating Capacity (ROC) for the standard machine configuration that is equipped with the following items:

- Full fuel tank

- Lubricants
- 75 kg (165 lb) operator
- Caterpillar Material Handling Arm

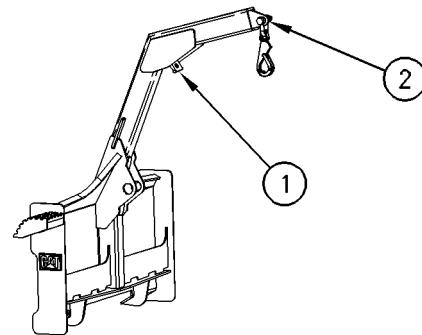


Illustration 18

g00668844

Lifting point 1 (1)

Lifting point 2 (2)

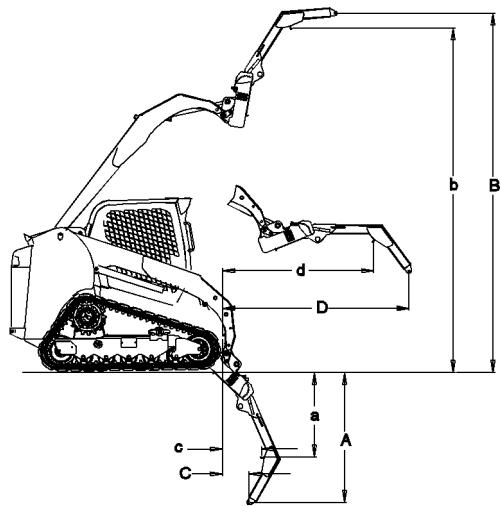


Illustration 19

g01451261

Dimension (A) represents the clearance at the full down position from Lifting Point 2. Dimension (a) represents the clearance at the full down position from Lifting Point 1. Dimension (B) represents the clearance at maximum height from Lifting Point 2. Dimension (b) represents the clearance at maximum height from Lifting Point 1. Dimension (C) represents the minimum reach from Lifting Point 2. Dimension (c) represents the minimum reach from Lifting Point 1. Dimension (D) represents the maximum reach from Lifting Point 2. Dimension (d) represents the maximum reach from Lifting Point 1.

Table 14

<b>Material Handling Arm</b>					
<b>Models</b>	<b>P/N</b>	<b>216-8756</b>			
	<b>Weight</b>	131 kg		289 lb	
		Point 1		Point 2	
<b>279C</b>	<b>R.O.C. 35%</b>	651 kg	1435 lb	542 kg	1195 lb
	<b>Clearance at Full Down</b>	-974 mm	-38 in	-1459 mm	-57 in
	<b>Clearance at Maximum Height</b>	4359 mm	172 in	4804 mm	189 in
	<b>Minimum Reach</b>	437 mm	17 in	285 mm	11 in
	<b>Maximum Reach</b>	1756 mm	69 in	2201 mm	87 in
<b>289C</b>	<b>R.O.C. 35%</b>	757 kg	1669 lb	625 kg	1378 lb
	<b>Clearance at Full Down</b>	-947 mm	-37 in	-1441 mm	-57 in
	<b>Clearance at Maximum Height</b>	4470 mm	176 in	4915 mm	194 in
	<b>Minimum Reach</b>	516 mm	20 in	398 mm	16 in
	<b>Maximum Reach</b>	1650 mm	65 in	2096 mm	83 in
<b>299C</b>	<b>R.O.C. 35%</b>	862 kg	1901 lb	710 kg	1566 lb
	<b>Clearance at Full Down</b>	-947 mm	-37 in	-1441 mm	-57 in
	<b>Clearance at Maximum Height</b>	4517 mm	178 in	4962 mm	195 in
	<b>Minimum Reach</b>	516 mm	20 in	398 mm	16 in
	<b>Maximum Reach</b>	1637 mm	64 in	2083 mm	82 in

i03710844

## Specifications

**SMCS Code:** 7000

### Intended Use

This machine is classified as a Skid Steer Loader with wheels or tracks as described in "EN ISO 6165:2006". This machine normally has a front mounted bucket or another work tool for digging, loading, lifting, carrying and moving material such as earth, crushed rock or gravel. Additional work tools allow this machine to perform other specific tasks.

### Application/Configuration Restrictions

Refer to Operation and Maintenance Manual, "Machine Data" below for information about maximum machine weight.

Refer to Operation and Maintenance Manual, "Approved Work Tools" for information about acceptable work tools.

The maximum fore and aft slope for proper lubrication is 25 degrees continuous and 35 degrees intermittent. Intermittent time is 2 minutes.

Use this machine in environments with no explosive gases.

### Diesel Fuel Requirements

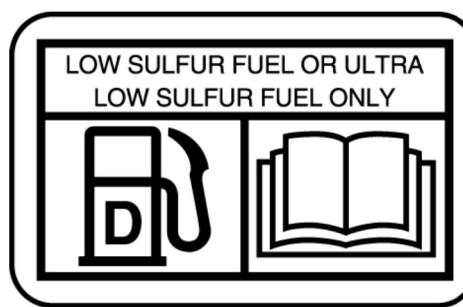


Illustration 20

g01416469

In the United States, 0.0015 percent (15 ppm) sulfur diesel fuels have been used in most on-highway truck engines since 15 October 2006. This ultra low sulfur diesel fuel (ULSD) was mandated as a means of directly reducing particulate emissions from on-highway diesel engines. This ultra low sulfur fuel will also be used in Caterpillar commercial diesel engines and in Caterpillar machine engines. ULSD fuel will be used when low emissions are required.

**Note:** In Europe, ultra low sulfur diesel fuel will have a maximum of 0.0010 percent (10 ppm) sulfur and is typically referred to as "sulfur-free".

#### NOTICE

Heavy Fuel Oil (HFO), Residual fuel, or Blended fuel must **NOT** be used in Caterpillar diesel engines (except in 3600 Series HFO engines). Blended fuel is residual fuel that has been diluted with a lighter fuel (cutter stock) so that they will flow. Blended fuels are also referred to as heavy fuel oils. Severe component wear and component failures will result if HFO type fuels are used in engines that are configured to use distillate fuel.

Low Sulfur Diesel (LSD) fuel will have  $\leq$ 500 ppm (0.05%) sulfur. Ultra Low Sulfur Diesel (ULSD) fuel will have  $\leq$ 15 ppm (0.0015%) sulfur using the "ASTM D5453", "ASTM D2622", or "ISO 20846, ISO 20884" test methods. Certain applications and/or governments/localities MAY require the use of ULSD fuel. Emission controlled diesel engines and/or diesel engines equipped with exhaust aftertreatment devices MAY require the use of ULSD fuel. Diesel engines equipped with a Diesel Particulate Filter (DPF) require the use of ULSD. Consult federal, state, and local authorities for guidance on fuel requirements for your area. Also, consult the specific engine Operation and Maintenance Manual for guidance.

There are many other diesel fuel specifications that are published by governments and by technological societies. Usually, those specifications do not review all the requirements that are addressed in the Operation and Maintenance Manual, SEBU6251, "Caterpillar Commercial Diesel Engine Fluids Recommendations" in the section "Caterpillar Specification for Distillate Diesel Fuel". To ensure optimum engine performance, a complete fuel analysis should be obtained before engine operation.

#### ⚠ WARNING

Mixing alcohol or gasoline with diesel fuel can produce an explosive mixture in the engine crankcase or fuel tank.

**Personal injury and damage to the engine may result. Caterpillar recommends against this practice.**

There are many different types of fuel additives that are available to use. Caterpillar does not generally recommend the use of fuel additives.

Refer to Operation and Maintenance Manual, SEBU6251, "Caterpillar Commercial Diesel Engine Fluids Recommendations" for the use of fuel additives and fuel conditioners.

## Machine Data

The specifications that are given herein describe the machine as the machine is manufactured by Caterpillar Inc. The machine is full of fluids. The machine is equipped with all options. The weight does not include the operator, work tools, or other attachments.

Table 15

	<b>279C</b>	<b>289C</b>	<b>299C</b>
Maximum Machine Weight	4533 kg (9994 lb)	4752 kg (10476 lb)	4871 kg (10739 lb)
Overall Length	2951 mm (116 inch)	2951 mm (116 inch)	3092 mm (122 inch)
Height	2083 mm (82 inch)	2083 mm (82 inch)	2083 mm (82 inch)
Width	1981 mm (78 inch)	1981 mm (78 inch)	1981 mm (78 inch)

## Identification Information

i04415225

### 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.

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

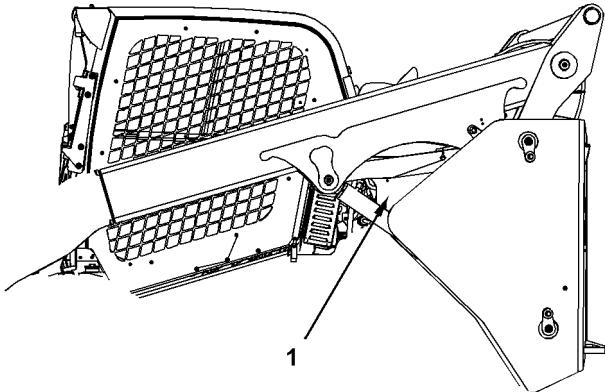


Illustration 21

g02639378

The Identification Plate for the machine is located under the lift arm on the left side.

(1) Machine PIN \_\_\_\_\_

Year of Manufacture \_\_\_\_\_

- PIN \_\_\_\_\_

- Model \_\_\_\_\_

- Power (kW) \_\_\_\_\_

- Weight (kg) \_\_\_\_\_

The engine serial number plate is located on the engine.

• Engine Serial Number \_\_\_\_\_

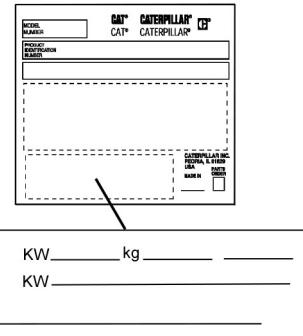


Illustration 22

g02020534

This plate is located on the bottom left side of the Identification Plate.

**Note:** The CE plate is on machines that are certified to the European Union requirements that are listed on the "Document of Conformity". If the machine is equipped with the plate for the European Union, the plate is attached to the PIN plates.

For machines that are 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.

- Year of Manufacture \_\_\_\_\_
- Engine Power for primary engine (kW) \_\_\_\_\_
- Engine Power for additional engine (if equipped) \_\_\_\_\_
- Typical machine operating weight for European market (kg) \_\_\_\_\_
- Year of construction \_\_\_\_\_
- Machine Function \_\_\_\_\_

For machines that are compliant with "98/37/EC" the following information is stamped on the CE plate. For quick reference, record this information in the spaces that are provided below.

- Engine Power for primary engine (kW) \_\_\_\_\_
- Typical machine operating weight for European market (kg) \_\_\_\_\_
- Year \_\_\_\_\_

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

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i04687649

## Emissions Certification Film

**SMCS Code:** 1000; 7000; 7405

### Certification Label for Emissions

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

Consult your Cat dealer for an Emission Control Warranty Statement.

This label is located on the engine valve cover.

i03659202

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 16

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

### EC DECLARATION OF CONFORMITY OF MACHINERY

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth moving Equipment
Function:	Compact Track loader	
Model/Type:	(279C), (289C), 299C Compact Track Loader	
Serial Number:		
Commercial Name:	Caterpillar	

Fulfils all the relevant provisions of the following Directives

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

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

**Done at:**

**Signature**

**Date:**

**Name/Position**

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

i03740705

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 17

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

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### EC DECLARATION OF CONFORMITY OF MACHINERY

---

**Manufacturer:**

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
Function:	Rake with Top Clamp	
Model/Type:	Industrial Grapple Rake	
Serial Number:		
Commercial Name:	Caterpillar	

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	

Note (1) 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 October 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

i03740703

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 18

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

### EC DECLARATION OF CONFORMITY OF MACHINERY

**Manufacturer:**

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Bucket with Top Clamp
	Model/Type:	Industrial Gapple Bucket, Utility Grapple Bucket
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	

Note (1) 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 October 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

i03740584

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 19

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

---

### EC DECLARATION OF CONFORMITY OF MACHINERY

---

**Manufacturer:**

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Fork with Top Clamp
	Model/Type:	Industrial Grapple Fork, Utility Grapple Fork
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	

Note (1) 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 October 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

i03740663

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 20

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

### EC DECLARATION OF CONFORMITY OF MACHINERY

**Manufacturer:**

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Multipurpose Bucket
	Model/Type:	Multipurpose (MP) Bucket
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	

Note (1) 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 October 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

i03740701

## Declaration of Conformity

**SMCS Code:** 1000; 7000

Table 21

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

---

### EC DECLARATION OF CONFORMITY OF MACHINERY

---

**Manufacturer:**

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

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

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

I, the undersigned, \_\_\_\_\_, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
Function:	Material Handling Arm	
Model/Type:	Material Handling Arm (MHA), Truss Boom, Lifting Hook	
Serial Number:		

Commercial Name: Caterpillar

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	

Note (1) 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 October 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

# Operation Section

## Before Operation

i02601969

### Mounting and Dismounting

SMCS Code: 7000

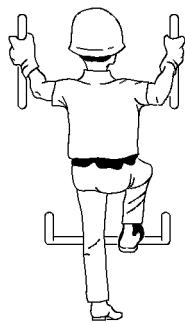


Illustration 23

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.

i03921321

## Daily Inspection

SMCS Code: 1000; 7000

### 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, make a thorough daily inspection before you operate the machine. Remove any debris from the engine compartment and the undercarriage. Ensure that all guards, covers, and caps are secured. Inspect all hoses and belts for damage. Make the needed repairs before you operate the machine.

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

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

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

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

Remove any trash buildup and debris. Inspect the area between lift cylinder and lower plate of the lift tower for debris and clean as necessary. Inspect the rear portion of the right side lift cylinder tower for debris and clean as necessary.

Perform all necessary repairs before you operate the machine.

Ensure that all covers and guards are securely attached.

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

Grease all of the fittings that are scheduled on a daily basis.

Daily, perform the procedures that are applicable to your machine. Refer to the Operation and Maintenance Manual, "Maintenance Interval Schedule" "Every 10 Service Hours or Daily" category for the list of procedures.

# Machine Operation

## Alternate Exit

SMCS Code: 7000

## Primary Exit

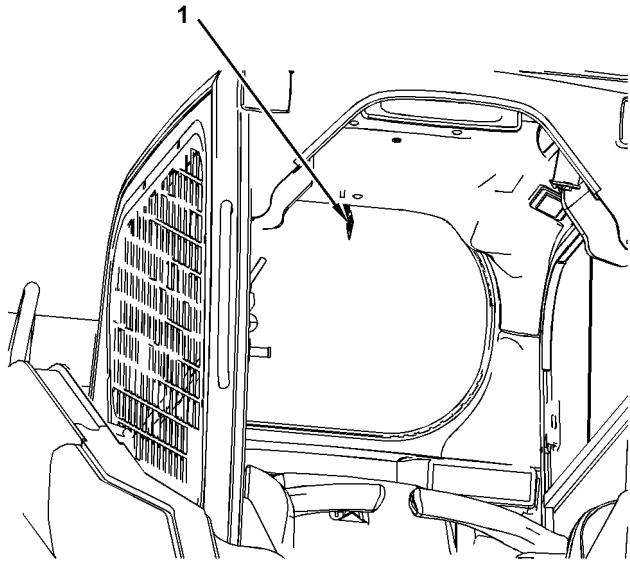


Illustration 24

(1) Latch pin

The rear window in the machine serves as the primary alternate exit. The window will need to be removed in order to use the primary alternate exit. Pull on the ring at the top of the window in order to remove the window. This will remove the seal that holds the window in place. When the seal is taken out, carefully remove the window.

i02518644

g01260321

## Secondary Exit

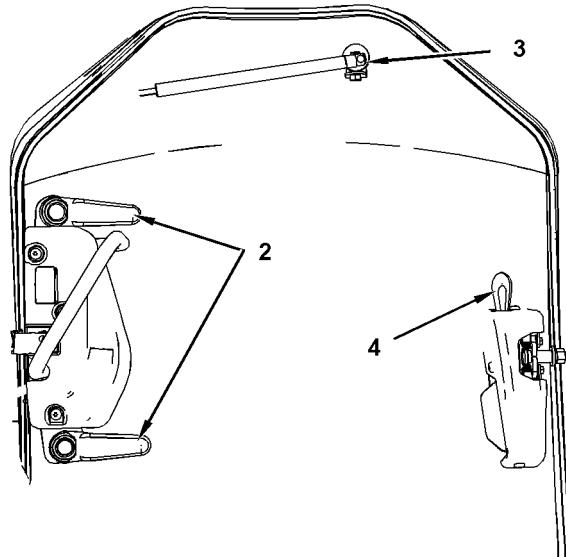


Illustration 25

g01260322

- (2) Release levers for the hinge
- (3) Quick release for the strut
- (4) Door Latch

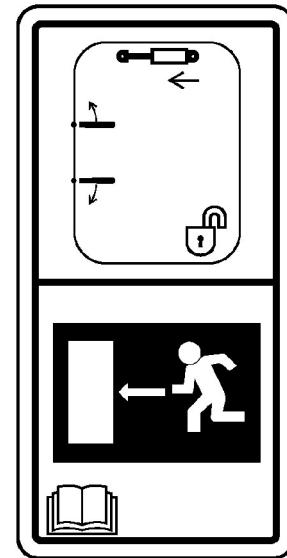


Illustration 26

g01260324

If necessary, the cab door may be removed from the hinges from the inside of the machine. Use the following procedure:

1. Release the door from the striker (4).
2. Use the two levers (2) in order to release the hinge. Move the upper lever counterclockwise. Move the lower lever clockwise.

3. Locate the quick release (3) on the end of the support strut. Move the quick release to the left and hold the quick release.
4. Push up on the strut in order to release the strut from the mount.
5. Push the door away from the cab.

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

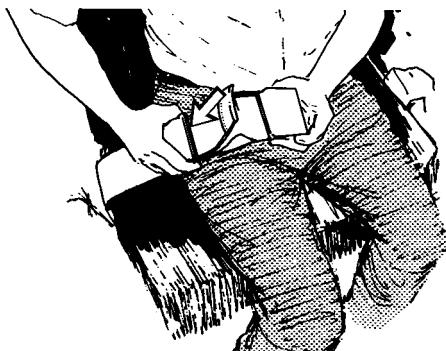


Illustration 27

g00100709

1. Unfasten the seat belt.

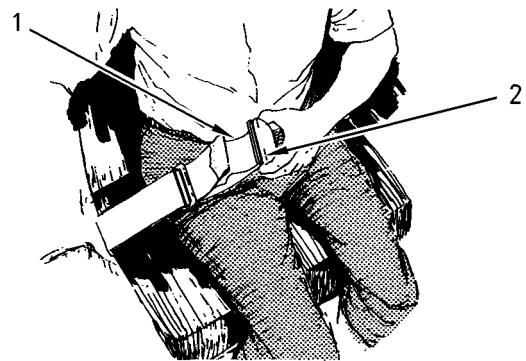


Illustration 28

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

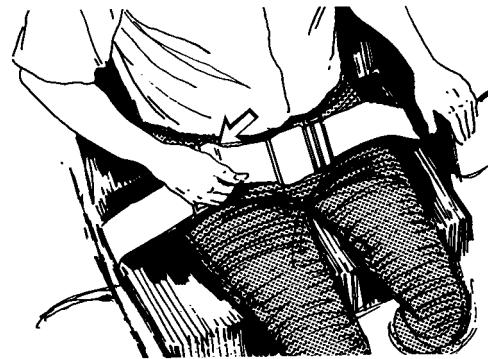


Illustration 29

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

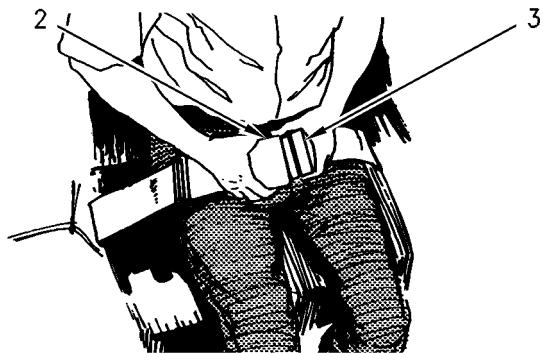


Illustration 30

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

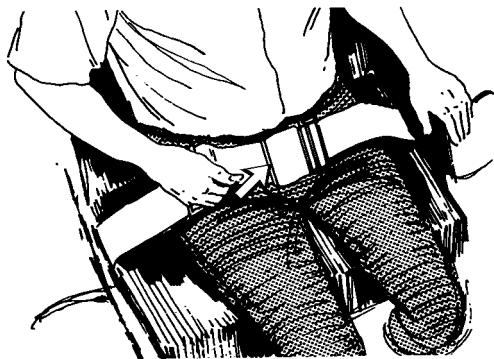


Illustration 31

g00100717

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

## Seat Belt Adjustment for Retractable Seat Belts

### Fastening The Seat Belt

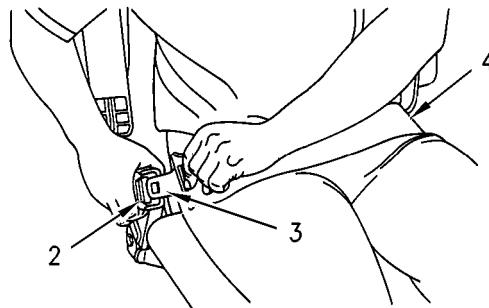


Illustration 32

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

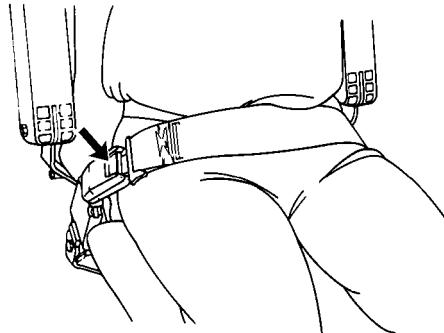


Illustration 33

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.

i04077189

## Operator Controls

**SMCS Code:** 7300; 7451

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

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

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

**Note:** Simple hydromechanical work tools may be shipped without hydraulic oil. Uneven movement may occur until all the air has been removed from the work tool. You may need to add hydraulic oil to the machine after the machine fills the circuits of the work tool. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check" for the proper procedure for checking the hydraulic oil level.

**Note:** If the machine is not equipped with a cab that is enclosed, Caterpillar recommends the use of a flying object guard. If the machine is equipped with an enclosed cab, operate the machine with the cab door in the CLOSED position.

## Left Side Controls

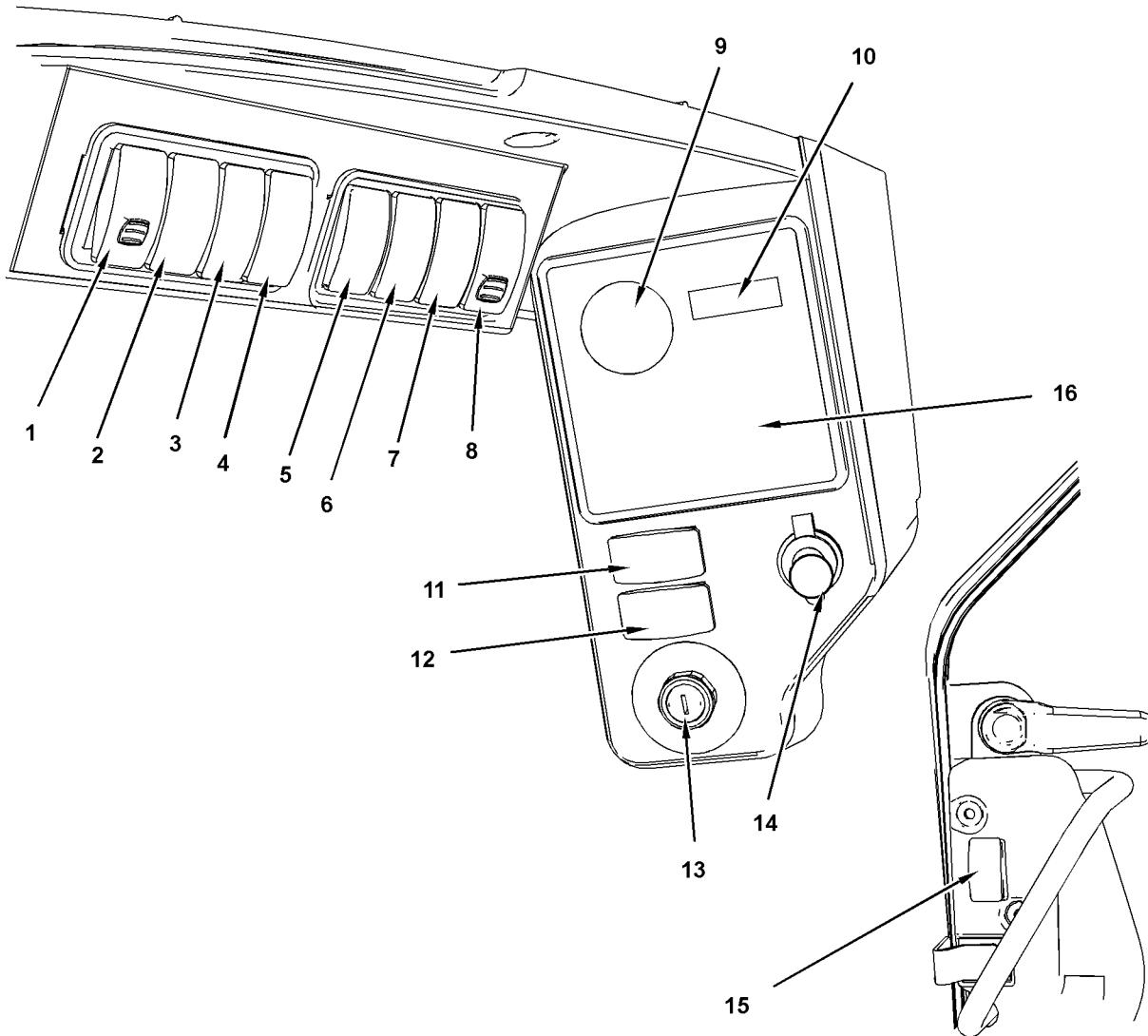


Illustration 34

g01210307

- (1) Auxiliary Hydraulic Pressure Release
- (2) Hydraulic Lockout and Interlock Override
- (3) Rear Work Lights
- (4) Front Work Lights
- (5) Multifunction Switch for the Left Hand Trigger

- (6) Auxiliary Electrical Control
- (7) Automatic Level Control
- (8) Work Tool Coupler Control
- (9) Fuel Level Gauge
- (10) Service Hour Meter
- (11) Joystick Control Pattern

- (12) Parking Brake
- (13) Engine Start Switch
- (14) 12 volt Plug
- (15) Window Wiper and Window Washer
- (16) Alert Indicator Panel

## Auxiliary Hydraulic Pressure Release (1)

### **WARNING**

Personal injury or death can result from the work tool falling.

Fully lower the loader arms before you release the hydraulic system pressure.

**Auxiliary Hydraulic Pressure Release** – After the engine has run in order to charge the accumulator, turn the ignition switch to the OFF position. Turn the ignition switch to the ON position. Release the parking brake. Push up on the locking tab and press the bottom of the switch in order to release the pressure in the Standard Flow Auxiliary Circuit and the High Flow Auxiliary Circuit. Hold the switch for 4 to 5 seconds and release the switch.

**Note:** The operator must remain in the seat with the armrests in the LOWERED position in order for the control to function. If equipped, the front door must be closed.

**Note:** The pressure in the secondary circuit is not affected by this switch. Refer to Operation and Maintenance Manual, "Work Tool Coupler Operation : Secondary Auxiliary Circuit" for the procedure to release the pressure.

## Hydraulic Lockout and Interlock Override (2)



**Hydraulic Lockout** – Press the top of the switch in order to disable the hydraulic functions. Return the switch to the middle position in order to activate the hydraulic functions.

**Note:** Activate the hydraulic shutoff when you are operating the machine in order to prevent unplanned movement of the work tool and the loader arms.



**Interlock Override** – The interlock override allows the auxiliary hydraulic circuits to function with the armrests in the RAISED position. First bring the machine to a complete stop. Activate the continuous flow control that is located on the left side joystick. Refer to the section "Joystick Controls" for detailed information. Press the bottom of the interlock override switch and release the switch in order to activate the interlock override function. In order to turn off the interlock override and continuous flow, press the bottom of the switch and release the switch again.



### WARNING

Inadvertent movement of the work tool may occur if the interlock override function is used with work tools. This may result in personal injury or death. Only use interlock override function for hand-held work tools.

**Note:** The alert indicator for the parking brake will light when the interlock override is activated. When the interlock override is deactivated, press the parking brake switch in order to disengage the parking brake and activate the hydraulic functions.

### NOTICE

Do not leave the machine unattended while you have the interlock override function activated.

## Switch on the Cab Door

A switch is provided on the cab door that prevents the work tool from operating when the cab door is open. If the cab door is not installed, install a jumper wire between Terminal 2 and Terminal 4 in the wiring harness connector for the Window Wiper. Refer to Special Instruction, REHS1738, "Installing the Cab Door and Mounting Group" for more information about the cab door.

**Note:** When the door is installed, remove the jumper wire from the connector plug before you connect the harness. Damage to the door could occur if the jumper is left in place.

## Rear Work Lights (3)



**Rear Work Lights** – Press the bottom of the switch in order to turn on the lights. Press the top of the switch in order to turn off the lights.

## Front Work Lights (4)



**Front Work Lights** – Press the bottom of the switch in order to turn on the lights. Press the top of the switch in order to turn off the lights.

## Multifunction Switch for the Left Hand Trigger (5)

This switch is used to toggle the function of the trigger on the left-hand joystick between Two Speed and the Auxiliary Electrical Function "AUX 7".

### Two Speed



**Two Speed** – Push the top of the switch in order to use the trigger for the two speed control. Press the trigger and release the trigger on the front of the left-hand joystick in order to activate rabbit mode. In order to return to single speed, press the trigger and release the trigger again.

**Note:** Keep the work tool close to the ground when you travel in rabbit mode. This method will maximize the stability of the machine.

**Note:** Do not move the multifunction switch while the Two Speed function is active. Ensure that the machine is in single speed mode before the Auxiliary Electrical Function "AUX 7" is activated.

**Note:** The creeper must be turned off in order to shift the machine into two speed. If you activate the creeper, the machine will return to single speed. If you set the parking brake, the machine will return to low speed.

### Auxiliary Electrical Function “AUX 7”

**Note:** If the switch is not present, the trigger on the left-hand joystick only provides this auxiliary function.

 **Auxiliary Electrical Function “AUX 7” –** Push the bottom of the switch in order to activate the seventh auxiliary electrical function. Pull the trigger and hold the trigger on the left-hand joystick in order to provide electrical power to pin (B) on the work tool connector on the loader arm. Release the trigger in order to deactivate the control.

### Auxiliary Electrical Control “AUX 8”

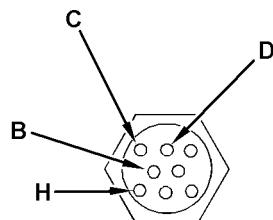


Illustration 35

g01107114

Typical electrical connection on the loading arm

 **Auxiliary Electrical Control “AUX 8” –** (6) – The auxiliary electrical control supplies continuous electrical power to pin (H) on the connector for the work tool on the loader arm. Press on the bottom of the switch in order to turn on electrical power. Press on the top of the switch in order to turn off electrical power.

### Automatic Level Control (7)

 **Automatic Level Control –** The Automatic Level Control maintains the approximate selected angle of the work tool as the loader lift arms are raised. Press on the bottom of the switch in order to activate the automatic level control. Press on the top of the switch in order to deactivate the automatic level control.

**Note:** The Automatic Level Control keeps a load at the selected angle when the lift arms are raised. The Automatic Level Control is not designed to maintain the selected angle of the work tool when the lift arms are lowered.

**Note:** If Automatic Level Control and Ride Control are selected, Ride Control will be activated at the Activation Speed and the Automatic Level Control will be deactivated. When the machine reaches the Deactivation speed, the Ride Control will be deactivated and the Automatic Level Control will be activated. Refer to the section on “Ride Control” for more details.

### Work Tool Coupler Control (8)

#### WARNING

Improper Attachment of the Work Tool could result in injury or death.

**Do not operate the machine without confirmation that the coupler pins are fully engaged. Follow the operating procedures in the Operation and Maintenance Manual.**

**Work Tool Coupler Control –** The work tool coupler control controls the engagement of the coupler pins.

 **Disengaged –** Push the red button upward and press the bottom of the switch. Hold the switch in the downward position until the coupler pins disengage.

 **Engaged –** Press the top of the switch and hold the top of the switch until the coupler pins engage.

Refer to Operation and Maintenance Manual, “Work Tool Coupler Operation” for the proper procedure for the work tool coupler.

### Fuel Level Gauge (9)

 **Fuel Level Gauge –** The needle in the red range indicates low fuel.

### Service Hour Meter (10)

 **Service Hour Meter –** The service hour meter should be used to determine service hour maintenance intervals.

## Joystick Control Pattern (11)

The switch for the Joystick Control Pattern has a number "1" on one side and a number "2" on the other side. When you start the machine, choose "1 - Caterpillar" or "2 - Alternate" in order to release the parking brake. The numbers on the Alert Indicator panel will blink until a pattern is selected. Once a pattern has been selected, activating the parking brake will not affect the selection of the pattern. Refer to the section "Joystick Controls" for detailed information.

## Parking Brake Control (12)

 **Parking Brake Control** – Press on the right side of the switch and release the switch in order to engage the parking brake. The same operation will disengage the parking brake.

**Note:** The parking brake will engage when the engine is stopped. The parking brake will engage when the armrests are moved to the RAISED position. The parking brake will engage when the operator leaves the operator seat for a time. The parking brake will engage when the interlock override is activated.

**Note:** If the switch for the Joystick Control Pattern is installed, select a pattern in order to release the parking brake.

## Engine Start Switch (13)

 **OFF** – Insert the engine start switch key only from the OFF position and remove the engine start switch key only from the OFF position. Turn the engine start switch key to the OFF position in order to stop the engine. In the OFF position, there is no power to most electrical circuits on the machine. The cab dome light is operational even when the engine start switch is in the OFF position.

 **ON** – Turn the engine start switch key clockwise to the ON position in order to activate all of the cab circuits.

 **START** – Turn the engine start switch key clockwise to the START position in order to crank the engine. Release the engine start switch key after the engine starts and the engine start switch key returns to the ON position.

**Note:** If the engine fails to start, turn the engine start switch key to the OFF position in order to attempt to start the engine again. Refer to the Operation and Maintenance Manual, "Engine Starting" for more details about starting the engine.

## 12 volt plug (14)

12 volt plug

## Window Wiper and Window Washer (15)



**Window Wiper and Window Washer –** Move the switch to the middle position in order to turn on the wiper. Press on the top of the switch in order to operate the washer. Press on the bottom of the switch in order to turn off the wipers.

## Alert Indicator Panel (16)

Refer to the section Operator and Maintenance Manual, "Alert Indicators" for a description about the indicators.

## Right Side Controls

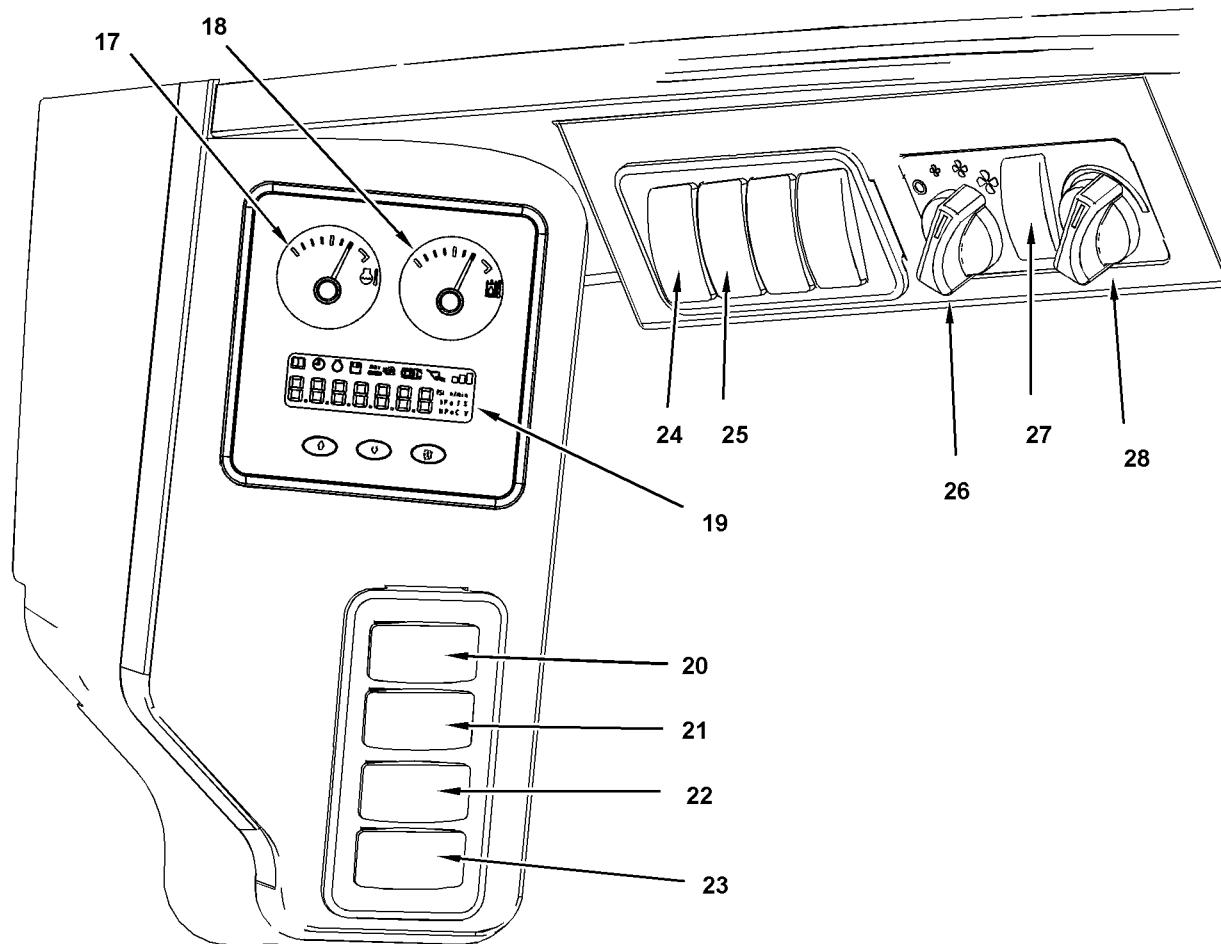


Illustration 36

g01210277

(17) Coolant Temperature  
 (18) Hydraulic Oil Temperature  
 (19) Digital Display Window  
 (20) Beacon Switch

(21) Hazard Flashers  
 (22) Roading Lights  
 (23) Turn Signals  
 (24) Creeper Control

(25) Ride Control  
 (26) Fan Speed Control  
 (27) Air Conditioning Control  
 (28) Temperature Control

### Coolant Temperature (17)

Coolant Temperature gauge

### Hydraulic Oil Temperature (18)

Hydraulic Oil Temperature gauge

### Digital Display Window (19)

Refer to the section "Digital Display Window" for detailed information.

### Beacon Switch (20)



**Beacon** – Press on the left side of the switch in order to turn on the beacon. Press the right side of the switch in order to turn off the beacon. The receptacle for the beacon is located on the upper left corner on the rear of the cab.

### Hazard Flashers (21)



**Hazard Flasher Control** – Press on the left side of the switch in order to activate the hazard flashers. Press on the right side of the switch in order to deactivate the hazard flashers.

## Roading Lights (22)



**Roading Lights** – Move the switch to the middle position in order to turn on the control panel lights and position lights.

Press on the left side of the switch in order to turn on the front low beams. Press on the right side of the switch in order to turn off the lights.

- Activation speed - 8 km/h (5.0 mph) for Ride Control
- Deactivation speed - 6 km/h (3.7 mph) for Ride Control.

**Note:** If Automatic Level Control and Ride Control is selected, Ride Control will be activated at the Activation Speed and the Automatic Level Control will be deactivated. When the machine reaches the Deactivation speed, the Ride Control will be deactivated and the Automatic Level Control will be activated.

## Turn Signals (23)



**Turn Signals** – Press on the left side of the switch in order to turn on the left turn signals. Press on the right side of the switch in order to turn on the right turn signals. Move the switch to the middle position in order to turn off the turn signals.

## Fan Speed Control (26)



Fan Speed Control

## Creeper Control (24)

The Creeper Control allows the operator to select a maximum machine travel speed at full joystick movement. Use creeper control for operations that require slow, constant speed.



**Creeper Control** – In order to activate the creeper control, stop the machine and return the joysticks to the neutral position.

Press the bottom of the switch in order to turn on the creeper control. In order to deactivate the creeper control, stop the machine and return the joysticks to the neutral position. Press the top of the switch in order to turn off the creeper control.

Refer to “Digital Display Window” for detailed information about the creeper speed control.

## Air Conditioner Control (27)



Air Conditioner Control

## Ride Control (25)

Ride Control assists in smoothing the ride of the machine. Travel over rough terrain causes bucket movement. The ride control system uses the lift cylinders as shock absorbers. The lift cylinders dampen the forces from the bucket.



**Ride Control** – Press the bottom of the switch in order to turn on the ride control.

Ride control will activate and the alert indicator will illuminate at the appropriate speed. Press the top of the switch in order to turn off the ride control.

**Note:** The ride control will deactivate and the indicator will not be illuminated at the appropriate speed. The ride control will also deactivate if the tilt function for the work tool is operated.

The following approximate speeds apply:

## Temperature Control (28)



Temperature Control

## Digital Display Window

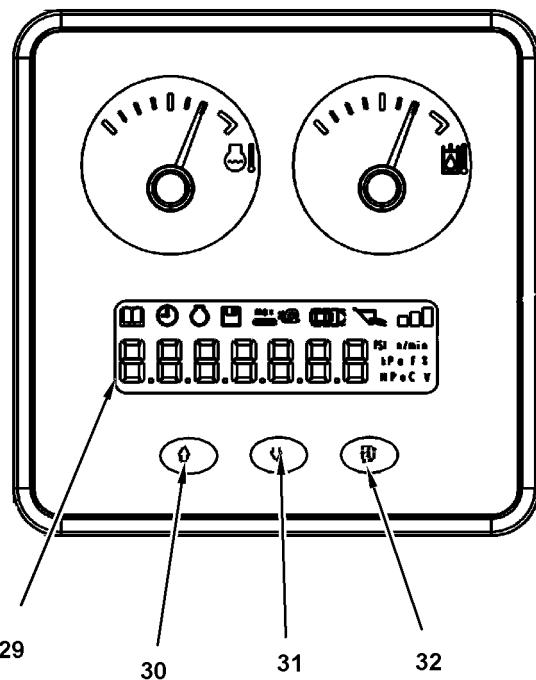


Illustration 37

g01227636

- (29) Digital Display Window
- (30) Scroll Up Key
- (31) Scroll Down Key
- (32) Function Selector

### General Description

The digital display window (29) shows some basic information about the machine. The Engine Speed, System Voltage, Job Clock, Work tool Control, "Drive Mode Control", and Creeper Control are displayed. The digital display window is used to set the work tool control. The digital display window is used to set the Creeper Control. The Function Selector (32) is used to toggle between modes that are available:

- Operator Mode 1 - Display Screen
- Operator Mode 2 - Work Tool Control
- Operator Mode 3 - Drive Mode Control
- Operator Mode 4 - Creeper Control

The scroll up key (30) and the scroll down key (31) are used to toggle between screens or settings in a mode.

In order to display the AccuGrade menu, press the scroll down key (31) and press the function key (32) at the same time. Refer to the AccuGrade section below.

### Operator Mode 1 - Display Screen

Three displays are available in this mode: Digital Tachometer, System Voltage, and Job Clock.



Illustration 38

g01242569

Representation of the Digital Tachometer (default start-up mode)

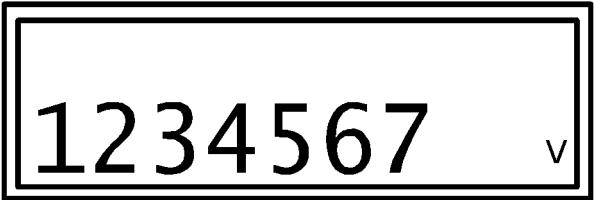


Illustration 39

g01242622

Representation of the System Voltage



Illustration 40

g01242648

Representation of the Job Clock

The default start-up mode is the Digital Tachometer. Use the “Scroll Up” button and the “Scroll Down” button in order to change the screen. The Job Clock can be reset by holding the “Scroll Up” and the “Scroll Down” buttons for 3 seconds.

## Operator Mode 2 - Work Tool Control

In Operator Mode 1, push the “Function Selector” button 1 time. The “Work Tool Control” screen is used in order to display the current setting for the response of the lift and tilt functions of the machine. Use the “Scroll Up” button and the “Scroll Down” button in order to change to a different setting.



Illustration 41

g01242657

Representation of the Work Tool Control

The Work Tool Control mode has three settings:

- Fine Control - 1 Bar
- Medium Control - 2 Bars
- Coarse Control - 3 Bars

**Note:** The Work Tool Control setting will not change when the ignition switch is turned off.

## Operator Mode 3 - Drive

In Operator Mode 1, push the “Function Selector” button 2 times. The “Drive Mode Control” screen is used in order to display the current setting of the “Drive Mode Control” functions. Use the “Scroll Up” button and the “Scroll Down” button in order to change to a different setting.

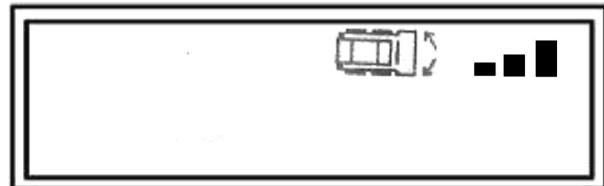


Illustration 42

g01892289

Representation of the “Drive Mode Control”

The “Drive Mode Control” has three settings:

- Standard Mode - 1 Bar
- Intermediate Mode - 2 Bars
- Maximum Mode - 3 Bars

**Note:** The “Drive Mode Control” setting will not change when the ignition switch is turned off.

**Note:** The machine will start, stop, and steer more aggressively with each progressive drive control mode. Test drive the machine in an open area in order to test the operating characteristics of the machine.

## Operator Mode 4 - Creeper Control

In Operator Mode 1, push the “Function Selector” button 3 times. The “Creeper Control” screen is used in order to display the current setting for the creeper control. Use the “Scroll Up” button and the “Scroll Down” button in order to change to a different setting for the Creeper Control.

**Note:** The “Creeper Control” setting will not change when the ignition switch is turned off. Refer to the section “Creeper Control” for operation of the switch.



Illustration 43

g01242658

Representation of the Creeper Control

The Creeper Control has the following ten settings:

Table 22

Setting	Approximate Percent of Full Speed
1	5%
2	7%
3	10%
4	13%
5	17%
6	24%
7	37%
8	57%
9	80%
10	100%

 **Setting 10 –** The “MAX” icon will appear at the maximum setting.

## AccuGrade (If Equipped)

The following instructions are a quick reference for the AccuGrade. For detailed instructions for the AccuGrade, refer to the Operation and Maintenance Manual, SEBU8278.

1. Ensure that the Laser Receiver is attached to the work tool and attached to the machine properly.
2. In order to display the AccuGrade menu, press the scroll down key (31) and press function key (32) at the same time.

3. In order to set the benchmark, press the scroll up key (30) and press the scroll down key (31) at the same time. Hold the keys until the value is set in the computer (approximately 3 seconds). The screen will display a “0” and the screen will flash once.

4. Press the trigger and release the trigger on the right-hand joystick in order to enable the AccuGrade automatic controls. Operate the implement joystick or operate the thumb wheel in order to override the automatic controls temporarily.
5. Press the trigger and release the trigger on the right-hand joystick in order to disable the AccuGrade automatic controls.
6. Press the scroll up key (30) and hold the scroll up key in order to exit AccuGrade.

## Other Features in the Cab

### Cab Dome Light



**Cab Dome Light –** Press on either side of the light in order to turn on the light. Move the light to the middle position in order to turn off the light.

### Interlock Control

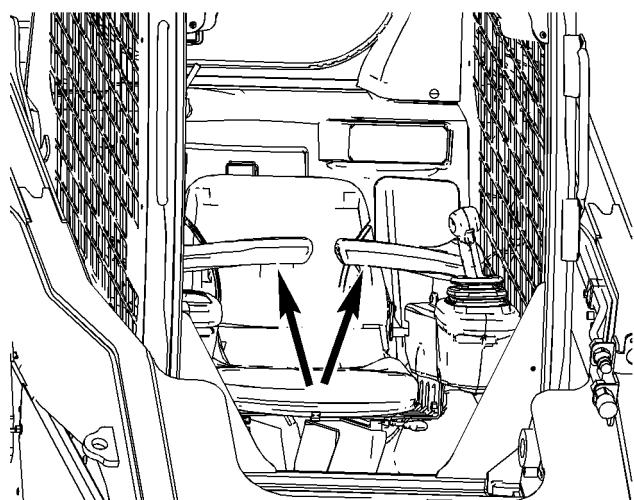


Illustration 44

g01231722

Armrests

**Interlock Control –** Move the armrests to the RAISED position in order to lock out the hydraulic controls.

**Note:** When the armrests are moved to the RAISED position, the parking brake will engage. Move the armrests to the LOWERED position and push the switch for the parking brake in order to activate the hydraulic controls.

**Note:** When you start the engine, the parking brake must be disengaged in order for the hydraulic controls to be activated. If the armrests are raised and lowered during operation, disengage the parking brake in order for the hydraulic controls to be activated.

## Accelerator Control

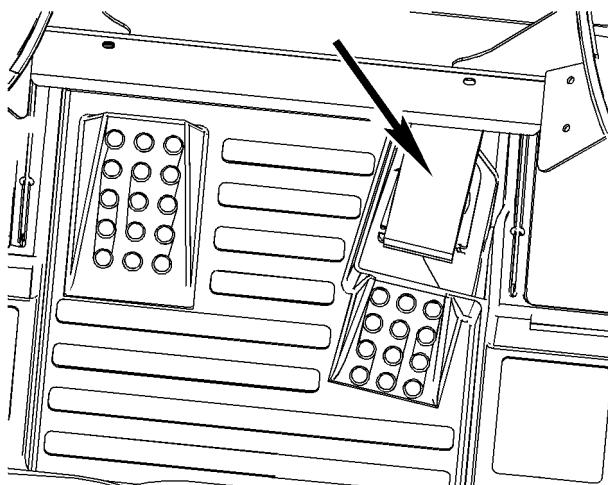


Illustration 45

g01231723

 **Accelerator Control** – Push down on the accelerator pedal in order to increase engine speed. Release the accelerator pedal in order to decrease engine speed. The accelerator pedal will return to the setting of the governor control.

## Standard Seat

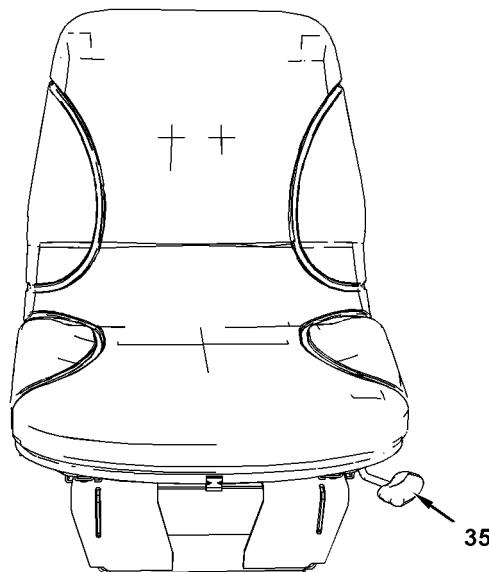


Illustration 46

g01231724

(35) Fore/Aft Adjustment



## Standard Seat

## Suspension Seat

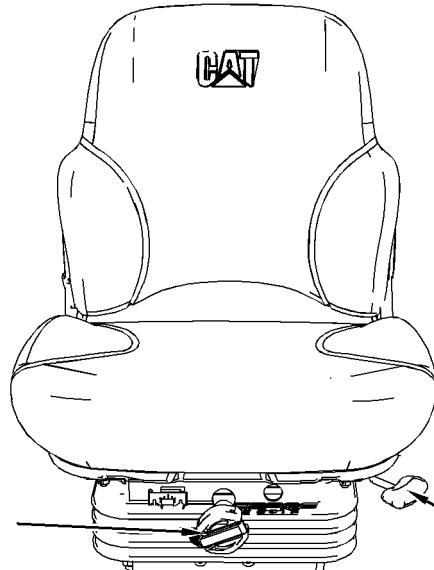


Illustration 47

g01243184

(35) Fore/Aft Adjustment  
(37) Adjustment for the suspension

**Fore/Aft lever (35)** – Move the lever in order to adjust the seat.

**Height (37)** – Turn the knob in order to adjust the suspension of the seat. Turn the knob clockwise for a heavier person. Turn the knob counterclockwise for a lighter person.

## Air Suspension Seat

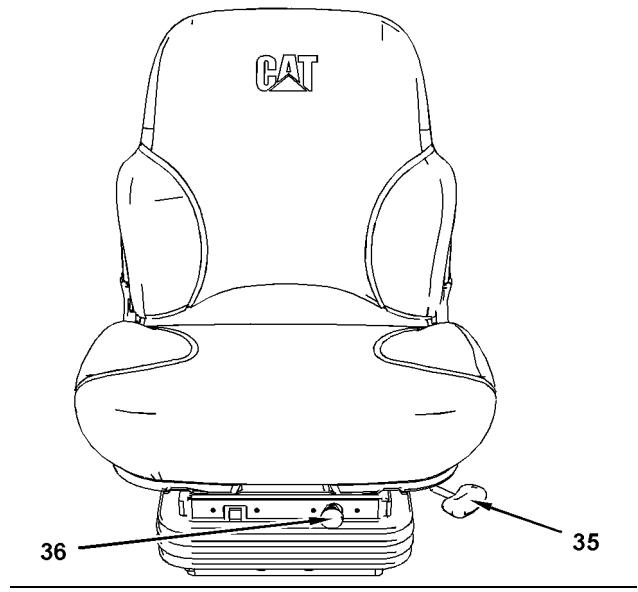


Illustration 48

g01231726

- (35) Fore/Aft Adjustment
- (36) Adjustment for the suspension



### Seat Adjustment

Push in the knob (36) in order to increase the stiffness of the suspension. Pull the knob in order to decrease the stiffness of the suspension.

**Note:** The engine start switch key must be in the ON position in order to increase the stiffness of the seat.

## Governor Control

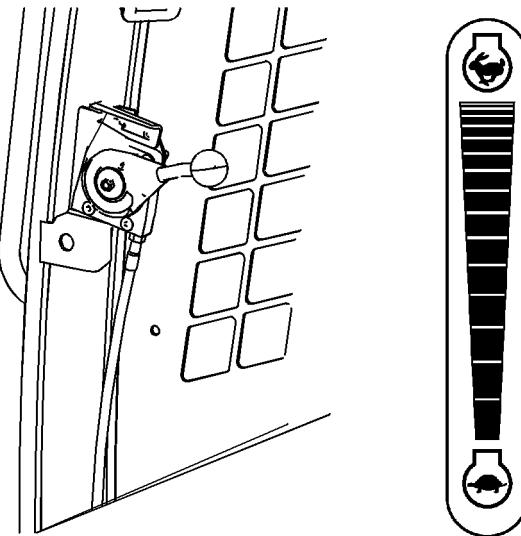


Illustration 49

g01231729

**Governor Control** – Use the governor control when you want to set a constant engine speed. Move the lever upward in order to increase engine speed. Move the lever downward in order to decrease engine speed.

## Joystick Controls

The joystick control that is described in this section is for the Caterpillar Joystick Control Pattern. This pattern is the default for machines that are NOT equipped with the option for the Selectable Control Pattern or the Dedicated Control Pattern.

Refer to the section “Selectable Control Pattern and Dedicated Control Pattern” below for instructions about the Alternate Joystick Control pattern and the Dedicated Control Pattern.

Refer to the section “Auxiliary Hydraulic Controls” below for instructions about the Auxiliary Hydraulic Controls .

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

## Left Hand Joystick

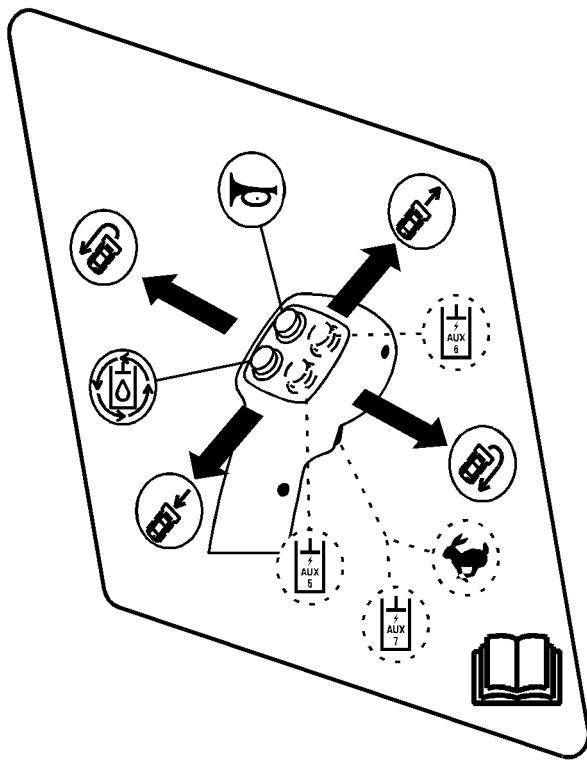


Illustration 50

g01259300

Instruction Decal for the Left Hand Joystick

### Forward



**Forward Travel** – Push the joystick forward in order to travel forward.

### Backward



**Backward Travel** – Pull back on the joystick in order to travel in reverse.

### Right Turn



**Right Turn** – Move the joystick to the right in order to turn the machine to the right.

### Left Turn



**Left Turn** – Move the joystick to the left in order to turn the machine to the left.

## Horn



**Horn** – Press the switch in order to sound the horn. Use the horn in order to alert personnel.

## Two Speed Control



**Two Speed** – Press the trigger and release the trigger on the front of the left-hand joystick in order to activate rabbit mode. In order to activate rabbit mode, the Multifunction Switch must also be in the Two Speed position. Refer to “Multifunction Switch for the Left Hand Trigger (5)” above for instructions about the switch.

**Note:** Keep the work tool close to the ground when you travel in rabbit mode. This method will maximize the stability of the machine.

## Continuous Flow Control



**Continuous Flow** – The continuous flow control supplies continuous flow of hydraulic fluid to the auxiliary hydraulic circuit without continuously holding the auxiliary hydraulic control. Press either one of the two auxiliary hydraulic switches (1) or (2) that are located on the right side joystick and hold that switch. If equipped, you may also move the thumb wheel on the right side joystick and hold the thumb wheel. Press the continuous flow switch on the left-hand joystick and release the continuous flow switch. Immediately release the auxiliary hydraulic switch or the thumb wheel after you release the continuous flow switch. The continuous flow function will be activated if the operator releases the auxiliary hydraulic switch within one second of pressing the continuous flow switch. Press on either the auxiliary hydraulic control or the continuous flow switch in order to stop the flow to the auxiliary circuit.

## Right Hand Joystick

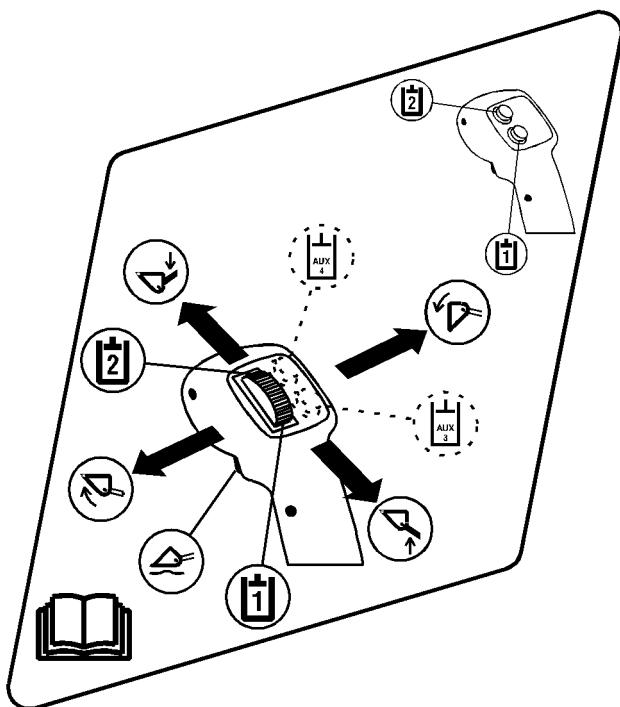


Illustration 51

g01259303

Instruction Decal for the Right Hand Joystick

### Lower



**Lower** – Push the joystick forward in order to lower the work tool.

### Dump



**Dump** – Move the joystick to the right in order to tilt the work tool downward.

### Raise



**Raise** – Pull the joystick backward in order to raise the work tool.

### Tilt Back



**Tilt Back** – Move the joystick to the left in order to tilt the work tool upward.

### Float



**Float** – Float allows the work tool to follow the contour of the ground.

The following conditions will activate the float function on the machine.

Move the joystick to the lower position and press the trigger. Float is activated. You may now release the trigger.

For an earlier machine that is not updated, move the joystick to the lower position. Press the trigger and release the trigger. Float is activated.

Once the float function is engaged, the joystick can be returned to the neutral position without affecting the float function. Float will remain engaged until the trigger on the right-hand joystick is pressed again. The float function will disengage also when the bucket is raised or when the bucket is lowered.

**Note:** These changes affect the following serial numbers: (S/N: JAY3086-UP), (S/N: DWS1377-UP), (S/N: MST2570-UP), (S/N: RED1669-UP), (S/N: JWF2014-UP), (S/N: MAS1735-UP), (S/N: GCP1475-UP), (S/N: MBT326-UP), (S/N: JSP289-UP), and (S/N: JMP309-UP). Serial numbers earlier than the listed will be affected if the software for the machine control has been updated.

**Note:** If the float function is enabled, the AccuGrade option is disabled.

### Auxiliary Shake Out Mode

Auxiliary Shake Out mode is an aggressive movement of the work tool in order to dislodge effectively wet material or sticky material.

Move the thumb wheel over the NEUTRAL position three times within a 2 second period in order to activate Auxiliary Shake Out mode. Auxiliary Shake Out mode will remain engaged while the thumb wheel is moved back and forth over the NEUTRAL position. Normal auxiliary control mode will return when the movement of the thumb wheel is discontinued.

## Selectable Control Pattern and Dedicated Control Pattern

If your machine is equipped with a Selectable Control Pattern or the Dedicated Control Pattern, there are two options for the joystick control:

- The alert indicator “1” will light when the Caterpillar Joystick Control Pattern is activated. Refer to the section “Joystick Controls” above for instructions about the Caterpillar Joystick Control Pattern in illustration 52 and in illustration 53 with the label “1”.
- The alert indicator “2” will light when the Alternate Joystick Control Pattern is activated.

The following instructions reflect the operation of the joysticks when the Alternate Joystick Control Pattern is selected. The Alternate Joystick Control Pattern changes the control of the work tool and the movement of the machine. The changes in the control are indicated in illustration 52 and in illustration 53 with the label “2”.

Refer to the section “Auxiliary Hydraulic Controls” below for instructions about the Auxiliary Hydraulic Controls .

## Left Hand Joystick

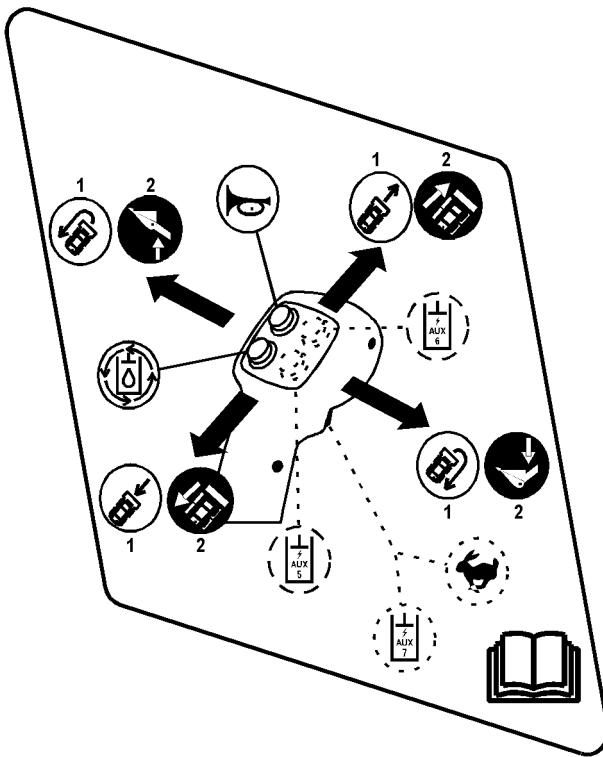


Illustration 52

g01259305

Instruction Decal for the Left Hand Joystick

### Forward Drive



**Forward** – Push the left-hand joystick forward in order to move the left side of the machine forward.

Push both joysticks forward equally in order to move the machine in a straight line.

### Reverse Drive



**Reverse** – Pull the left-hand joystick backward in order to move the left side of the machine backward.

Pull both joysticks backward equally in order to move the machine backward in a straight line.

### Right Turn

Push the left joystick forward in order to turn the machine to the right.

Push the left joystick forward and pull the right joystick backward in order to turn the machine rapidly to the right.

### Horn



**Horn** – Press the switch in order to sound the horn. Use the horn in order to alert personnel.

### Two Speed Control



**Two Speed** – Press the trigger and release the trigger on the front of the left-hand joystick in order to activate rabbit mode. In order to activate rabbit mode, the Multifunction Switch must also be in the Two Speed position. Refer to “Multifunction Switch for the Left Hand Trigger (5)” above for instructions about the switch.

**Note:** Keep the work tool close to the ground when you travel in rabbit mode. This method will maximize the stability of the machine.

### Lower



**Lower** – Move the joystick to the right in order to lower the work tool.

### Raise



**Raise** – Move the joystick to the left in order to raise the work tool.

## Continuous Flow Control

 **Continuous Flow** – The continuous flow control supplies continuous flow of hydraulic fluid to the auxiliary hydraulic circuit without continuously holding the auxiliary hydraulic control. Press either one of the two auxiliary hydraulic switches (1) or (2) that are located on the right side joystick and hold that switch. If equipped, you may also move the thumb wheel on the right side joystick and hold the thumb wheel. Press the continuous flow switch on the left-hand joystick and release the continuous flow switch. Immediately release the auxiliary hydraulic switch or the thumb wheel after you release the continuous flow switch. The continuous flow function will be activated if the operator releases the auxiliary hydraulic switch within one second of pressing the continuous flow switch. Press on either the auxiliary hydraulic control or the continuous flow switch in order to stop the flow to the auxiliary circuit.

## Right Hand Joystick

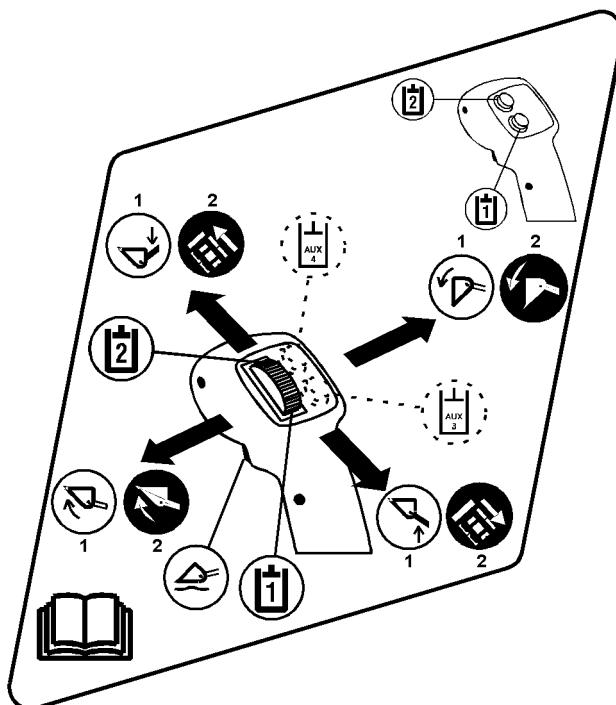


Illustration 53

g01259306

Instruction Decal for the Right Hand Joystick

### Forward Drive



**Forward** – Push the right-hand joystick forward in order to move the right side of the machine forward.

Push both joysticks forward equally in order to move the machine forward in a straight line.

### Reverse Drive



**Reverse** – Pull the right-hand joystick backward in order to move the right side of the machine backward.

Pull both joysticks backward equally in order to move the machine backward in a straight line.

### Left Turn

Push the right joystick forward in order to turn the machine to the left.

Push the right joystick forward and pull the left joystick backward in order to turn the machine rapidly to the left.

### Dump



**Dump** – Move the joystick to the right in order to tilt the work tool downward.

### Tilt Back



**Tilt Back** – Move the joystick to the left in order to tilt the work tool upward.

### Float



**Float** – Float allows the work tool to follow the contour of the ground.

The following conditions will activate the float function on the machine.

Move the joystick to the lower position and press the trigger on the right-hand joystick. Float is activated. You may now release the trigger.

For an earlier machine that is not updated, move the joystick to the lower position. Press the trigger and release the trigger. Float is activated.

Once the float function is engaged, the joystick can be returned to the neutral position without affecting the float function. Float will remain engaged until the trigger on the right-hand joystick is pressed again. The float function will disengage also when the bucket is raised or when the bucket is lowered.

**Note:** These changes affect the following serial numbers: (S/N: JAY3086-UP), (S/N: DWS1377-UP), (S/N: MST2570-UP), (S/N: RED1669-UP), (S/N: JWF2014-UP), (S/N: MAS1735-UP), (S/N: GCP1475-UP), (S/N: MBT326-UP), (S/N: JSP289-UP), and (S/N: JMP309-UP). Serial numbers earlier than the listed will be affected if the software for the machine control has been updated.

**Note:** If the float function is enabled, the AccuGrade option is disabled.

## Auxiliary Hydraulic Controls

If the work tool has a wiring harness, connect the work tool harness to the electrical plug on the loader arm. If your High Flow work tool does not have a wiring harness, a Jumper Plug should be installed on the electrical plug for the work tool control. Without this Jumper Plug, the machine will not provide High Flow to the work tool. Refer to your Parts Manual for the current part number for the Jumper Plug.

**Note:** High flow mode requires an electrical connection that is located on the loader arm. Refer to Operation and Maintenance Manual, "Work Tool Coupler Operation" or Operation and Maintenance Manual, "Work Tool Operation" for additional details.

**Note:** If the high flow work tool does not have a wiring harness, consult the Operation and Maintenance Manual for the work tool for the proper instructions for attaching the work tool.

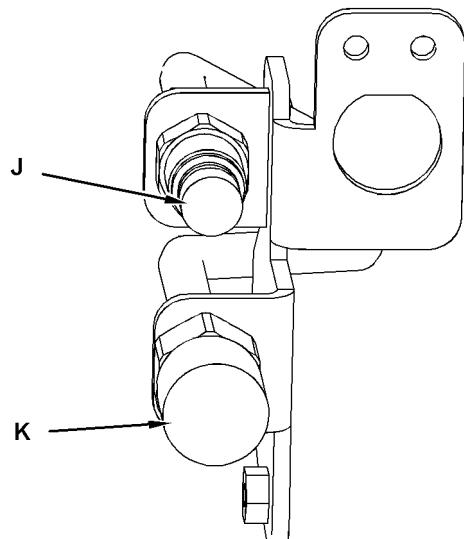


Illustration 54

g01291620

Standard Auxiliary Connections

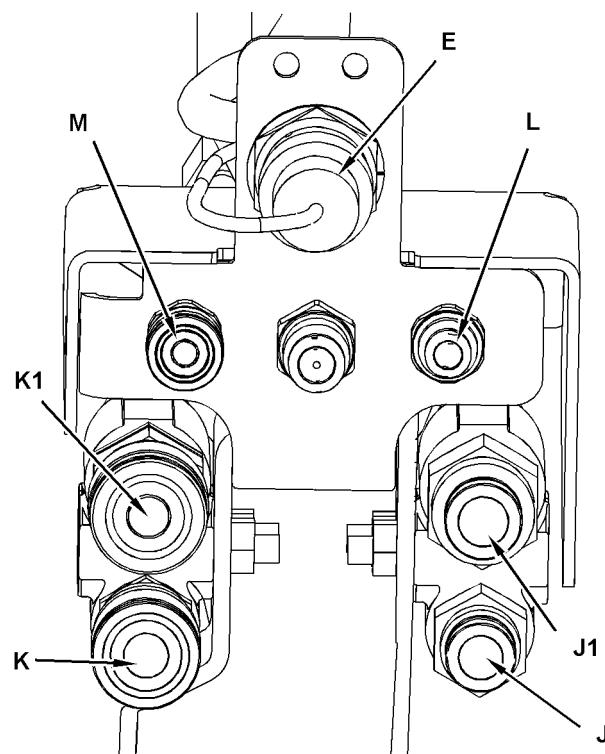


Illustration 55

g01210266

High Flow Connections



**Auxiliary Hydraulic Control (A1)** – This control provides hydraulic oil flow to the auxiliary connections on the loader arm.

Engage the control in order to provide hydraulic oil flow to the connector (K). For high flow work tools, engage the control in order to provide hydraulic oil flow to the connector (K1).



**Auxiliary Hydraulic Control (A2)** – This control provides hydraulic oil flow to the auxiliary connections on the loader arm.

Engage the control in order to provide hydraulic oil flow to the connector (J). For high flow work tools, engage the control in order to provide hydraulic oil flow to the connector (J1).



**Secondary Auxiliary Hydraulic Control (C-)** – This control provides hydraulic oil flow to the auxiliary connections on the loader arm. Press the control in order to provide hydraulic oil flow to the connector (M).



**Secondary Auxiliary Hydraulic Control (C+)** – This control provides hydraulic oil flow to the auxiliary connections on the loader arm. Press the control in order to provide hydraulic oil flow to the connector (L).

## Auxiliary Electrical Control (E)

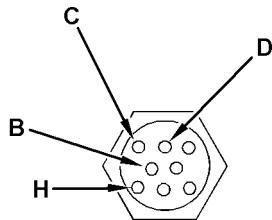


Illustration 56

g01107114

Typical electrical connection on the loading arm



### Auxiliary Electrical Control “AUX 5”

**(C2)** – This control provides electrical power in order to control a three-position diverter valve that is located on some work tools. Press the switch and hold the switch on the left-hand joystick in order to provide electrical power to the pin (D). Release the switch in order to deactivate the control.



### Auxiliary Electrical Control “AUX 6”

**(C1)** – This control provides electrical power in order to control a three-position diverter valve that is located on some work tools. Press the switch and hold the switch on the left-hand joystick in order to provide electrical power to the pin (C). Release the switch in order to deactivate the control.



### Auxiliary Electrical Control “AUX 7” –

Press the left hand trigger and hold the trigger in order to provide electrical power to the pin (B). Release the trigger in order to deactivate the control. Refer to “Multifunction Switch for the Left Hand Trigger (5)” above for instructions about the switch.

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## Alert Indicators

**SMCS Code:** 7450; 7451

The alert indicators are located on the left side overhead console.

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

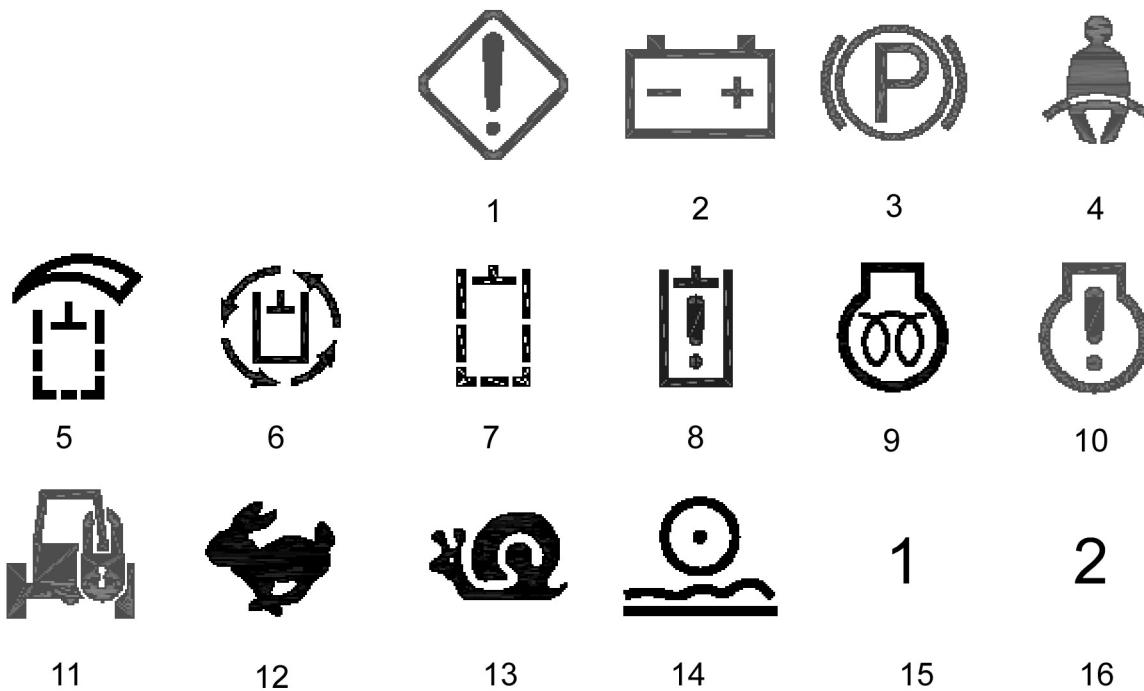


Illustration 57

Left Side

g01218926

- 1** – Driver Alert
- 2** – Alternator Output
- 3** – Parking Brake
- 4** – Seat Belt
- 5** – High Flow
- 6** – Continuous Flow
- 7** – Work Tool System
  - RED Work Tool Lockout
  - AMBER Interlock Override
- 8** – Hydraulics
  - RED Hydraulic Temperature
  - AMBER Hydraulic Filter Bypass
- 9** – Glow Plug Starting Aid
- 10** – Engine Condition Indicator
  - RED Coolant Temperature

- 11** – MSS Indicator
  - 12** – Two Speed Control
  - 13** – Creeper Control
  - 14** – Ride Control
  - 15** – Caterpillar Joystick Control Pattern
  - 16** – Alternate Joystick Control Pattern
- 1 - Driver Alert** This alert indicator will activate when there is a problem which requires the operator's attention.

**Note:** Other alert indicators that light or the gauges may help investigate the cause of any problems.

There are three levels of severity for the indicator:

- Level 1 - If the alert indicator is on continuously, stop the machine at the earliest convenience. Investigate the cause. If no additional alert indicators are illuminated, contact your Caterpillar dealer or refer to the service manual.

- Level 2 - If the alert indicator is flashing and there is no audible alarm, severe component damage could occur. Change your operation or perform the indicated maintenance.
- Level 3 - If the alert indicator is flashing and there is an audible alarm, injury to the operator or severe component damage could occur. Stop the machine immediately and stop the engine.

**2 - Alternator Output** This alert indicator will light if there is a malfunction in the electrical system. If this alert indicator comes on, the system voltage is too high for normal machine operation or too low for normal machine operation.

If electrical loads are high and the engine speed is near low idle, increase the engine speed to high idle. This will generate more output from the alternator. If the alert indicator for the electrical system turns off within one minute, the electrical system is probably operating in a normal manner. However, the electrical system may be overloaded during periods of low engine speeds.

Increase the engine idle speed with the governor lever in order to compensate for a higher electrical load on the system.

If this procedure does not cause the alert indicator to turn off, move to a convenient location. Investigate the cause (loose alternator belt, broken alternator belt, faulty batteries, etc).

**3 - Parking Brake** This alert indicator will light when the parking brake is engaged. The alert indicator should come on during start-up. The alert indicator should go out when the parking brake is disengaged.

**4 - Seat Belt and Armrests** This alert indicator will light when the armrests are in the RAISED position. The alert indicator will light when the operator gets out of the operator seat. The alert indicator should go out when the operator is in the operator seat and the armrests are in the LOWERED position.

**5 - Hydraulic High Flow** This alert indicator will light when the high flow hydraulic system is activated.

**Note:** The thumb wheel on the joystick must be fully displaced in order to activate the high flow hydraulic system.

**Note:** High flow mode requires an electrical connection that is located on the loader arm. Refer to Operation and Maintenance Manual, "Work Tool Coupler Operation" or Operation and Maintenance Manual, "Work Tool Operation" for additional details.

**6 - Continuous Flow** This alert indicator will light when the continuous flow is activated.

## 7 - Work Tool System

- This alert indicator will light red when the work tool lockout control is activated.
- This alert indicator will light amber when the interlock override is activated.

## 8 - Hydraulics

- This alert indicator will light red and an audible alert will sound when the temperature of the hydraulic oil is too high. If this indicator comes on, stop the machine immediately. Stop the engine and investigate the problem.
- This indicator will light amber when the hydraulic oil filter is not functioning properly. Stop the machine and replace the oil filter. The indicator will stay on until the hydraulic oil has warmed up. Do not operate the machine until the light turns off.

**9 - Glow Plug Starting Aid** With the engine start switch in the ON position, this alert indicator will light when the glow plugs are activated. The operator should wait until this light is no longer illuminated before starting the machine. Refer to Operation and Maintenance Manual, "Engine Starting" for more information about the glow plug starting aid.

## 10 - Engine

- This alert indicator will light red and an audible alert will sound when the engine coolant temperature is too high. If this alert indicator comes on, stop the machine immediately. Stop the engine and investigate the cause.
- This alert indicator will light red and an audible alert will sound when the engine oil pressure is low. If this alert indicator comes on, stop the machine immediately. Stop the engine and investigate the cause.
- This alert indicator will light amber when the air cleaner indicator is activated. Stop the machine and service the air cleaner.

**11 - Machine Security System** This alert indicator will light when the Machine Security System is activated. Refer to "Machine Security System" for more details about the security system.

**12 - Two-Speed Control** This alert indicator will light when rabbit mode is selected with the two speed control.

**13 - Creeper Control** This alert indicator will light when creeper mode is selected.

**14 - Ride Control** This alert indicator will light when the Ride Control switch is “ON” and the necessary ground speed is reached for Ride Control activation.

**15 - Joystick Control Pattern 1** If your machine is equipped with a Selectable Control Pattern, this alert indicator will light when the Caterpillar Joystick Control Pattern is activated.

**Note:** Refer to Operation and Maintenance Manual, “Operator Controls - Joystick Controls” for information about the joystick control patterns. If your machine does not have the Dedicated Control Pattern, the light will flash until a selection is made.

**16 - Alternate Joystick Control Pattern 2** If your machine is equipped with a Selectable Control Pattern, this alert indicator will light when the Alternate Joystick Control Pattern is activated.

**Note:** Refer to Operation and Maintenance Manual, “Operator Controls - Joystick Controls” for information about the joystick control patterns. If your machine does not have the Dedicated Control Pattern, the light will flash until a selection is made.

## Machine Security System (If Equipped)

### NOTICE

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



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

## Basic Operation

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

When the key start switch of the machine is turned to the ON position, the ECM will read the unique ID that is stored in the electronic key. The ECM will then compare this ID to the list of authorized keys. The status light is located on the alert indicator panel. If the light is on, the key is not authorized.

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

## Security Management

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

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

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

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

# Engine Starting

i03741443

## Engine Starting

SMCS Code: 1000; 7000

### **WARNING**

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

It is important to prepare the machine for operation in temperatures that are below 0 °C (32 °F). It is also important to follow the appropriate warm up procedures when the machine is operated in temperatures that are below 0 °C (32 °F).

Machine preparation for cold weather includes using the correct hydraulic system oil. The factory fills the hydraulic system with 10W hydraulic oil which has a minimum operating temperature of -20 °C (-4 °F). If the machine will be operated at temperatures below -20 °C (-4 °F), the 10W oil must be replaced with 0W30 hydraulic oil in order to provide the proper oil viscosity. Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities". Refer to Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations for Caterpillar Machines". Refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations".

### **NOTICE**

Keep the engine speed low until the engine oil pressure alert indicator goes out. If the alert indicator does not go out within ten seconds, stop the engine and investigate the cause before starting again. Failure to do so can cause engine damage.

### **NOTICE**

If the engine does not start within 30 seconds, disengage the starter. Wait for 2 minutes and repeat the procedure.

### **NOTICE**

If you fail to follow the steps described below, damage to the engine or damage to the hydraulic system may occur.

1. Fasten the seat belt.
2. Pull the armrests downward.

3. Before the engine is started, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the forward horn before you start the engine.
4. Move the governor control lever or the accelerator pedal to low idle.

**Note:** If you are starting the engine in cold conditions, turn the engine start switch key to the ON position. If the glow plug indicator light is ON, wait until the light goes out. Then turn the key to the START position. After the engine starts, the glow plugs may continue to operate briefly, even though the light is off.

5. Turn the engine start switch key to the START position in order to start the engine. Release the key after the engine has started.

**Note:** If the machine is equipped with "Pattern Changer", you must select a pattern before you disengage the parking brake.

6. Disengage the parking brake.

7. Run the engine for 5 minutes before performing the following procedure. Run the engine at half throttle. Hold the work tool joystick control in the TILT BACK position for thirty seconds. Release the control for thirty seconds. Hold the work tool joystick control in the DUMP position for thirty seconds. Release the control for thirty seconds. Perform the procedure for three minutes.

**Note:** If you are operating the machine below 0 °C (32 °F), perform the procedure for eight minutes.

### **NOTICE**

Do not use the hydraulic interlock override function to warm up the machine.

8. Keep all personnel away from the machine. Move the machine very slowly to an open area. Repeat Step 7 as you move the machine back and forth for 3 m (10 ft).

**Note:** More warm up time may be required if the hydraulic functions are sluggish.

# Operation

i03879242

## Operation Information

**SMCS Code:** 7000

### General Information

1. Adjust the operator's seat.
2. Fasten the seat belt.
3. Lower the armrests.
4. Start the engine and allow the machine to warm up. Refer to Operation and Maintenance Manual, "Engine Starting".
5. Disengage the parking brake.
6. Raise all lowered work tools and attachments in order to negotiate any obstacles.
7. Smoothly move the speed and direction control for the desired direction and speed.

To prevent injury, make sure that no people are working on the machine or near the machine. To prevent injury, keep the machine under control at all times.

Do not allow the machine to overspeed when you go downhill. Move the joystick toward the neutral position in order to reduce the speed of the machine when you are going downhill. For additional information, refer to "Operating on a Slope".

Always put the heaviest end of the machine uphill when you are working on an incline.

The loader arms of the machine should be fully lowered onto the stops when you are digging with the machine. Digging with the loader arms in the fully lowered position will transfer the stress that is placed on the loader arm into the frame.

---

#### NOTICE

The use of this machine in certain applications can cause premature wear and/or failure of the tracks. Applications that may cause premature wear and/or failure of the tracks include: use in rocky terrain, use in gravel, use in concrete demolition, and use in terrain where metal debris is present.

Damage to the tracks that is caused from using the machine in these conditions is not covered under warranty.

Avoid any situation that causes the tracks of the machine to spin on the ground. Avoid spinning the tracks. This will extend the life of the track.

### Operating on a Slope

When it is necessary to travel across a slope, never exceed a slope that is greater than 3 to 1 (18.4°).

When it is possible, avoid operating the machine across a slope. When it is possible, operate the machine up a slope and down a slope. Never exceed a slope that is greater than 25 degrees for continuous fore/aft slope operation and 35 degrees intermittent fore/aft operation. The engine has an intermittent rating of 15 minutes. Do not turn the machine while you are operating on a slope.

---

#### NOTICE

When it is necessary to operate the machine on a slope, keep bucket loads light in order to decrease the possibility of derailing the tracks.

---

#### NOTICE

If the correct method for turning is not followed, the tracks may derail.

When it is necessary to travel across a slope, the following steps should always be followed:

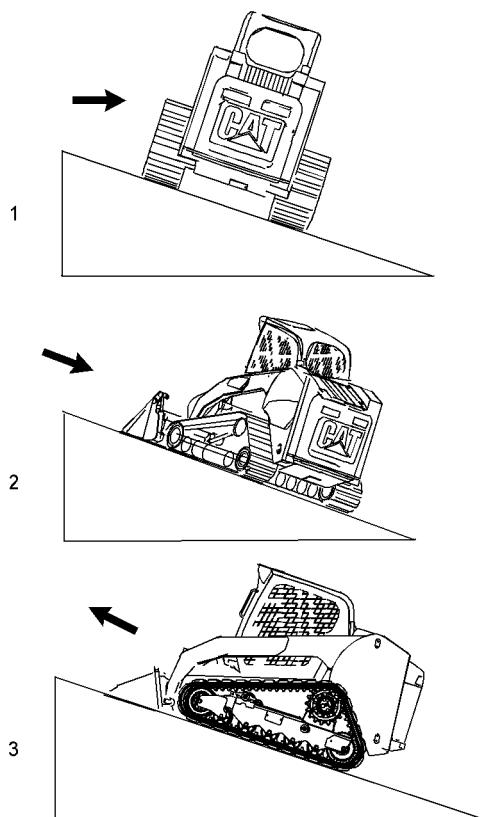


Illustration 58

g01451273

1. Stop the machine. Turn the machine slowly while you are backing down the slope.

**Note:** Do not back up a hill in order to turn.

2. Position the machine so that the front of the machine faces the direction for travel that is desired.

## Operating on a Transition

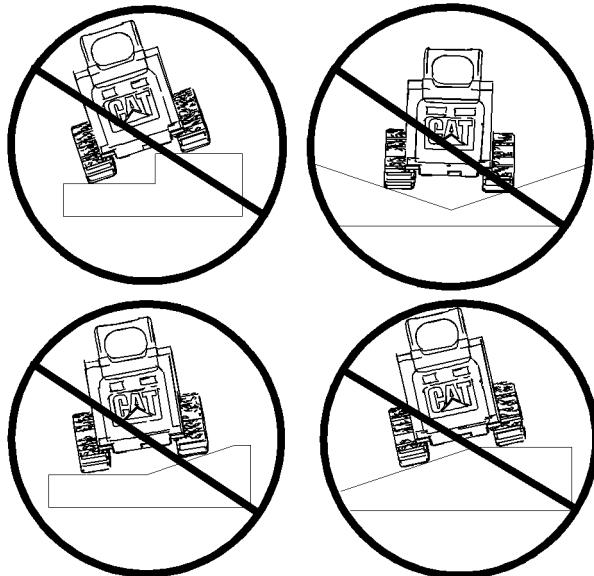


Illustration 59

g01296038

### NOTICE

Avoid operating this machine on transitions. Operating this machine on transitions may cause the tracks to derail.

When the machine is operated on a transition, the tracks may not be supported fully.

When the tracks are not supported fully, the wheels may ride on top of the drive lugs of the tracks. The track will derail if you continue to travel on the transition.

If you must travel on a transition, travel the machine at 90° to the transition. Do not perform hard turns or fast turns when you are operating the machine on the transition.

## Counterrotate turn

For maximum life of the undercarriage, use more gradual turns while you slowly move forward or reverse. Gradual turns will help minimize wear on the track and wear on the wheels. Only use counterrotate turns, if necessary. Sharp turns will increase the wear on the components of the undercarriage.

i03708381

## Work Tool Coupler Operation

**SMCS Code:** 6129; 7000

### ⚠️ WARNING

**Improper Attachment of the Work Tool could result in injury or death.**

**Do not operate the machine without confirmation that the coupler pins are fully engaged. Follow the operating procedures in the Operation and Maintenance Manual.**

## Attaching the Work Tool

**Note:** Before you install the work tool, inspect the coupler and the work tool mounting bracket for any wear or for any damage. Ensure that the work tool mounting bracket and the face of the coupler are clean. Ensure that the coupler has no accumulation of material. Refer to Operation and Maintenance Manual, "Quick Coupler - Clean/Inspect" and Operation and Maintenance Manual, "Work Tool Mounting Bracket - Inspect" for inspection procedures.

1. Position the work tool on a level surface. Move the hydraulic lines (if equipped) for the work tool and electrical lines (if equipped) away from the work tool mounting bracket.

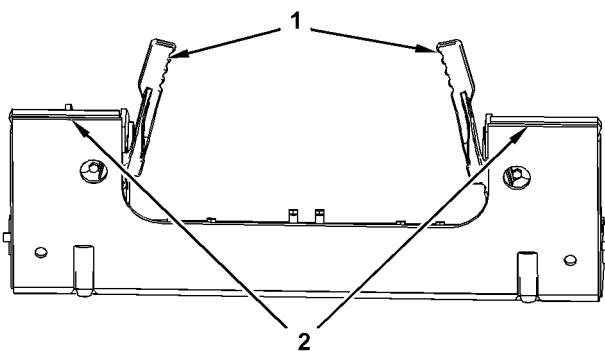


Illustration 60

g01263431

2. If the machine is equipped with a manual coupler, ensure that the levers(1) for the coupler are in the DISENGAGED position. If the machine is equipped with a hydraulic quick coupler refer to Operation and Maintenance Manual, "Operator Controls" for details on the location and the operation of the hydraulic quick coupler control.
3. Enter the machine.

4. Fasten the seat belt and lower the armrests.

5. Start the engine.

6. Disengage the parking brake.

7. Tilt the quick coupler assembly forward.

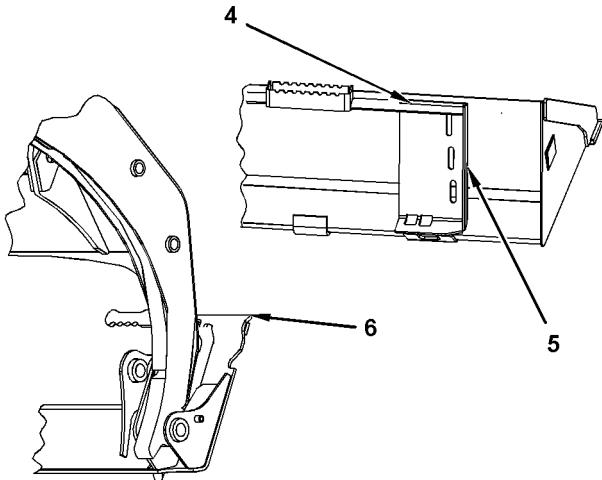


Illustration 61

g01278223

8. Align the quick coupler assembly (6) between the outer plates (5) of the mounting bracket. Move the quick coupler assembly under the angled plate (4) of the mounting bracket and rack back the work tool.
9. Fully lower the loader arms.

### ⚠️ WARNING

**Improper attachment of the work tool could result in injury or death. If the work tool touches the ground, the work tool may move away from the coupler. Do not allow the work tool to touch the ground until the coupler pins are fully engaged.**

10. Turn the engine start switch key to the OFF position in order to stop the engine.
11. If the work tool requires hydraulics, the hydraulic system pressure must be released before you connect the work tool. Refer to the section "Auxiliary Hydraulic Pressure Release".
12. Exit the machine.

**Note:** If you are installing a material handling arm that is not equipped with the optional center step, do not exit the machine. A second person needs to perform steps 13 through step 15.

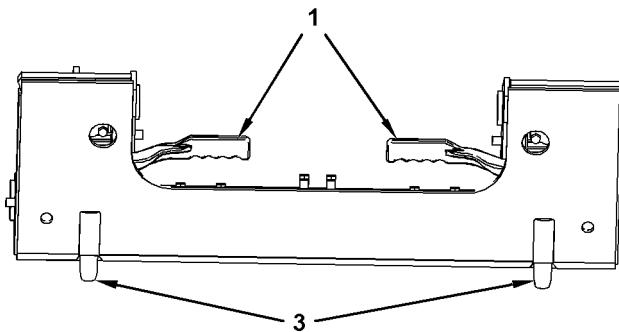


Illustration 62

g01263432

**13.** Engage the coupler pins(3). If the machine is equipped with a manual coupler, ensure that the levers(1) for the coupler are in the ENGAGED position. If the machine is equipped with a hydraulic quick coupler refer to Operation and Maintenance Manual, "Operator Controls" for details on engaging the coupler pins.

**14.** If the work tool requires hydraulics, refer to the following procedure in order to connect the hydraulic hoses.

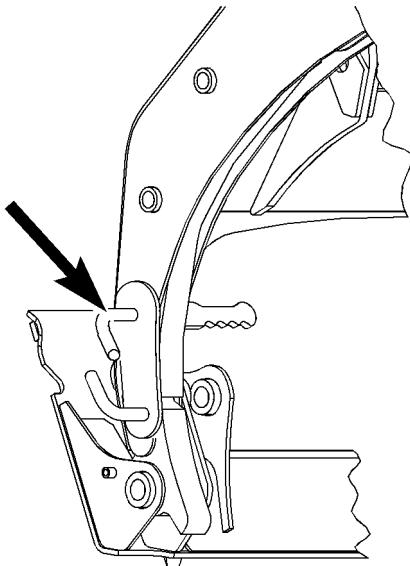


Illustration 63

g02020639

**a.** Route the hydraulic hoses through the hose guide on the machine in order to prevent damage to the hoses. Not all work tools require the hydraulic hoses to be routed through the hose guide. The work tool Operation and Maintenance Manual will inform you if the hydraulic hoses need to be routed through the hose guide. Caterpillar work tools require the hoses to be routed through the hose guide.

- b.** Ensure that the quick connect couplers are clean.
- c.** Connect the auxiliary hydraulic hoses for the work tool to the machine. Twist the collar of the quick connect coupler for one quarter of a turn in order to secure the hydraulic connections. If the work tool uses High Flow hydraulics, refer to Operation and Maintenance Manual, "Operator Controls - Auxiliary Hydraulic Controls" for operating details.

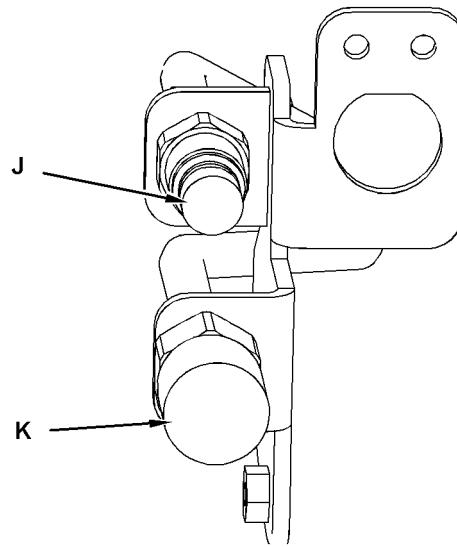


Illustration 64

g01291620

Standard Auxiliary Connection

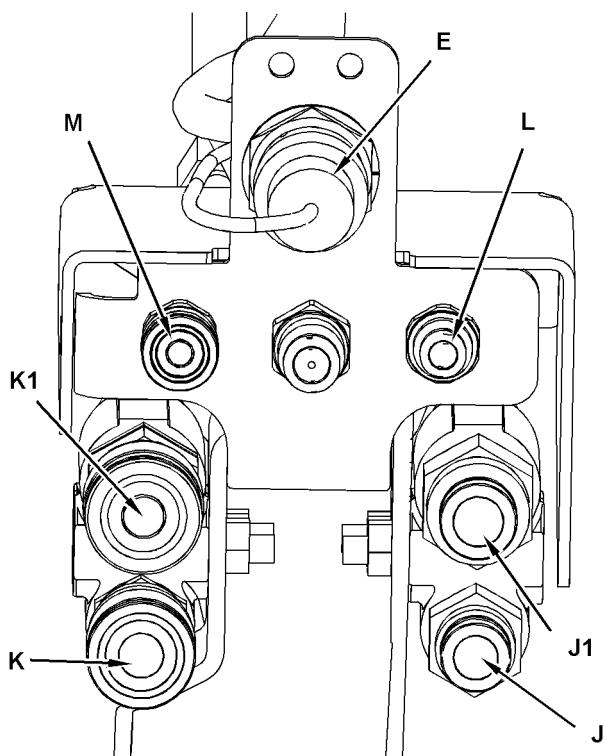


Illustration 65

g01210266

High Flow Auxiliary Connection

- d. If the work tool is equipped with electrical lines, then route the electrical lines with the hydraulic hoses and connect the wire harness to the electrical connector (E) on the host machine. Check the connections in order to ensure that the connections are properly secured. Check the connections on the work tool in order to ensure that the connections are in the correct receptacle.

**Note:** If your High Flow work tool does not have a wiring harness, a Jumper Plug needs to be installed on the electrical plug for the work tool control. Without this Jumper Plug, the machine will not provide high flow to the work tool. Please refer to your Parts Manual for the current part number for the Jumper Plug.

- e. If the work tool is equipped with a water line, then connect the water line from the work tool to the connector on the machine. Move the water line to a position that is away from the work tool mounting bracket.

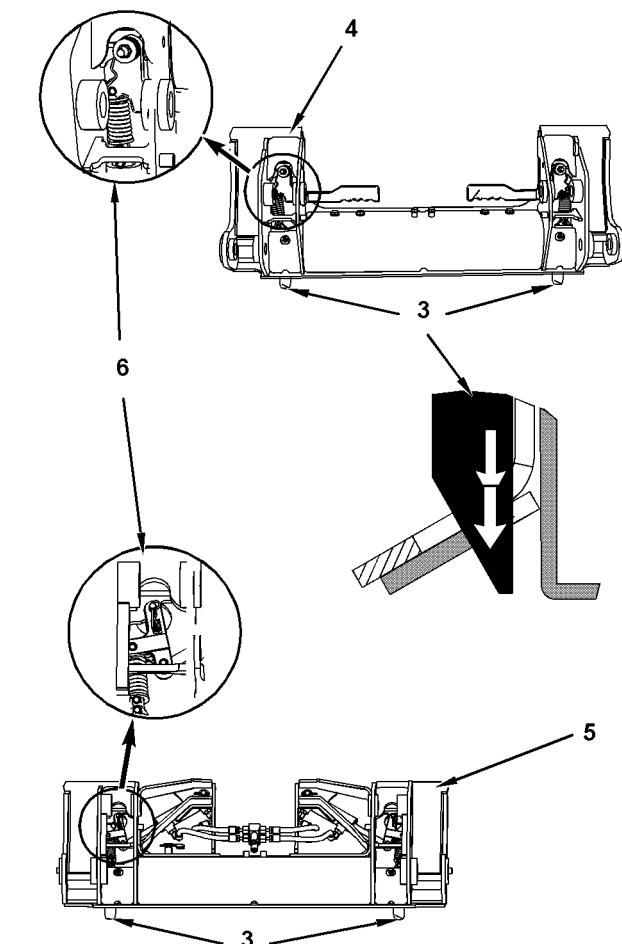


Illustration 66

g01352752

- (3) Coupler Pins
- (4) Manual Work Tool Coupler
- (5) Hydraulic Work Tool Coupler
- (6) Lever for the Coupler Pin

15. Visually ensure that both coupler pins (3) are extending out of the holes in the work tool mounting bracket.
16. Use the following procedure to verify engagement of the coupler pins.
- a. Enter the machine.
  - b. Fasten the seat belt and lower the armrests.
  - c. Start the engine.
  - d. Disengage the parking brake.
  - e. Raise the work tool off the ground.
  - f. Visually inspect the coupler pins (3) in order to ensure that the pins are fully extended through the work tool.

- g. Visually inspect the lever (6) that holds the coupler pins in order to ensure that the lever is in the proper position.
- h. Activate the tilt control in order to tilt the work tool downward.
- i. Apply down pressure on the work tool.

**Note:** The work tool Operation and Maintenance Manual will inform you if forward pressure should not be applied on a work tool.

- j. Move the machine backward. Ensure that the coupler pins do not disengage from the work tool.

#### 17. Test the work tool for leaks and for proper operation.

## Removing the Work Tool

### **WARNING**

**Disengaging the coupler pins will release the work tool from control of the operator.**

**Serious injury or death may result from disengaging the work tool when it is in an unstable position or carrying a load.**

**Place the work tool in a safe position before disengaging the coupler pins.**

### **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.

1. Position the machine on level ground.
2. Lower the work tool to the ground.
3. Rack back the work tool until the work tool is slightly off the ground.
4. Turn the engine start switch key to the OFF position in order to stop the engine.
5. If the work tool requires hydraulics the hydraulic system pressure must be released. Refer to the section "Releasing the Auxiliary Hydraulic System Pressure".
6. Perform Step 7 through Step 12 only after you have released the hydraulic system pressure.

7. Disconnect the auxiliary hydraulic hoses from the machine.

**Note:** If protective caps are available, install protective caps over the quick connect couplers.

8. If hoses are routed through the hose guide, remove the hoses from the hose guide. Move the hoses to a position that is away from the work tool mounting bracket.

**Note:** Connect the hoses for the work tool together. Connecting the hoses together will reduce the probability of contaminating the hydraulic system. Connecting the hoses together will reduce the buildup of pressure in the hoses. Connecting the hoses together will ease the connection of the hoses to the machine.

9. If the work tool is equipped with an electrical line, then disconnect the wire harness from the connector on the machine. If protective caps are available, install protective caps over the electrical connectors.

10. If the auxiliary electrical line is routed through the hose guide, remove the line from the hose guide. Move the auxiliary electrical line to a position that is away from the work tool mounting bracket.

11. If the work tool is equipped with a water line, then disconnect the water line from the connector on the machine. Move the water line to a position that is away from the work tool mounting bracket.

12. Exit the machine.

**Note:** If you are removing a material handling arm that is not equipped with an optional center step, do not exit the machine. A second person needs to perform step 13.

13. Disengage the coupler pins. If the machine is equipped with a manual coupler, ensure that the levers for the coupler are in the DISENGAGED position. If the machine is equipped with a hydraulic quick coupler, refer to Operation and Maintenance Manual, "Operator Controls" for details on disengaging the coupler pins with the hydraulic quick coupler control.

14. Enter the machine.

15. Fasten the seat belt and lower the armrests.

16. Start the engine.

17. Disengage the parking brake.

**18.** As you slowly back away from the mounting bracket, tilt the quick coupler assembly forward until the top of the quick coupler assembly clears the angled plate.

**19.** Back away from the work tool.

## Releasing the Auxiliary Hydraulic System Pressure

### NOTICE

If the work tool is equipped with an Operation and Maintenance Manual, follow the procedure that is described in the Operation and Maintenance Manual for that work tool. Damage to the work tool and the host machine may occur if you do not follow the proper installation procedure.

Refer to Operation and Maintenance Manual, "Operator Controls - Auxiliary Hydraulic Pressure Release".

### Standard Flow Auxiliary Circuit and the High Flow Auxiliary Circuit (if equipped)

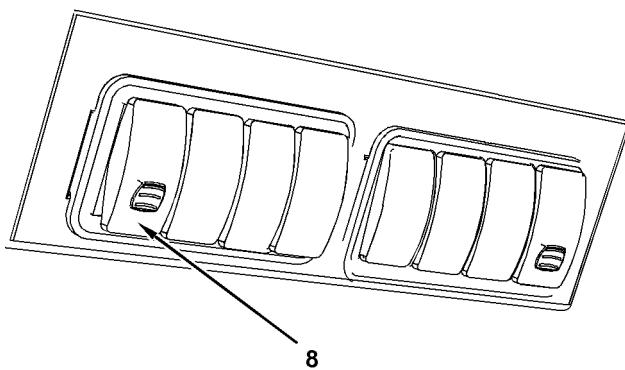


Illustration 67

g01274820

(8) Auxiliary Hydraulic Pressure Release

1. After the engine has run in order to charge the accumulator, turn the ignition switch to the OFF position. Turn the ignition switch to the ON position. Press the parking brake switch and release the parking brake switch.

**Note:** The parking brake indicator will remain illuminated since the engine is not running. When the indicator for the work tool is no longer illuminated, the pressure can be released.

2. Push up on the locking tab and press the bottom of the switch in order to release the pressure in the Standard Flow Auxiliary Circuit and the High Flow Auxiliary Circuit (if equipped). Hold the switch for four seconds and release the switch.

**Note:** The pressure in the secondary circuit is not affected by this switch.

**Note:** The operator must remain in the seat with the armrests in the LOWERED position in order for the control to function. If equipped, the front door must be closed.

3. Move the engine start switch to the OFF position.

### Secondary Auxiliary Circuit

The pressure in the secondary circuit is released with the following procedure:

If electrical power is available and the accumulator is charged, the pressure can be released from the operator station with the work tool control.

1. Fasten the seat belt. Lower the armrests.
2. Move the engine start switch to the ON position. Press the parking brake switch and release the parking brake switch.

**Note:** The parking brake indicator will remain illuminated since the engine is not running. When the indicator for the work tool is no longer illuminated, the pressure can be released.

3. Activate the controls for the secondary auxiliary function. Activate the controls several times in order to release all the pressure. Refer to Operation and Maintenance Manual, "Operator Controls - Auxiliary Hydraulic Controls" for information about the controls.

If the pressure is not released, the accumulator is not charged. It is possible to recharge the accumulator by running the engine or cranking the engine for a period of fifteen seconds. Repeat steps 2 and 3 in order to release the pressure.

i01964204

## Material Handling Arm Operation

**SMCS Code:** 6400; 6700; 7000

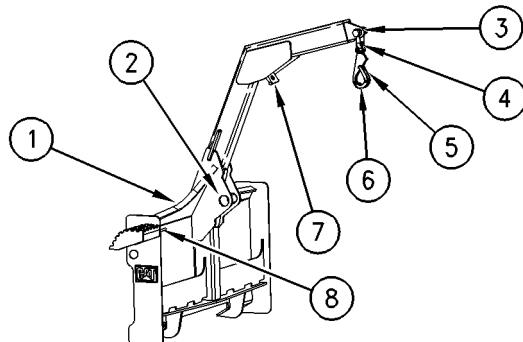


Illustration 68

g00674640

- (1) Location of Optional Center Step
- (2) Tie-Down Point
- (3) Lifting Point 2
- (4) Shackle
- (5) Hook Clasp
- (6) Hook
- (7) Lifting Point 1
- (8) Stored location of Position Lock Pin

Inspect the material handling arm and the attachments for wear and damage. Ensure that the load is properly attached to the material handling arm before you operate the machine.

**Note:** The physical size and the weight of the load determines the lifting point that is appropriate. Whenever it is possible, use the lifting point 1. This will improve the stability and this will reduce the movement of the load. Refer to the Operation and Maintenance Manual, "Material Handling Arm Rated Load" for the limitations on the weight.

**Note:** Use only Caterpillar 9V-2714 Hook and Caterpillar 9V-2715 Shackle to attach a load to the material handling arm. Never use an open hook. Use a line that is rated for 2.5 times the weight of the load.

### **WARNING**

**Do not allow anyone to be near a suspended load unless the position lock pin is installed. If the lift arms must be raised to handle a tall load, do not allow anyone to be near the suspended load unless the lift arms are blocked. Failure to follow the instructions or heed the warnings could result in injury or death.**

## Two Person Operation

### Attaching A Load

1. Verify that the load does not exceed the weight limit. Refer to the Operation and Maintenance Manual, "Material Handling Arm Rated Load" for the rated load capacities.
2. Keep all personnel out of the work area at all times, except when you are attaching or removing a load.
3. Enter the machine. Start the engine.
4. Disengage the parking brake.

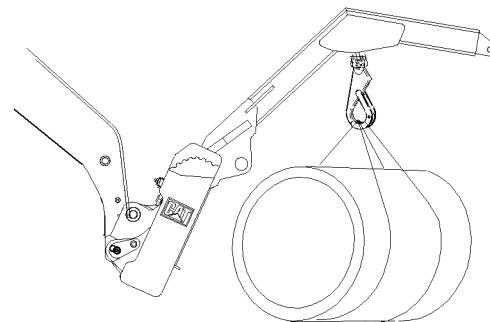


Illustration 69

g01020534

5. Keep the loader arms in the fully lowered position. Slowly position the material handling arm until either lifting point 1 or the lifting point 2 is directly above the load.
6. Tilt the material handling arm forward until the hook is slightly higher than the load in order to minimize swinging of the load.
7. Stop the engine.
8. Wait as the second person attaches the load securely to the hook. The second person needs to ensure that the hook clasp is in the locked position.
9. Ensure that ALL personnel have left the work area.
10. Start the engine.
11. Disengage the parking brake.
12. Slowly tilt back the material handling arm until the material handling arm is fully tilted back.
13. Stop the engine.

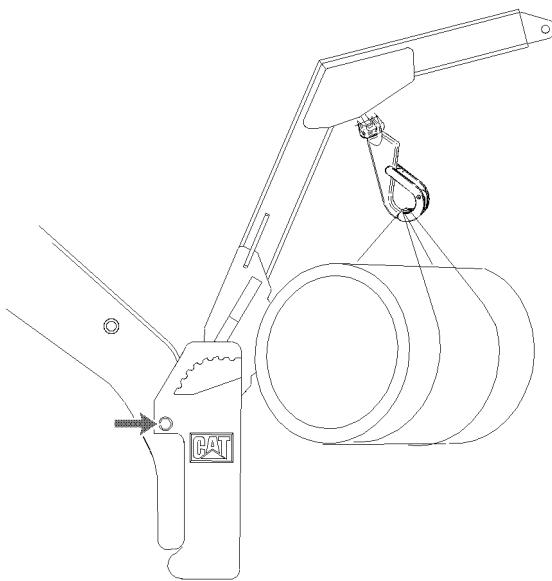


Illustration 70

g01020535

- 14.** Wait as the second person installs the position lock pin through the hole in the material handling arm and the hole in the loader arm of the machine.

**Note:** This will prevent the material handling arm from tilting forward.

- 15.** Wait as the second person secures the load to the tie-down points with a suitable line in order to minimize load swing.

**Note:** Do not move the load when you are securing the load. Do not pull the load toward the material handling arm when you are securing the load to the tie-down points.

- 16.** Wait as the second person removes the position lock pin. Wait as the second person places the pin in the STORED position on the material handling arm.

## Removing a Load

1. Slowly tilt back the material handling arm until the material handling arm is fully tilted back. Lower the loader arms fully.
2. Stop the engine.
3. Wait as the second person installs the position lock pin through the hole in the material handling arm and the hole in the loader arm of the machine.
4. Wait as the second person removes the line that secures the load to the tie-down points.

**5.** Wait as the second person removes the position lock pin. Wait as the second person places the pin in the STORED position on the material handling arm.

**6.** Remove all personnel from the work area.

**7.** Start the engine.

**8.** Disengage the parking brake.

**9.** Lower the load to the ground.

**10.** Stop the engine.

**11.** Wait as the second person removes the load from the hook.

**12.** Remove all personnel from the work area.

**13.** Start the engine.

**14.** Disengage the parking brake.

**15.** Slowly tilt back the material handling arm until the material handling arm is fully tilted back.

**16.** Back away from the load.

## One Person Operation

**Note:** The material handling arm must be equipped with a center step in order to do the one person operation.

### Attaching the Load

1. Verify that the load does not exceed the weight limit. Refer to the Operation and Maintenance Manual, "Material Handling Arm Rated Load" for the rated load capacities.
2. Keep all personnel out of the work area at all times, except when you are attaching or removing a load.
3. Enter the machine. Start the engine.
4. Disengage the parking brake.

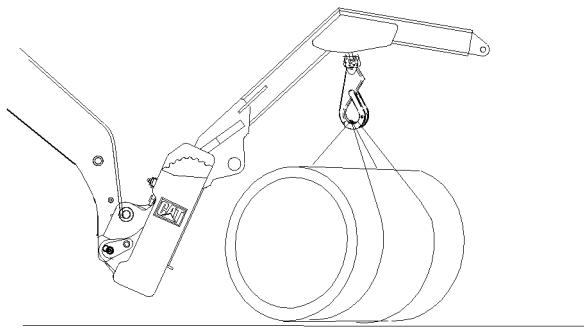


Illustration 71

g01020534

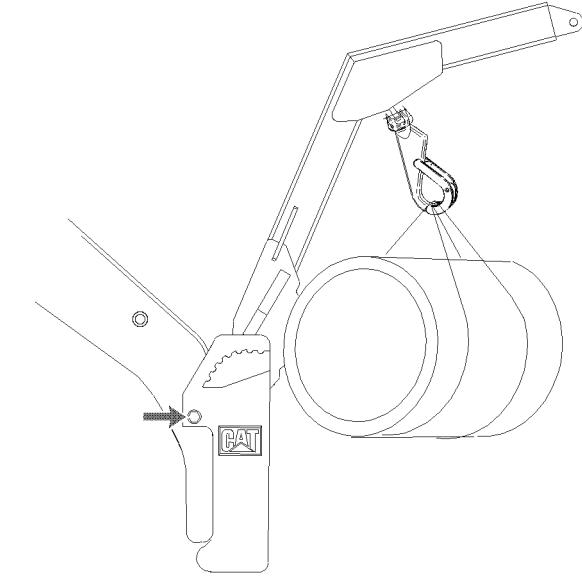


Illustration 72

g01020535

5. Keep the loader arms in the fully lowered position. Slowly position the material handling arm until either lifting point 1 or lifting point 2 is directly above the load.
6. Tilt the material handling arm forward until the hook is slightly higher than the load in order to minimize swinging of the load.
7. Stop the engine. Exit the machine.
8. Attach the load securely to the hook. Ensure that the hook clasp is in the LOCKED position.
9. Keep all personnel out of the work area.
10. Enter the machine. Start the engine.
11. Disengage the parking brake.
12. Slowly tilt back the material handling arm until the material handling arm is fully tilted back.
13. Stop the engine. Exit the machine.

**14.** Install the position lock pin through the hole in the material handling arm and the hole in the loader arm of the machine.

**15.** Secure the load to the tie-down points with a suitable line in order to minimize load swing.

**Note:** Do not move the load when you are securing the load. Do not pull the load toward the material handling arm when you are securing the load to the tie-down points.

**16.** Remove the position lock pin and place the pin in the STORED position on the material handling arm.

## Removing a Load

1. Fully tilt back the material handling arm. Fully lower the loader arms.
2. Stop the engine. Exit the machine.
3. Install the position lock pin through the hole in the loader arm of the machine.
4. Remove the line that secures the load to the tie-down points .
5. Remove the position lock pin and place the pin in the STORED position on the material handling arm.
6. Keep all personnel out of the work area.
7. Enter the machine. Start the engine.
8. Disengage the parking brake.

9. Lower the load to the ground.
  10. Stop the engine. Exit the machine.
- Note:** Make sure that the load is stable.
11. Remove the load from the hook.
  12. Keep all personnel out of the work area.
  13. Enter the machine. Start the engine.
  14. Disengage the parking brake.
  15. Slowly tilt back the material handling arm until the material handling arm is fully tilted back.
  16. Back away from the load.

### Traveling with a Load

1. Ensure that all personnel have left the work area.
2. Start the engine.
3. Disengage the parking brake.
4. Raise the load so that the load is slightly off of the ground.
5. Slowly travel to the destination. Keep the load as close to the ground as possible. Travel up slopes with the load uphill. Travel down slopes with the load uphill. Do not travel across slopes.

i01878348

## Pallet Forks Operation

**SMCS Code:** 6700; 7000

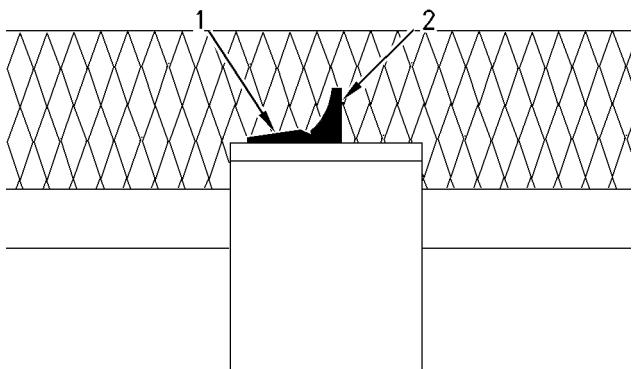


Illustration 73

g00955937

The "type 1" pin that is in the unlocked position (2) and the locked position (1).

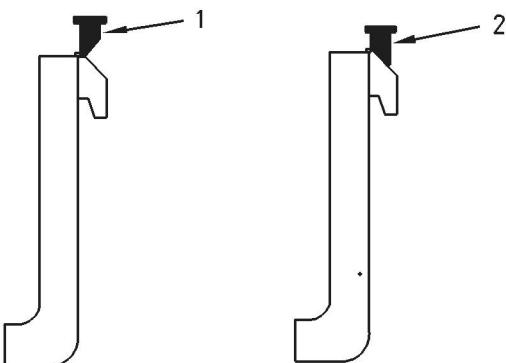


Illustration 74

g00955964

The "type 2" pin that is in the unlocked position (1) and the locked position (2).

1. Put the fork tines in the Unlocked position. Space the fork tines as far as possible from each other.
2. Put the fork tines in the Locked position.
3. Slowly, move the machine into position and engage the load. The machine should be square with the load. Space the forks evenly between the pallet stringers.
4. Move the machine forward until the load contacts the carriage.
5. Lift the load carefully.
6. Slowly, move the machine in reverse until the load is clear enough to lower.
7. Carefully lower the load while you tilt the forks back to the travel position.

Travel with the load as low as possible while you still maintain ground clearance.

Travel with the load uphill on upgrades and on downgrades.

i02955359

## Angle Blade Operation

**SMCS Code:** 6060; 7000

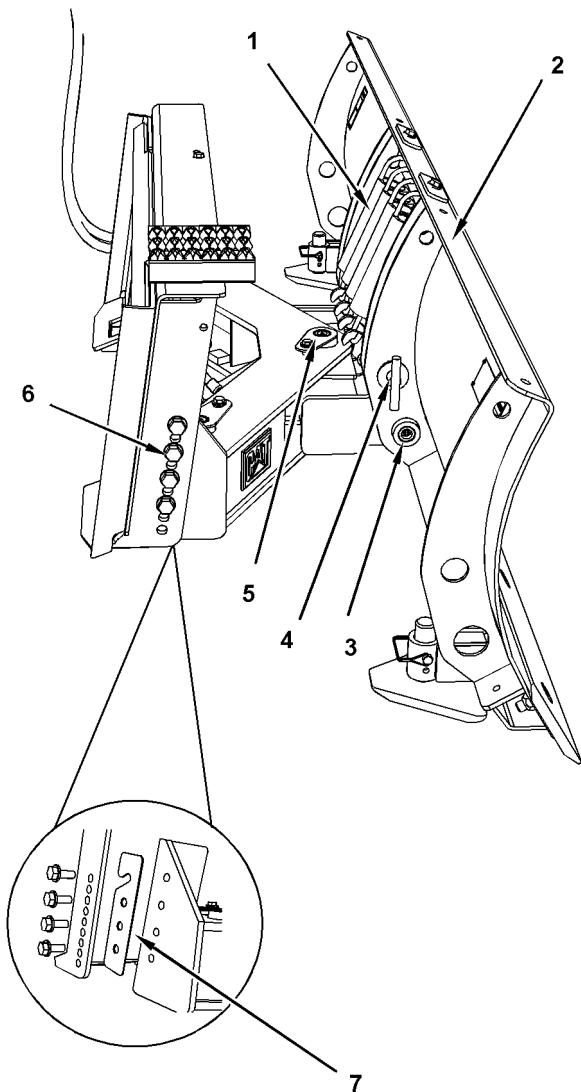


Illustration 75

- (1) Springs
- (2) Blade
- (3) Pivot pin for the blade
- (4) Locking pin
- (5) Vertical pivot pin
- (6) Bolts for adjusting height
- (7) Shims

g01470952

i04000738

### Height Adjustment

In order to properly adjust the height of the blade, use the following procedure:

1. Start the engine.

2. Position the blade so that the vertical pivot pin (5) is in the vertical position.
3. Move the angle of the blade fully from one side to the other side. The blade cutting edge should remain parallel to the ground.
4. If the blade cutting edge does not remain parallel to the ground, the height of the blade needs to be adjusted. Use the following steps in order to adjust the height:
  - a. Lower the blade and the frame onto adjustable stands.
  - b. Stop the engine and remove the ignition key.
  - c. Remove the bolts (6) for adjusting the height.
  - d. Move the frame to the desired height.
  - e. Ensure that the shims are installed. Install the bolts for adjusting the height. Tighten the bolts to a torque of  $270 \pm 40 \text{ N}\cdot\text{m}$  ( $199 \pm 30 \text{ lb ft}$ ).
  - f. In order to test the adjustment, start the engine.
  - g. Repeat steps 2 and 3.

### Tilt Lock

The angle blade has two modes of operation:

- Locked
- Spring load trip

In order to lock the blade, install the locking pin (4). In the locked position, the blade can be used for heavy operations. The blade will not tilt with the locking pin in the locked position.

There may be lighter operations that allow the blade to tilt. Remove the locking pin and store the locking pin in the cab. This will help prevent damage to the blade or to the frame. If the plowing overcomes 306 kg (675 lb) of spring force, the top of the blade will tilt forward.

### Work Tool Operation

**SMCS Code:** 6700; 7000

The following table describes the functionality of approved Caterpillar work tools.

Refer to Operation and Maintenance Manual, "Operator Controls - Joystick Controls" and Operation and Maintenance Manual, "Operator Controls - Auxiliary Hydraulic Controls" for the location and operation of the joystick controls that are referenced below.

**Note:** All of the work tool functions that are described below are viewed from the left side of the machine.

Operate the machine and the work tool slowly in an open area. Check for proper operation of all controls and all protective devices on the machine and the work tool.

**Note:** During initial operation, unexpected motion may occur due to air in the hydraulic system. Cycle the hydraulic system approximately five times in order to purge air out of the circuit. You may need to add hydraulic oil to the machine after the machine fills the hydraulic circuits of the work tool. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check" for the proper procedure for checking the hydraulic oil level.

**Note:** If your High Flow work tool does not have a wiring harness, a Jumper Plug (241-3763 Plug As) should be installed on the electrical plug (1) for the work tool control. Without this Jumper Plug, the machine will not provide High Flow to the work tool. The affected machines are in the following list:

## Simple Hydromechanical Work Tools

Work tools in the following table are approved by Caterpillar. Refer to Operation and Maintenance Manual, "Operator Controls - Joystick Controls" and Operation and Maintenance Manual, "Operator Controls - Auxiliary Hydraulic Controls" for the location and operation of the joystick controls that are referenced in the table.

Please read the manual and understand the instructions and warnings in the Operation and Maintenance Manual for these work tools. Consult your Caterpillar dealer for replacement manuals. Proper care is your responsibility.

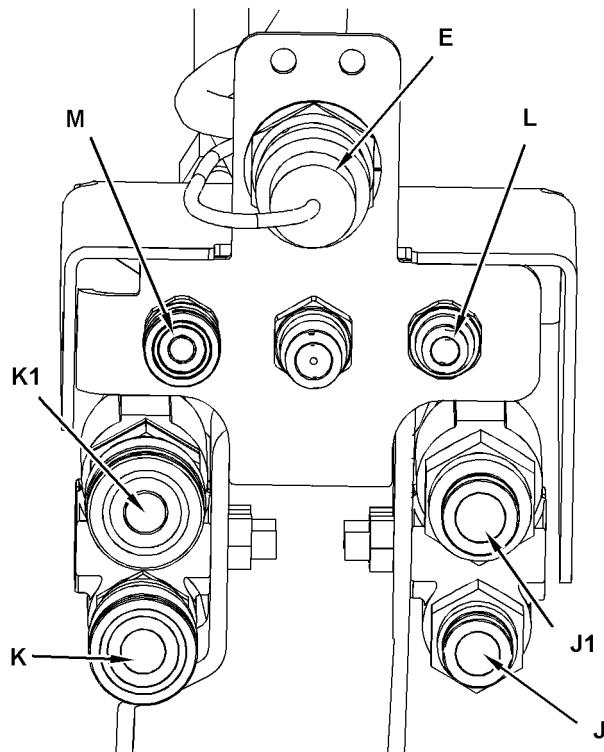


Illustration 76

g01210266

For all High Flow work tools, refer to Operation and Maintenance Manual, "Operator Controls - Joystick Controls". Connect the wiring harness to the electrical plug (E).

Table 23

Work Tool	Left Hand Joystick				Right Hand Joystick				Actions
	8	5	6	7	1	2	3	4	
Multipurpose Bucket					X				The bucket clam closes.
						X			The bucket clam opens.
All Grapple Tools					X				The grapple closes.
						X			The grapple opens.
Angle Blade						X			The blade angles to the left.
					X				The blade angles to the right.
Dozer Blade						X			The blade angles to the left.
					X				The blade angles to the right.
	X					X			The blade tilts down to the left.
	X				X				The blade tilts down to the right.
		X				X			The blade tilts down to the left and the blade angles to the left.
		X			X				The blade tilts down to the right and the blade angles to the right.

## Complex Hydromechanical Work Tools

**Note: For the functionality of Caterpillar Complex Work Tools, please read the Operation and Maintenance Manual for the work tool.**

Consult your Caterpillar dealer for replacement manuals. Please read all the safety messages and understand all the safety messages for each work tool.

## Parking

i02417403

### Stopping the Engine

SMCS Code: 1000; 7000

i02582658

#### NOTICE

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

Refer to the following procedure, to allow the engine to cool, and to prevent excessive temperatures in the turbocharger housing (if equipped), which could cause oil coking problems.

1. Operate the engine for five minutes at low idle with no load.
- Note:** This allows hot areas in the engine to cool gradually. This will extend the engine life.
2. Move the joysticks to the NEUTRAL position.
  3. Turn the engine start switch key to the OFF position.
  4. Relieve the pressure in the auxiliary hydraulic system. Refer to Operation and Maintenance Manual, "Work Tool Coupler Operation" for details.
  5. Ensure that the engine start switch key is in the OFF position after the pressure in the auxiliary hydraulic system has been relieved.
  6. Cover the exhaust opening after the machine has cooled down.

### Stopping the Engine if an Electrical Malfunction Occurs

SMCS Code: 1000; 7000

#### Inside Cab

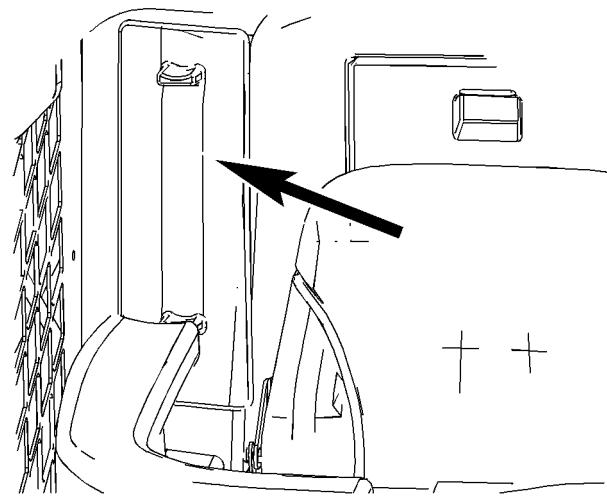


Illustration 77

g01287527

The fuse panel is located behind the seat on the right side.

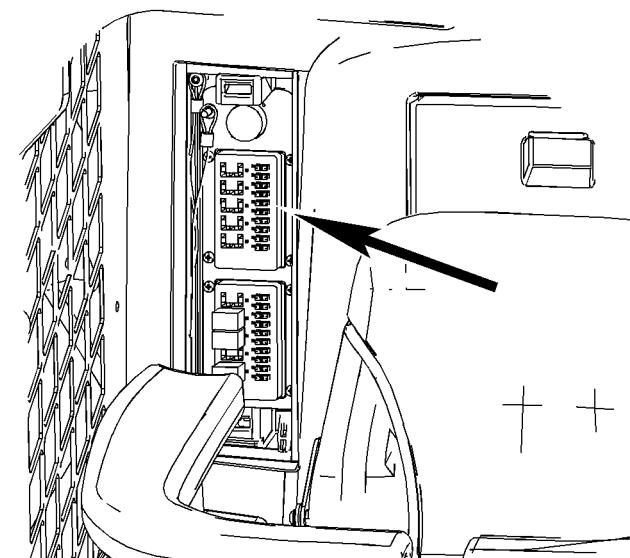


Illustration 78

g01210555

Remove the cover in order to access the fuse panel.

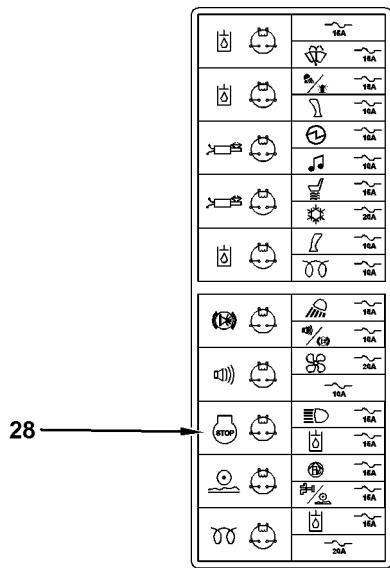


Illustration 79

g01330924

Remove the relay for the fuel shutoff solenoid (28) in order to shut off the fuel supply to the engine.

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

## Outside Cab

1. Lower the work tool to the ground.
2. Raise the armrests. Unfasten the seat belt. Exit the machine.
3. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

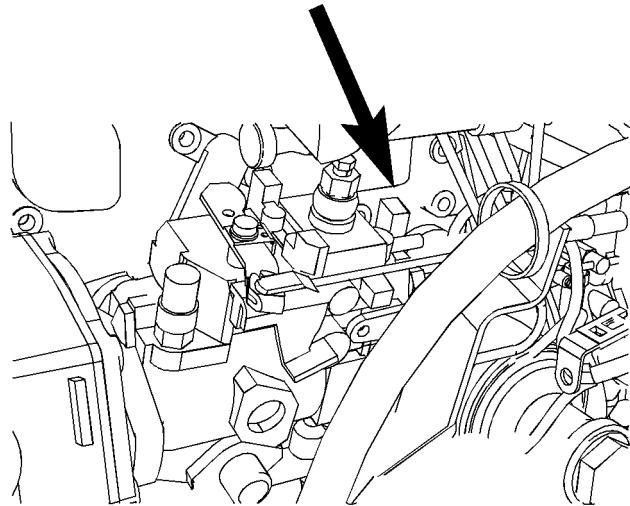


Illustration 80

g01289102

The connector for the fuel shutoff solenoid is located on the back of the fuel pump.

### 4. Unplug the connector for the fuel shutoff solenoid.

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

i02807964

## Equipment Lowering with Engine Stopped

SMCS Code: 6700; 7000

### WARNING

Personal injury or death can result from a work tool falling.

Keep personnel away from the front of the machine when lowering the work tool.

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure will vary with the type of equipment that is lowered. Keep in mind that most systems use a high pressure fluid or air in order to raise or lower the equipment. The procedure will cause high pressure air, hydraulic fluid, 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.

## Lowering the Equipment with the Accumulator Charged

If electrical power is available and the accumulator is charged, the loader arms can be lowered from the operator station with the work tool control.

1. Fasten the seat belt. Lower the armrests.
2. Move the engine start switch to the ON position. Press the parking brake switch and release the parking brake switch.

**Note:** The parking brake indicator will remain illuminated since the engine is not running. When the indicator for the work tool is no longer illuminated, the pressure can be released.

3. Slowly move the work tool control to the LOWER position in order to slowly lower the loader arms.

If the loader arms do not lower, the accumulator is not charged. It is possible to recharge the accumulator by cranking the engine for a period of fifteen seconds. Repeat step 2 and 3.

If there is no electrical power the loader arms must be lowered by using the procedure that is explained next.

## Alternate Lowering the Equipment

### **WARNING**

Personal injury can result from oil under high pressure.

**DO NOT** allow high pressure oil to contact skin.

Wear appropriate protective equipment while working with high pressure oil systems.

The loader arms must be lowered manually if the accumulator is not charged or if there is no electrical power.

Do not go under the raised lift arm without the brace for the loader lift arm in the LOCKED position.

**Note:** Make sure that there are no people near the front or sides of the machine.

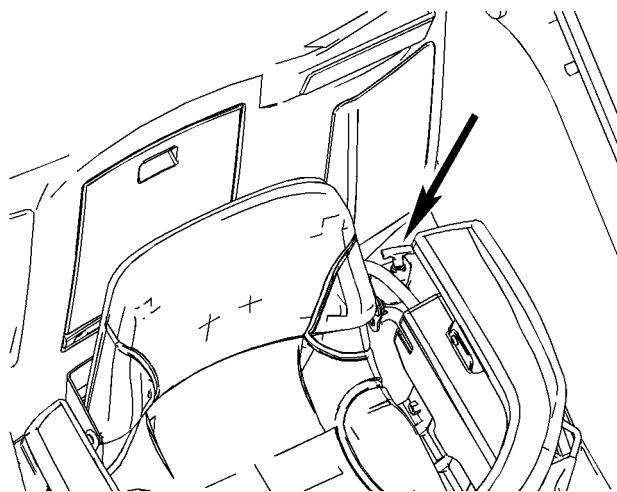


Illustration 81

g01400888

The bypass valve is located on the left side next to the seat in the cab.

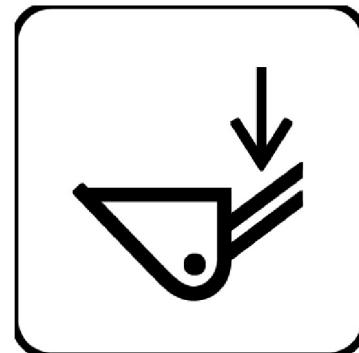


Illustration 82

g01332374

Film next to the red knob

1. Slide the seat forward. Slide the left hand armrest forward.
2. Pull up on the red handle. Push the handle in order to stop the loader arms, if necessary.
3. Allow the loader arms to lower until the work tool is on the ground.
4. Push the red handle to the original position.
5. Make the necessary repairs before you operate the machine.

i01956123

## Machine Storage Procedure

**SMCS Code:** 7000

### NOTICE

If long term storage for a period of time exceeding one year is necessary, contact your local Caterpillar dealer for the preferred procedure to use in your specific case.

This machine may be stored for one year or less in a temperature range of -32 °C (-25.6 °F) to 43 °C (109.4 °F).

To store machines in ambient temperatures between -20 °C (-4.0 °F) to 43 °C (109.4 °F), refer to Special Instructions, SEHS9031, "Storage Procedure for Caterpillar Products".

To store machines in ambient temperatures between -32 °C (-26 °F) and -21 °C (-6 °F), refer to the following publications and topics:

- Special Instructions, SEHS9031, "Storage Procedure For Caterpillar Products"
- Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations for Caterpillar Machines"

**Note:** Do not use the steps that are listed in Special Instructions, SEHS9031 in order to maintain the fuel system.

Use the following steps to maintain the fuel system.

1. Drain the fuel tank. Follow the procedure that is described in Operation and Maintenance Manual, "Fuel Tank Water and Sediment - Drain".
2. Drain the water separator and replace the element. Follow the procedure that is described in Operation and Maintenance Manual, "Fuel System Water Separator Element - Replace".
3. Fill the fuel tank so that the fuel tank is at least 20% full with Calibration Fluid.
4. Prime the fuel system. Follow the procedure that is described in Operation and Maintenance Manual, "Fuel System Prime".
5. Start the engine and run at low idle for approximately 15 minutes in order to allow the calibration fluid to flush the diesel fuel from the system.
6. Turn off the engine.

7. Add .15 mL (0.02 oz) of commercial biocide for every 1 L (0.3 US gal) of calibration fluid to the fuel tank. Seal all openings to the fuel tank in order to prevent evaporation of the preservative.

# Transportation Information

i02520157

## Shipping the Machine

**SMCS Code:** 7000

Investigate the travel route for overpass clearances. Make sure that there will be adequate clearance.

Before you load the machine and before you unload the machine remove ice, snow, or other slippery material from the loading dock and from the trailering surface. Removal of ice, snow, or other slippery material will help prevent the slipping of the machine as you load the machine. Removing ice, snow, or other slippery material will help prevent the machine from moving in transit.

### NOTICE

Obey all state and local laws governing the weight, width and length of a load.

Make sure the cooling system has proper antifreeze if moving machine to a colder climate.

Observe all regulations governing wide loads.

Do not use a fork lift to lift the machine. Using a fork lift to move your machine can result in property damage.

Choose the flattest ground when you load the machine or when you unload the machine.

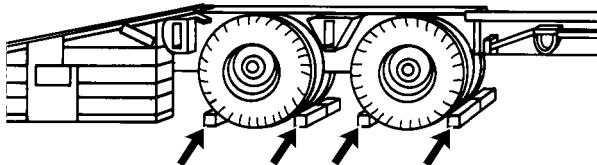


Illustration 83

g00040011

1. Before you load the machine chock the trailer wheels or the rail car wheels. Before you unload 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, and adequate strength. In addition, make sure that the surface of the loading ramps are clean. This will help prevent the machine from sliding in all types of weather conditions. This will allow the machine to move on the ramps smoothly.
3. Maintain the slope of the loading ramps within 15 degrees of the ground.
4. Minimize any step between the base of the loading ramps and the ground.
5. Clean the tracks on the machine in order to prevent any slippage.

## Loading the Machine

1. Position the machine so that the heaviest end of the machine is going up the ramps first.
2. Use caution when you travel over the areas around the loading ramp joints. Maintain the balance point of the machine. Keep the work tool low.
3. After you load the machine onto the trailer be sure that the machine is properly positioned on the trailer bed.
4. Lower the work tool to the floor of the transport vehicle.
5. Turn the engine start switch key to the OFF position in order to stop the engine.
6. Turn the engine start switch key to the ON position. Push the parking brake switch.
7. Move all joystick controls while you are pressing several times on each side of the auxiliary hydraulic control (if equipped) in order to relieve hydraulic pressure.
8. Move all hydraulic controls to the NEUTRAL position.
9. Turn the engine start switch key to the OFF position. Remove the engine start switch key.
10. Move the armrests to the RAISED position. Unfasten the seat belt.
11. Attach any vandalism protection.
12. Refer to the Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for information on tying down the machine.

- 13.** Cover the exhaust opening when the machine has cooled down.

## Unloading the Machine

- Position the machine so that the machine can drive straight down the loading ramps. Position the machine so that the heaviest end of the machine goes down the ramps last.
- Use caution when you travel over the areas around the loading ramp joints in order to maintain the balance point of the machine. Keep the work tool low.

i03886175

## Roadng the Machine

**SMCS Code:** 7000

Limitations for TON-kilometers per hour (TON-miles per hour) must be obeyed. Consult your tire dealer for the speed limit of the tires that are used.

Ensure that you have the required licenses and other similar items with you while you road the machine.

Ensure that your machine is equipped to comply with roading regulations.

Learn and obey all traffic regulations when you are roading the machine. Travel at a moderate speed. Observe all speed limitations when you road the machine. Ensure that all work tools remain securely attached to the work tool coupler. Ensure that appropriate locking pins remain in position.

**Note:** In Italy, limit Skid Steer Loaders that are equipped with two speed to low speed while roading.

i04777219

## Lifting and Tying Down the Machine

**SMCS Code:** 7000

### NOTICE

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

## Lifting the Machine

There are two lifting attachments for the machine:

- The single point lifting eye

- The four-point lifting group

Use one of the lifting attachments in order to lift the machine. Do not attach both lifting devices to the machine at the same time.

For lifting the machine, use properly rated cables and properly rated slings. Position the crane for a level machine lift. Do not drag the machine with a crane.

All work tools must be removed from the machine before the machine is lifted.

**Note:** Do not exceed the weight limit that is shown in Illustration 84. This film is located on the outside of the right-hand side of the cab.

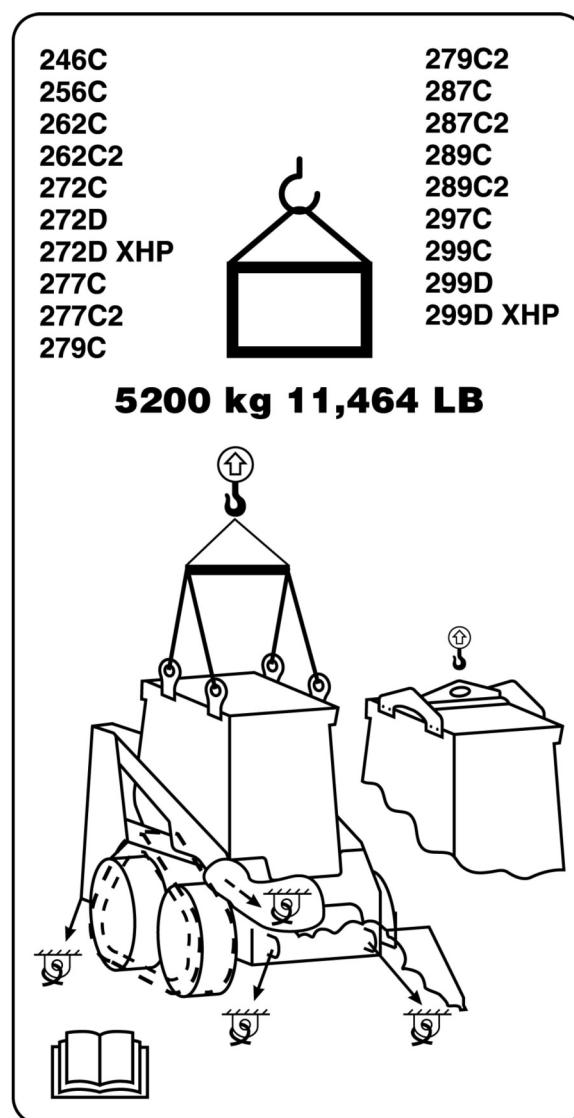


Illustration 84

g02623980

The lifting devices will be mounted on the top of the cab. If any accessory is mounted to the cab roof, the attachment must be removed before lifting the machine.

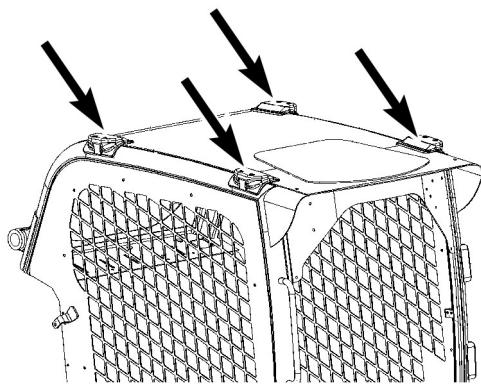


Illustration 85

g02838517

Points for attaching the lifting devices

When the four-point lifting group is used, the chain for each leg should be a minimum of 1 m (3.3 ft) in length. Keep the machine level during the lift.

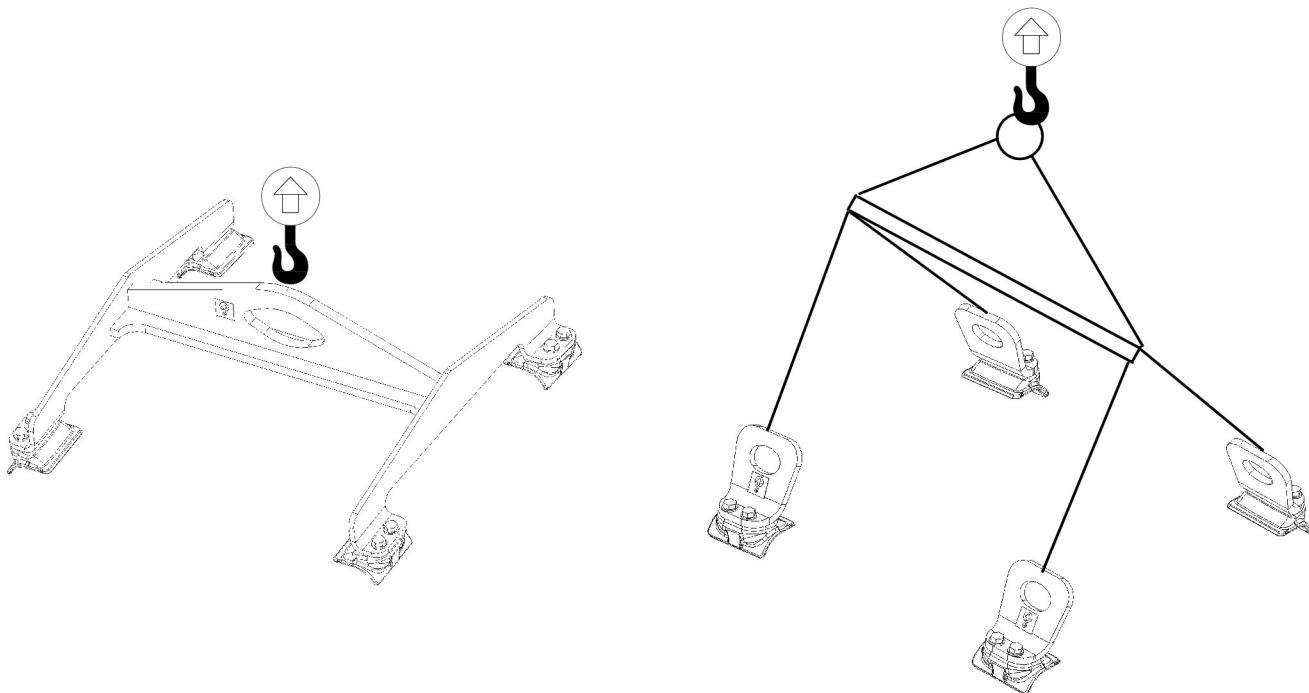


Illustration 86

g02838519

Refer to the Cat Parts Manual for the current part number for the lifting device for your machine. The parts manuals are listed in the Operation and Maintenance Manual, "Reference Information Section".



**Lifting Point** – Lifting points are designated by this symbol.

The weight and the instructions that are given describe the machine as manufactured by Caterpillar. Refer to the Operation and Maintenance Manual, "Specifications" for weight information about your machine.

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

1. Remove the work tool. If necessary, cover any hydraulic lines and quick disconnect coupler on the machine.
2. Lower the lift arms completely.
3. Turn off the machine.
4. Attach the single point lifting device or the four point lifting device to the machine.
5. Use properly rated cables and slings for lifting. The crane should be in a position that the machine is lifted without swinging.

## Lifting the Grapple Rake

---

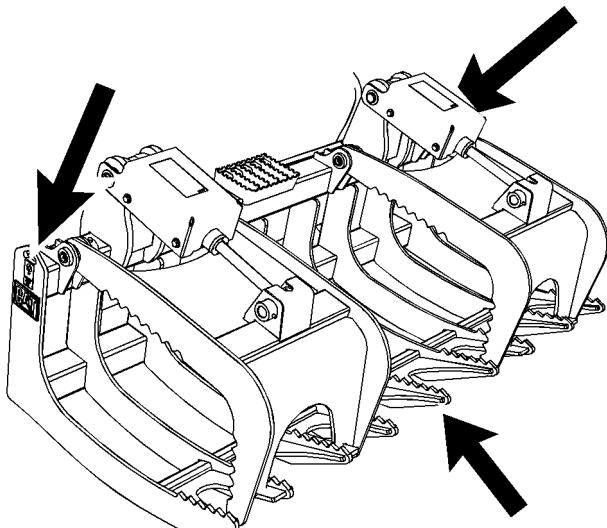


Illustration 87

g01368478

Use properly rated cables and properly rated slings for lifting work tools. Position the crane for a level lift. Do not drag the work tool with a crane.

**Note:** The approximate weight of the 1829 mm (72 inch) Grapple Rake is 458 kg (1010 lb). The approximate weight of the 2134 mm (84 inch) Grapple Rake is 506 kg (1116 lb).

Use two hooks in the lifting eyes on the frame. Use a sling around the front torque tube at the center rake tine.

## Tying Down the Machine

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

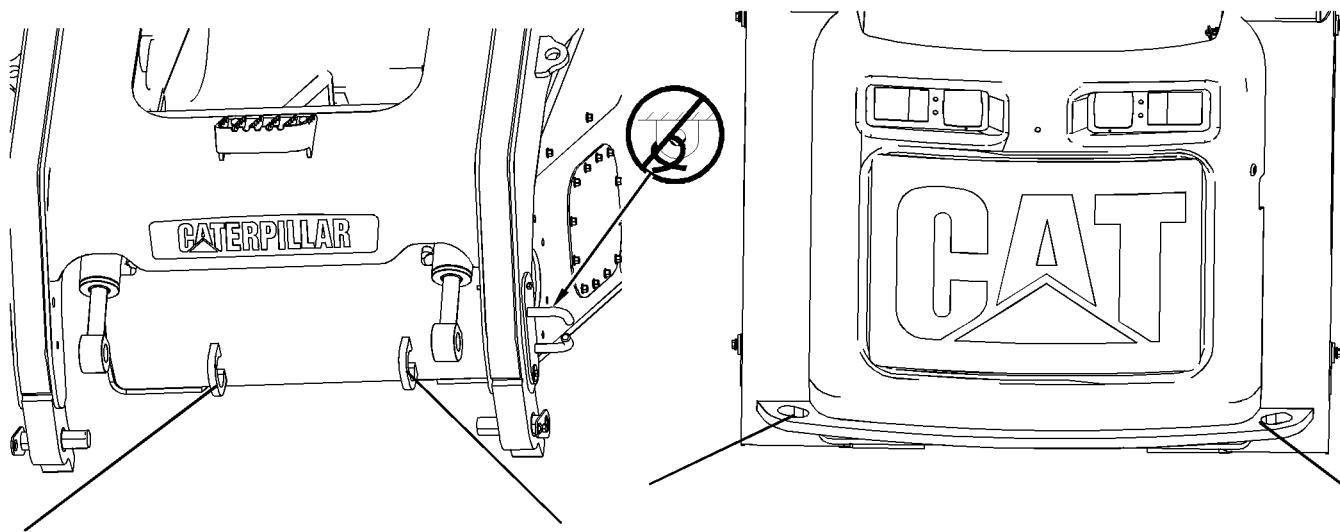


Illustration 88

g02882786

Two eyes are located on the front of the machine frame and two eyes are located on the rear of the machine frame.

Use the tie-downs shown in illustration 88.

**Note:** Use only the specified locations for tying down the machine. Do not use any other locations in order to tie down the machine. The eyes on the lift arms are for work tool restraint only. Never use the eyes on the lift arms for tie down or lifting.

Install tie-downs at all four locations. Place chocks in front of the machine and behind the machine.



**Tie-Down Point** – Tie-down points are designated by this symbol.

The weight and the instructions that are given describe the machine as manufactured by Caterpillar. Refer to the Operation and Maintenance Manual, "Specifications" for weight information about your machine.

1. Turn off the machine.
2. Use the properly rated cables and shackles for tying down the machine.
3. Use the front eyes and the rear eyes that are provided on the lower frame of your machine. Use corner protection when necessary.

**Note:** Where possible, avoid routing cables over tires or tracks. Avoid contact with the work tool to prevent false tension.

## Alternate Method

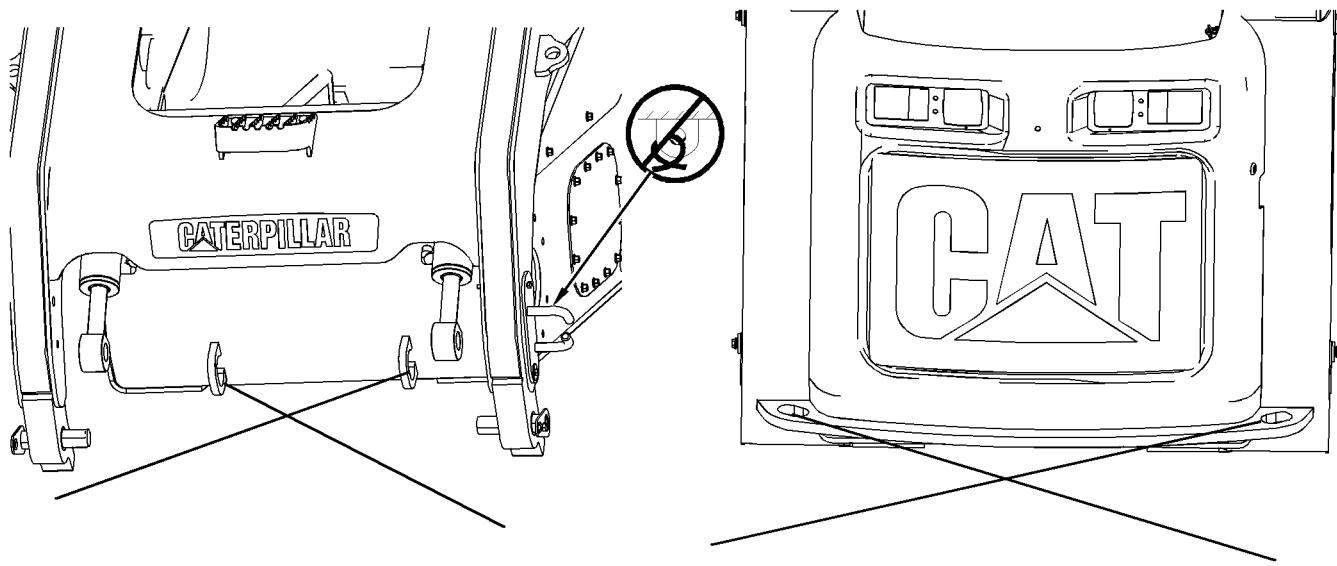


Illustration 89

g02882797

If the alternate method is used, the cable angle should be between 30 degrees and 50 degrees.

**Note:** Use only the specified locations for tying down the machine. Do not use any other locations in order to tie down the machine.

Install tie-downs at all four locations. Place chocks in front of the machine and behind the machine.

Consult your Cat dealer for shipping instructions for your machine.

# Towing Information

i04417305

## Machine Retrieval

**SMCS Code:** 7000

If the machine is disabled, the machine should be lifted onto a trailer in order to be transported. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for the lifting procedure.

If the machine cannot be lifted, use the following guidelines in order to retrieve the machine.

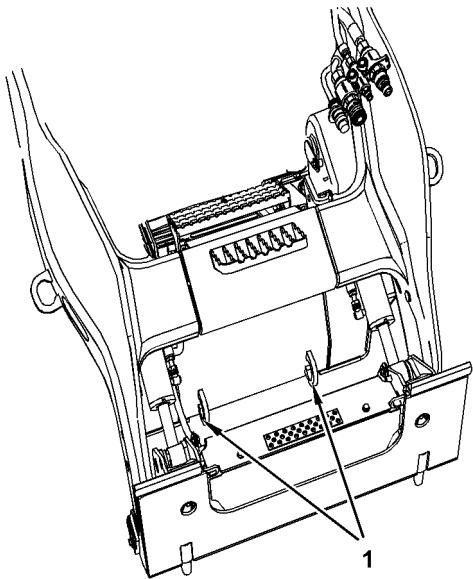


Illustration 90

g02623118

Two towing eyes (1) are located on the front of the machine.

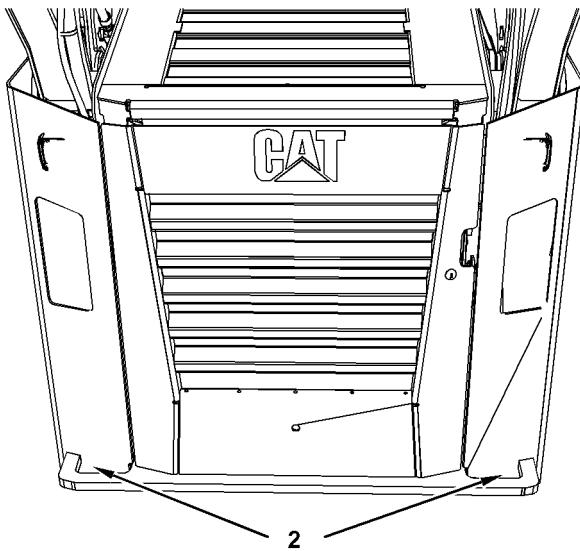


Illustration 91

g02623120

Two towing eyes (2) are located on the rear of the machine.

- The strength of the line should be at least 1.5 times the gross weight of the machine.
- Provide shielding in order to protect the operator if the line breaks.
- If a single line is used to pull the machine, then the line must be a minimum of 3 m (10 ft). If two lines are used to pull the machine, then each line must be a minimum of 1.5 m (5.0 ft).
- Do not exceed a maximum pull angle of 20 degrees in any direction.
- Attach the line to the towing eyes. Two towing eyes (1) are located on the front of the machine and two towing eyes (2) are located on the rear of the machine. Do not attach the line to any other point on the machine.

### NOTICE

**Do not attach the line to only one towing eye when you are retrieving the machine.** Use both towing eyes. Damage to the machine may occur.

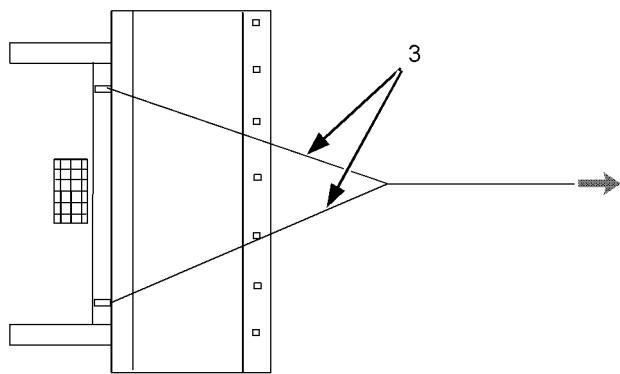


Illustration 92

g01019066

Each of the lines (3) must be a minimum of 1.5 m (5.0 ft).

---

**NOTICE**

Do not drag the machine for long distances. Damage to the tracks or the tires may occur.

---

# Engine Starting (Alternate Methods)

i02417424

## Engine Starting with Jump Start Cables

SMCS Code: 1000; 1401; 7000

### **WARNING**

Batteries give off flammable fumes that can explode resulting in 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 positive (+) to positive (+) and the negative (-) to 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.

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.

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 damages the electrical system. This machine has a 12 volt starting system. Use only the same voltage for jump starting.

Refer to Special Instruction, SEHS7633, "Battery Test Procedure" available from your Caterpillar dealer, for complete testing and charging information.

1. Engage the parking brake. Lower the work tools to the ground.  
**Reference:** Refer to Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped".
2. Move all hydraulic controls to the NEUTRAL position.
3. Turn the engine start switch key to the OFF position and turn all accessory switches to the OFF 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 the battery in the stalled machine is not frozen.

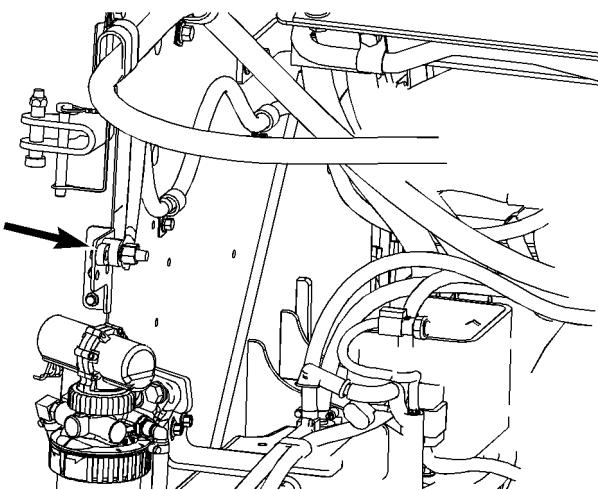


Illustration 93

g01210181

The jump start post on the left side of the engine compartment is shown without the red cover.

7. Connect the positive jump start cable to the positive cable terminal that is provided in the engine compartment of the stalled machine.  
  
Do not allow the positive cable clamps to contact any metal except for the terminals.
  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.
- 

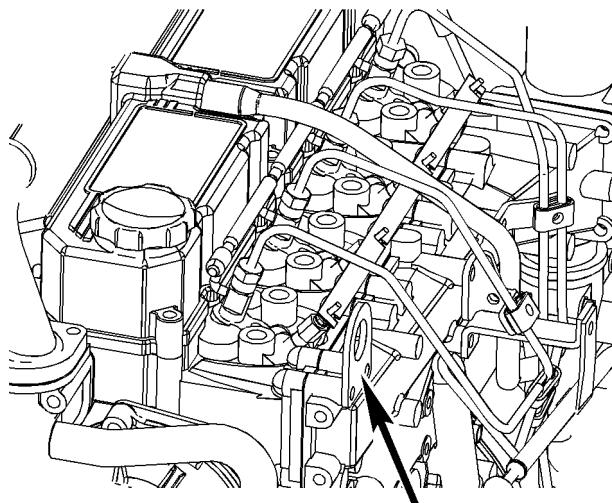


Illustration 94

g01266722

10. Connect the other negative end of the jump start cable to the lifting eye on the engine 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 battery in the stalled machine to partially charge.
  13. Attempt to start the stalled engine.
- Reference:** For the correct starting procedure, refer to Operation and Maintenance Manual, "Engine Starting".
14. After the stalled engine starts, disconnect the negative jump start cable from the stalled machine.
  15. Disconnect the negative jump start cable from the negative terminal of the electrical source.
  16. Disconnect the positive jump start cable from the positive terminal of the electrical source.
  17. Disconnect the positive jump start cable from the positive terminal of the stalled machine.
  18. Conclude the failure analysis on the starting system of the stalled machine and/or on the charging system of the stalled machine. Check the machine while the engine is running and the charging system is in operation.

## Maintenance Section

### Maintenance Access

i02417430

#### Access Doors and Covers

**SMCS Code:** 7273-572; 7273-573

#### Engine Access Door

**Note:** A pinch point exists between the top of the engine access door and the radiator guard. Keep hands away from this area when you close the engine access door.

The engine access door is located on the back of the machine.

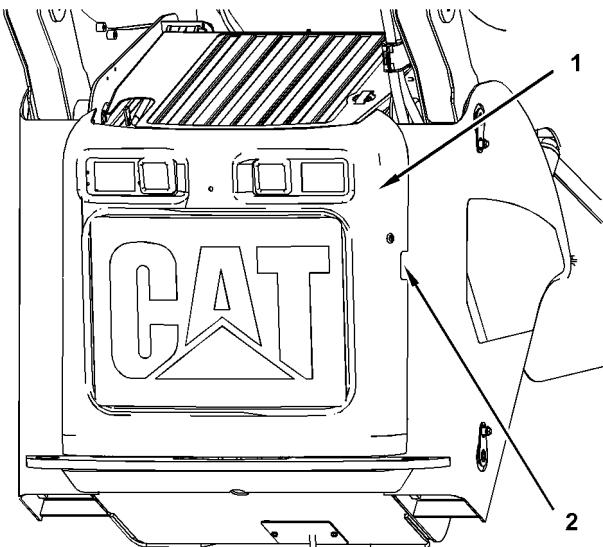


Illustration 95

g01210159

- (1) Engine Access Door
- (2) Access for Release Lever

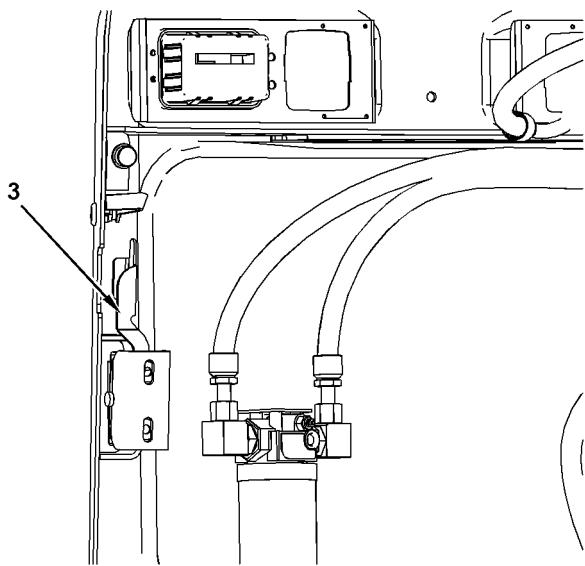


Illustration 96

g01210161

1. Pull the release lever (3) in order to open the engine access door (1).

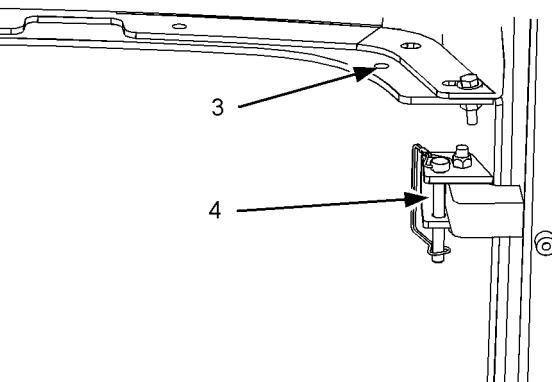


Illustration 97

g01019162

2. Move the retaining pin from the stored position (3) and put the retaining pin in the locked position (4). This will prevent the engine access door from closing inadvertently.
3. In order to close the engine access door, put the retaining pin in the stored position.
4. Close the engine access door. Ensure that the latch is engaged.

i02417435

## Cab Tilting

**SMCS Code:** 7301-506; 7301-509

### ⚠️ WARNING

**Do not go beneath cab unless cab is empty and support lever is engaged.**

**Failure to follow the instructions or heed the warnings could result in injury or death.**

### ⚠️ WARNING

**Do not tilt the cab using an open door. The door must be closed and latched when lifting the cab. The door may become dislodged from its hinges and may cause serious personal injury or death.**

## Tilting the Cab Upward

1. Park the machine on level ground.

**Note:** Empty the water tank (if equipped) before you tilt the cab.

2. Lower the loader arms fully. If you tilt the cab upward with the loader lift arms in the RAISED position, you must engage the brace for the loader lift arms. See Operation and Maintenance Manual, "Loader Lift Arm Brace Operation" for the process for engaging the brace for the loader lift arms.
3. Turn the engine start switch key to the OFF position.
4. Remove the two front bolts for the ROPS. There is one bolt on each side of the cab under the lift arm.
5. Close the cab door and ensure that the door is latched.
6. Tilt the cab upward. Stand on the ground when you tilt the cab.

**Note:** More than one person may be needed to tilt the cab.

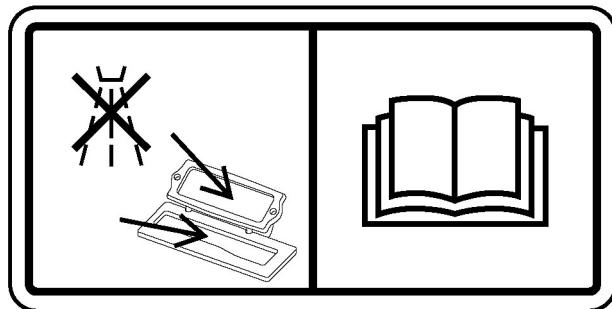


Illustration 98

g01270620

### NOTICE

Do not spray water or cleaning fluids into the ventilation ducts. Cover the opening in order to prevent foreign material or fluid from entering the ventilation ducts.

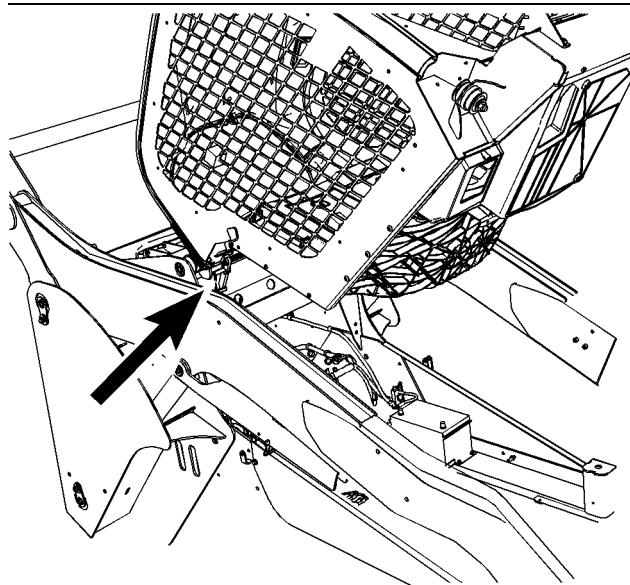


Illustration 99

g01210136

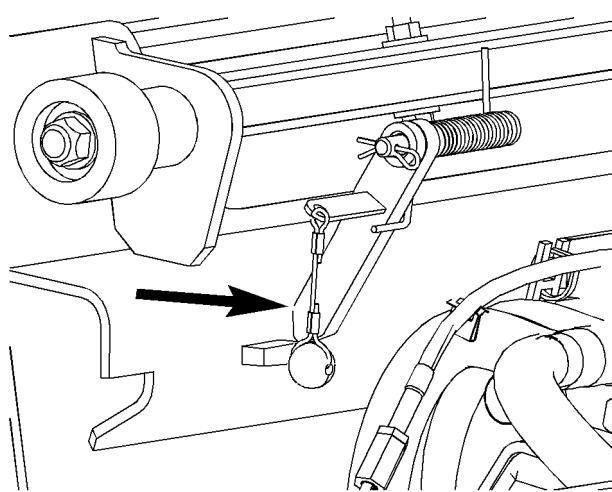


Illustration 100

g01210140

Cab support lever

7. The cab support lever is on the right side of the machine. Make sure that the cab support lever is in the **ENGAGED** position.

**Note:** If water or other fluid is used, cover the ventilation ducts with plastic.

## Tilting the Cab Downward

**Note:** More than one person may be needed to tilt the cab.

1. Remove the cover from the ventilation ducts.
2. Ensure that all persons are not under the cab. Remove all of the tools and unsecured items that are underneath the cab.
3. Tilt the cab upward. Move the cab support lever to the **DISENGAGED** position.
4. Tilt the cab downward.
5. Install the bolts for the ROPS. Torque the bolts to  $125 \pm 10 \text{ N}\cdot\text{m}$  ( $92 \pm 7 \text{ lb ft}$ ).

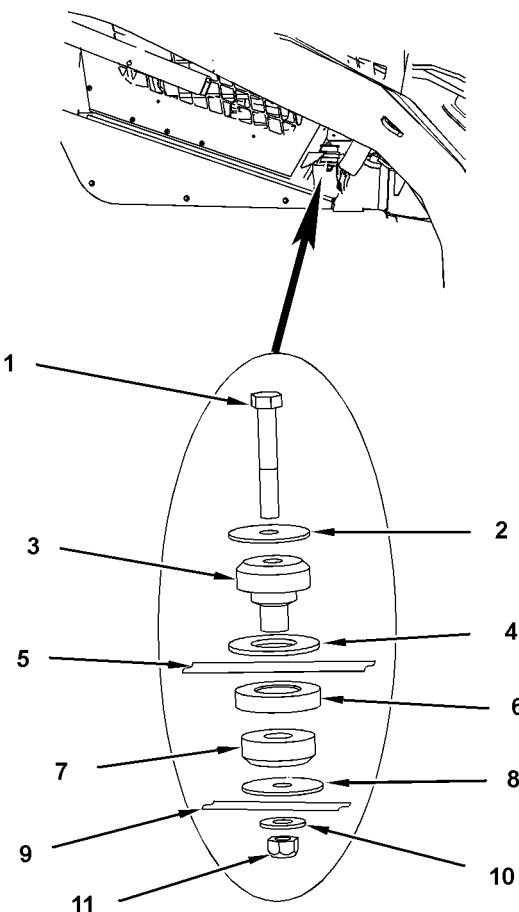


Illustration 101

g01271548

- (1) Bolt
- (2) Washer
- (3) Rubber mount - top half
- (4) Washer
- (5) ROPS structure
- (6) Spacer
- (7) Rubber mount - bottom half
- (8) Washer
- (9) Frame
- (10) Spacer
- (11) Locknut

i02417448

## Loader Lift Arm Brace Operation

SMCS Code: 6119-011-AB; 6119-012-AB

### WARNING

Loader lift arm brace must be in place when working under raised lift arms.

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

## Engage the Lift Arm Brace

1. Empty the work tool. Remove the work tool. Park the machine on level ground. Lower lift arms to the ground.
2. Remain in the seat with the seat belt fastened until the brace is installed.

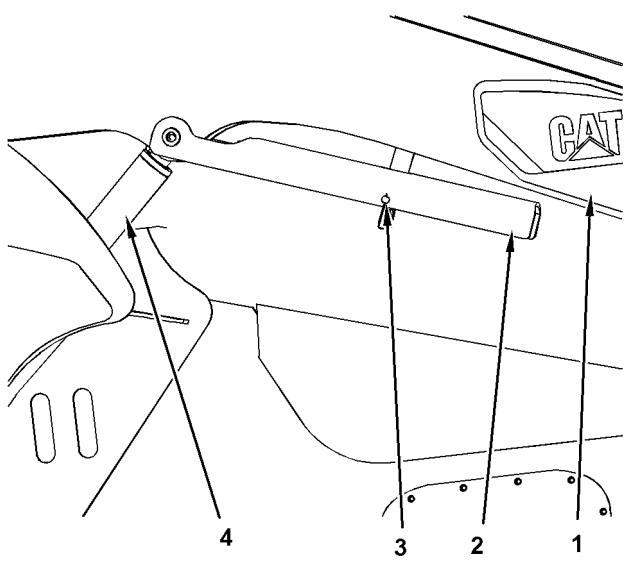


Illustration 102

- (1) Lift arm
- (2) Lift arm brace
- (3) Retaining pin
- (4) Lift cylinder

g01275448

3. A second person must remove the brace(2) from the storage position. Remove the retaining pin(3) and allow the lift arm brace to lower.
4. Raise the lift arms to the maximum height.
5. The second person should then swing the lift arm brace into the locked position on the lift cylinder. Secure the brace with the retaining pin.
6. Lower the lift arms against the brace.

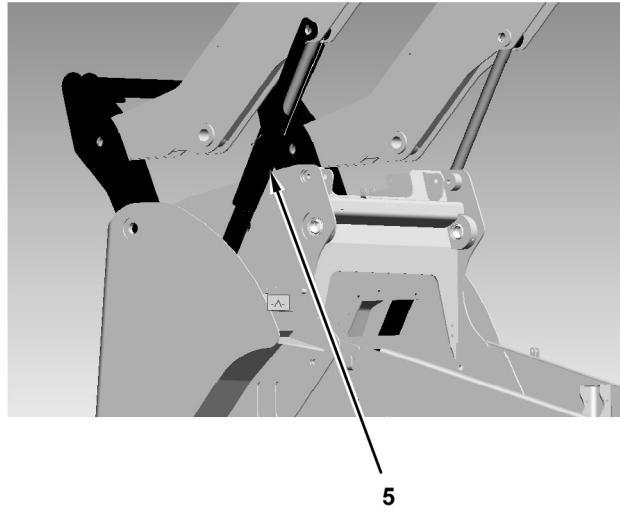


Illustration 103

g01275092

- (5) Lift arm brace in the locked position

7. Stop the engine. Exit the machine.

## Disengage the Lift Arm Brace

1. Enter the machine. Fasten the seat belt. Lower the armrests and remain in the seat until the brace is in the stored position.
2. Start the engine.
3. Slowly raise the lift arms until the brace is free. A second person must remove the retaining pin.
4. Slowly lower the lift arms.
5. A second person must return the brace to the storage position. Secure the brace with the retaining pin.
6. Slowly lower the lift arms to the ground.

i02417452

## Radiator Tilting

**SMCS Code:** 1353-506; 1353-509

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

- 
6. Close the engine access door.

## Tilting the Radiator Guard

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Remove the retaining pin (2) for the radiator guard. Tilt the radiator guard upward.
3. In order to tilt the radiator guard downward, pull down on the radiator guard and install the retaining pin.

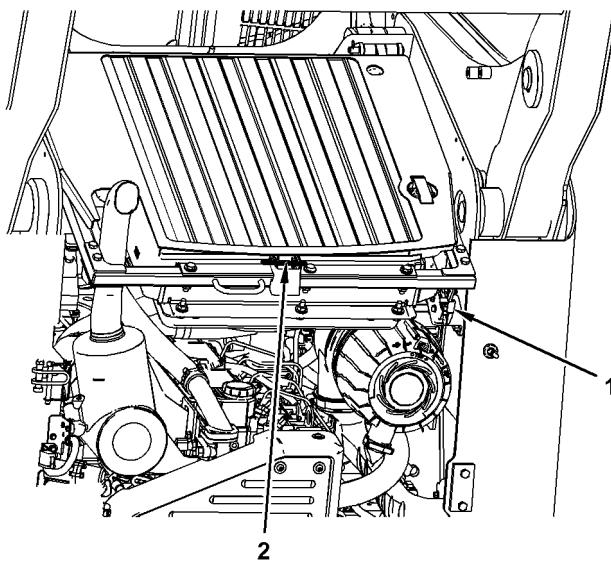


Illustration 104

g01209515

- (1) Radiator latch  
(2) Retaining pin for the radiator guard

2. The release lever for the radiator latch is located on the right side of the radiator. Push the release lever for the radiator latch. Tilt the radiator upward.

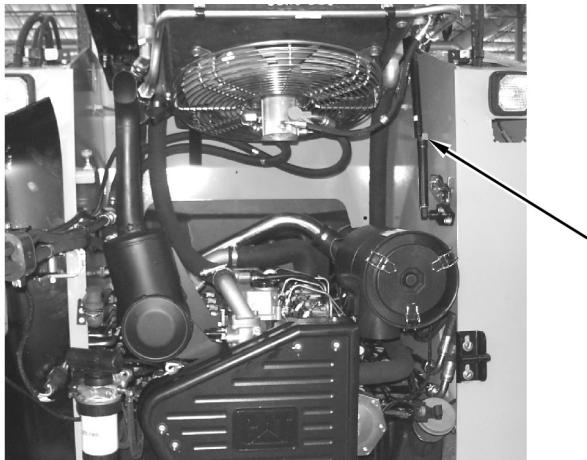


Illustration 105

g01209517

3. The strut lock is located on the right side of the engine compartment. Make sure that the strut lock is in the LOCKED position.
4. In order to tilt the radiator downward, push the lock on the strut and release the lock.
5. Tilt the radiator downward. Make sure that the radiator is in the LOCKED position.

# Lubricant Viscosities and Refill Capacities

i04777230

## Lubricant Viscosities

SMCS Code: 7581

### General Information for Lubricants

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

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

Caterpillar has determined that Medium Wheel Loaders equipped with the High Ambient Cooling Attachment can operate with Cat HYDO Advanced 10 Hydraulic System Oil in ambient temperatures from -20° C (-4° F) to 50° C (122° F).

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

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

### Selecting the Viscosity

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

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Measure the temperature when the machine is started and while the machine is operated. In order to determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the "Lubricant Viscosities for Ambient Temperatures" tables, use the highest oil viscosity that is allowed for the ambient temperature.

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

#### NOTICE

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

### Engine Oil

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

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

**Note:** SAE 10W-30 is the preferred viscosity grade for the 3116, 3126, C7, C-9, and C9 diesel engines when the ambient temperature is between -18° C (0° F) and 40° C (104° F).

Table 24

Engine Crankcase						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase	Cat DEO-ULS Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat DEO-ULS Cat DEO	SAE 10W-30	-18	40	0	104
	Cat DEO-ULS Cat DEO	SAE 15W-40	-9.5	50	15	122

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

- Cat DEO-ULS SYN
- Cat DEO SYN
- Cat DEO-ULS Cold Weather

## Hydraulic Systems

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

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

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

**Cat HYDO Advanced fluids have a 50% increase in the standard oil drain interval** for machine hydraulic systems (3000 hours versus 2000 hours) over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular machine. 6000 hour oil drain intervals are possible when using S-O-S Services oil analysis. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

**Second choice** oils are listed below.

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

Table 25

Hydraulic System						
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 30 Cat TDTO	SAE 30	0	50	32	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	45	-22	113
	Cat MTO Cat DEO-ULS Cat DEO	SAE10W-30	-20	40	-4	104
	Cat DEO-ULS Cat DEO	SAE15W-40	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	-15	50	5	122
	Cat DEO-ULS Cold Weather	SAE0W-40	-40	40	-40	104
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104

## Drive Train Components

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

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

Table 26

Drive Train Components						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Track Idlers and Track Rollers	Cat DEO-ULS Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat DEO-ULS Cat DEO	SAE 10W-30	-18	40	0	104
	Cat DEO-ULS Cat DEO	SAE 15W-40	-9.5	50	15	122
Final Drive	Caterpillar Synthetic GO <sup>(1)(2)</sup>	SAE 75W-140	-30	45	-22	113

(1) Cat Synthetic GO is the preferred oil for the final drive. If Cat Synthetic GO is not available, Cat GO, or API GL-5 grade oil may be substituted.

(2) Cat GO (Gear Oil) is available in SAE 80W-90 and SAE 85W-140 viscosity grades.

## Special Lubricants

### Grease

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

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

Table 27

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
External Lubrication Points	Cat Advanced 3Moly	NLGI Grade 2	-20	40	-4	104
	Cat Ultra 5Moly	NLGI Grade 2	-30	50	-22	122
		NLGI Grade 1	-35	40	-31	104
		NLGI Grade 0	-40	35	-40	95
	Cat Arctic Platinum	NLGI Grade 0	-50	20	-58	68
External Lubrication Points, Track Roller Frame Recoil Spring	Cat Desert Gold	NLGI Grade 2	-20	60	-4	140
External Lubrication Points, Track Roller Frame Recoil Spring	Cat Advanced 3Moly	NLGI Grade 2	-20	40	-4	104

## Diesel Fuel Recommendations

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

The preferred fuels are distillate fuels. These fuels are commonly called diesel fuel, furnace oil, gas oil, or kerosene. These fuels must meet the "Caterpillar Specification for Distillate Diesel Fuel for Off-Highway Diesel Engines". Diesel Fuels that meet the Caterpillar specification will help provide maximum engine service life and performance.

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

- Reduce engine efficiency and durability
- Increase the wear
- Increase the corrosion
- Increase the deposits

- Lower fuel economy
- Shorten the time period between oil drain intervals (more frequent oil drain intervals)
- Increase overall operating costs
- Negatively impact engine emissions

Failures that result from the use of improper fuels are not Caterpillar factory defects. Therefore the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in off road and machine applications that are not Tier 4/Stage IIIB certified engines. ULSD is not required in engines that are not equipped with after treatment devices.

Follow operating instructions and fuel tank inlet labels, if available, in order to ensure that the correct fuels are used.

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

## Fuel Additives

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

## Biodiesel

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

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

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

**Note:** Up to B20 biodiesel blend level is acceptable for use in Cat machine engines.

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

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

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

## Coolant Information

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

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

**Preferred** – Cat ELC (Extended Life Coolant)

**Acceptable** – Cat DEAC (Diesel Engine Antifreeze/Coolant)

### NOTICE

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

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## Capacities (Refill)

**SMCS Code:** 7560

Table 28

Approximate Refill Capacities			
Compartment or System	Liters	US Gallons	Imperial Gallons
Engine Crankcase 3044	10 <sup>(1)</sup>	2.6 <sup>(2)</sup>	2.2
Hydraulic Tank	39	10.3	8.6
Cooling System	13.9	3.7	3.1
Fuel Tank	97.5	25.8	21.4
Final Drive	1.0	0.26	0.22
Window Washer Fluid	1.7	0.45	0.37

(1) The amount includes 1L in the filter.

(2) The amount includes 0.26G in the filter.

Table 29

Track Roller Frame Approximate Refill Capacities	
Compartment or System	Milliliters
Track Roller	240 ± 12 ml
Idler - Single Flange	349 ± 15 ml
Idler - Dual Flange	354 ± 15 ml

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## S·O·S Information

**SMCS Code:** 1000; 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.

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

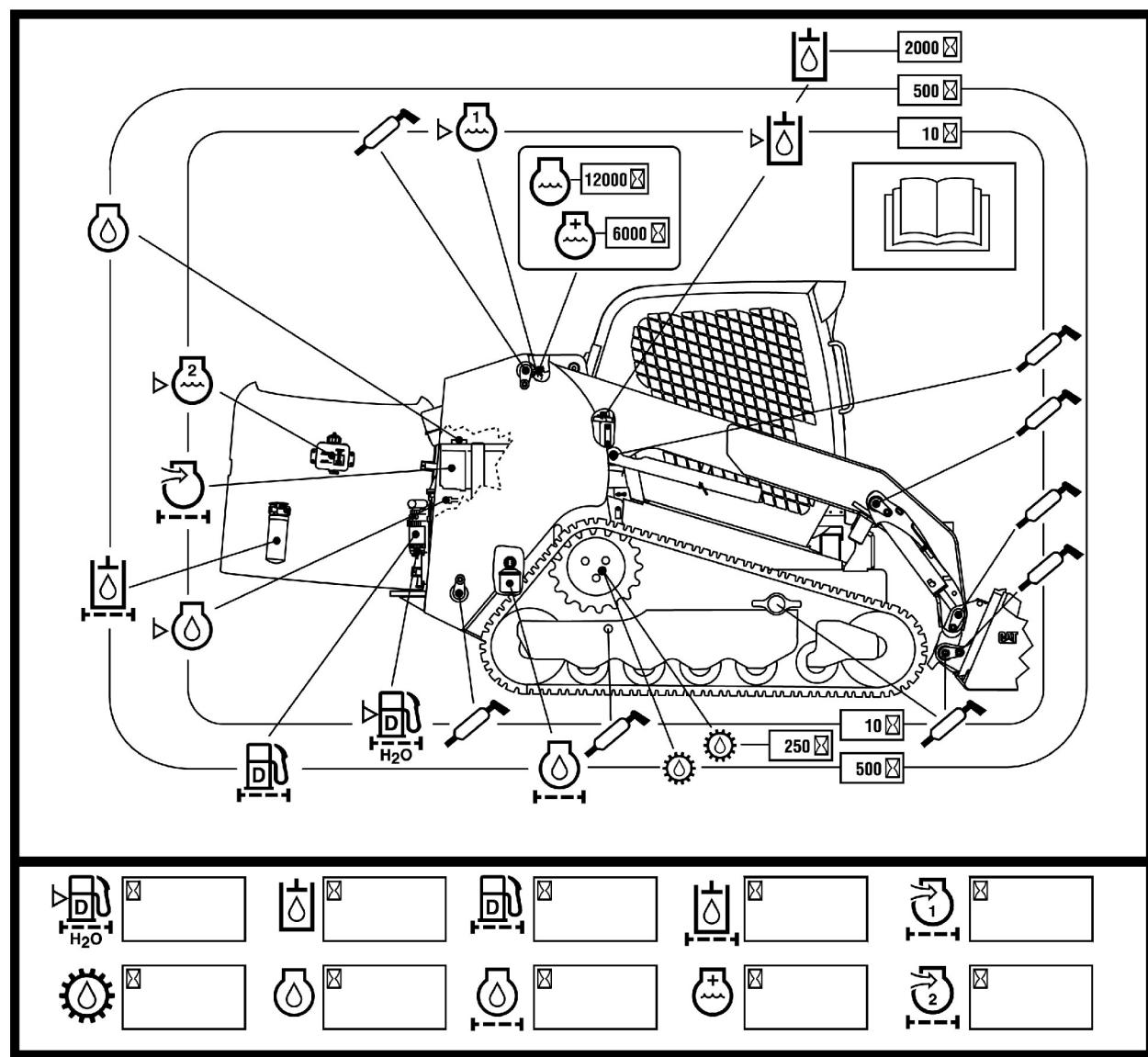
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## Service Interval Chart

**SMCS Code:** 7000

Refer to the following service interval charts and service intervals for additional maintenance information.

### 279C Service Interval Chart



## 289C and 299C Service Interval Chart

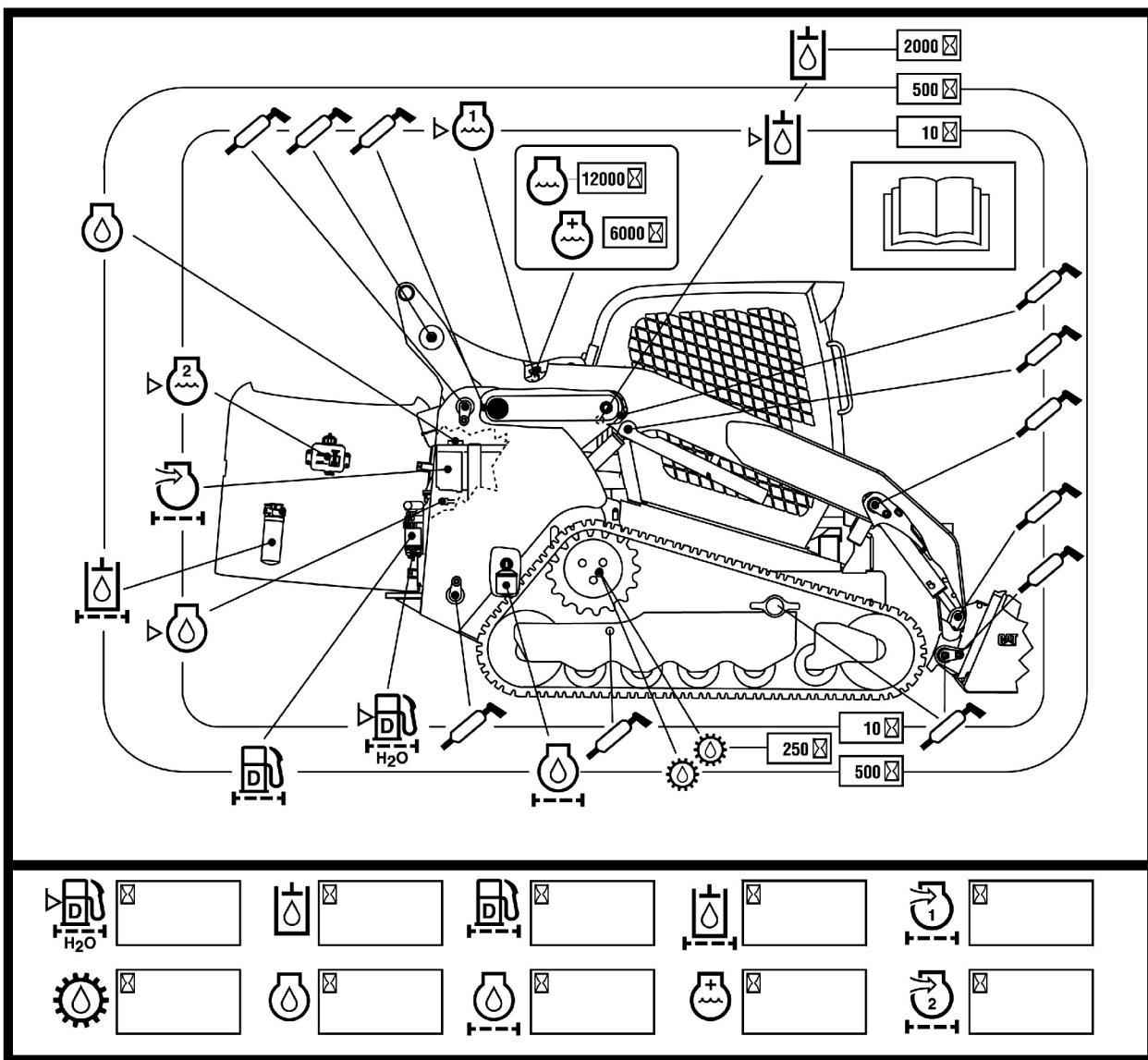


Illustration 107

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### Service Intervals



**Coolant additive** – Add the extender to the extended life coolant after every 6000 service hours or every 3 years.



**Coolant level (radiator)** – Check the coolant level in the radiator at the sight gauge after every ten service hours or at the end of each day.



**Coolant level (reservoir)** – Check the coolant level in the coolant reservoir after every ten service hours or at the end of each day.



**Cooling system coolant** – Change the ELC (Extended Life Coolant) after every 12,000 hours or every 6 years.



**Engine air filter primary element** – Clean the primary air filter element or replace the primary air filter element. The alert indicator for the air filter indicates when servicing is necessary.

**Engine air filter secondary element –**

Replace the secondary air filter element with every third change of the primary air filter element or replace the secondary air filter element when it is necessary.

**Engine oil level check –** Check the engine oil level after every ten service hours or at the end of each day.**Engine oil –** Change the engine oil after every 500 service hours or every year.**Engine oil filter –** Change the filter after every 500 service hours or every three months.

**Final Drive oil –** Check the final drive oil after every 250 service hours. Change the final drive oil after the initial 250 service hours. Change the final drive oil after every 500 service hours.

**Fuel system water separator –** Drain the water separator after every ten service hours or at the end of each day.**Fuel System Filter/Water Separator Element –** Replace the filter after every 500 service hours or every three months.**Grease zerk –** Lubricate the designated locations after every ten service hours or at the end of each day.**Hydraulic oil filter –** Change the filter after every 500 service hours or every three months.

**Hydraulic oil level check –** Check the hydraulic oil level at the sight gauge after every ten service hours or at the end of each day.

**Hydraulic oil –** Change the hydraulic oil after every 2000 service hours or every year.

## Welding on Machines and Engines with Electronic Controls

**SMCS Code:** 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Caterpillar dealer.

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

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

### NOTICE

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

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

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

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

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## Maintenance Interval Schedule

### SMCS Code: 7000

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

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

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

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

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

**Note:** If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 3000 hours. S-O-S services may extend the oil change even longer. Consult your Cat dealer for details.

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Aftercooler Core - Inspect/Clean .....	129
Aftercooler Intake Screen - Clean .....	130
Air Conditioner Condenser - Clean .....	131
Battery or Battery Cable - Inspect/Replace .....	132
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Bucket Tips - Inspect/Replace .....	136
Cab Air Filter - Clean/Replace .....	137
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Fuel Tank Cap - Clean .....	154
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### Every 10 Service Hours or Daily

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Work Tool - Lubricate .....	174
Work Tool Mounting Bracket - Inspect .....	176

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### Every 250 Service Hours

Final Drive Oil Level - Check .....	151
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### Every 250 Service Hours or Monthly

Belts - Inspect/Adjust/Replace .....	133
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### Every 500 Service Hours

Cooling System Coolant Sample (Level 1) - Obtain .....	141
Final Drive Oil - Change .....	151
Hydraulic System Oil Sample - Obtain .....	162

### Every 500 Service Hours or 6 Months

Fuel System Primary Filter (Water Separator) Element - Replace .....	153
Hydraulic System Oil Filter - Replace .....	160

### Every 500 Service Hours or 1 Year

Engine Oil and Filter - Change .....	148
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### Every 1000 Service Hours

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**Every 1000 Service Hours or 6 Months**

Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) - Inspect ... 167

**Every 2000 Service Hours**

Refrigerant Dryer - Replace ..... 166

**Every 2000 Service Hours or 1 Year**

Fuel Injection Timing - Check ..... 152  
Hydraulic System Oil - Change ..... 158

**Every Year**

Cooling System Coolant Sample (Level 2) -  
Obtain ..... 142

**Every 3000 Service Hours or 2 Years**

Cooling System Water Temperature Regulator -  
Replace ..... 143

**Every 3 Years**

Seat Belt - Replace ..... 168

**Every 6000 Service Hours or 3 Years**

Cooling System Coolant Extender (ELC) - Add .. 140

**Every 12 000 Service Hours or 6 Years**

Cooling System Coolant (ELC) - Change ..... 138

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## Aftercooler Core - Inspect/Clean

**SMCS Code:** 1064-571; 1064-571-Z3

### Inspect

**Note:** Adjust the frequency of inspection according to the effects of the operating environment. Clean the aftercooler core when you clean the radiator core.

The aftercooler is located behind the cab and in front of the engine.

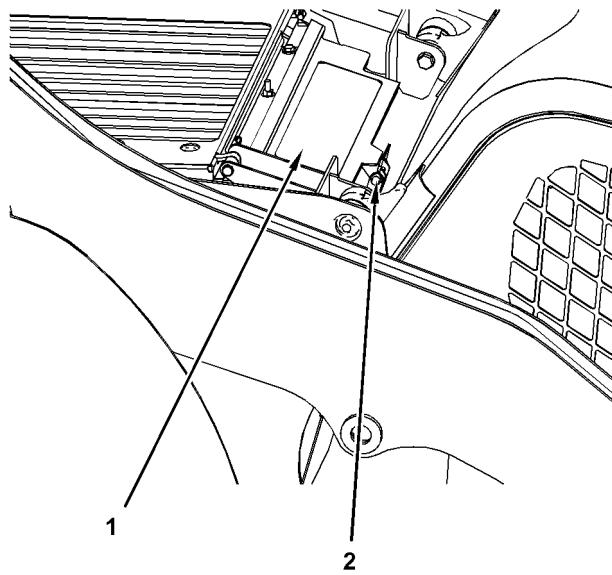


Illustration 108

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1. Stop the engine.
2. Clean the grill before you access the aftercooler core.
3. Remove the pin (2) that holds the grill (1) and lift the grill.

**Note:** If parts of the aftercooler system may appear to be damaged or if parts of the aftercooler system are repaired, a leak test is highly recommended. Consult your Caterpillar dealer for the most current information about the aftercooler.

Inspect the fins and tubes of the aftercooler for damage. Some fins and tubes may be worn from abrasive material that has passed through the aftercooler cores. Bent fins may be opened with a "comb".

Inspect these items for good condition: welds, mounting brackets, air lines, connections, clamps, and seals. Make repairs, if necessary.

### Clean

For air-to-air aftercoolers, use the same methods that are used for cleaning radiators.

#### **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**

When you are using compressed air or high pressure water to clean the radiator fins, ensure that the air or water is directed parallel to the fins. If the compressed air or high pressure water is not directed parallel to the radiator fins, the radiator fins could be bent or damaged.

Pressurized air is the preferred method for removing loose debris. Hold the nozzle approximately 6 mm (0.25 inch) away from the fins. Slowly move the air nozzle in a direction that is parallel with the tubes. The air nozzle should point in the opposite direction of the flow of the fan. This will remove debris that is between the tubes.

Pressurized water may also be used for cleaning. The maximum water pressure for cleaning purposes must be less than 275 kPa (40 psi). Use pressurized water in order to soften mud.

Use a degreaser and steam for removal of oil and grease. Wash the core with detergent and hot water. Thoroughly rinse the core with clean water.

After cleaning, start the engine and accelerate the engine to high idle rpm. This will help in the removal of debris and drying of the core. Stop the engine. Use a light bulb behind the core in order to inspect the core for cleanliness. Repeat the cleaning, if necessary.

**Note:** Adjust the frequency of cleaning according to the effects of the operating environment. If there is an extreme amount of debris, you may need to remove the air conditioning condenser or the cover plate from the fan housing for the aftercooler.

Close the grill and replace the retaining pin.

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## Aftercooler Intake Screen - Clean

**SMCS Code:** 1063-070-Z3

### ⚠️ 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.**

**Note:** Adjust the frequency of cleaning according to the effects of the operating environment.

**Note:** Pressurized air is the preferred method for removing loose debris. Pressurized water may also be used for cleaning. Use pressurized water in order to soften mud. Clean the screen from both sides. The maximum water pressure for cleaning purposes must be less than 275 kPa (40 psi).

1. Turn off the engine.

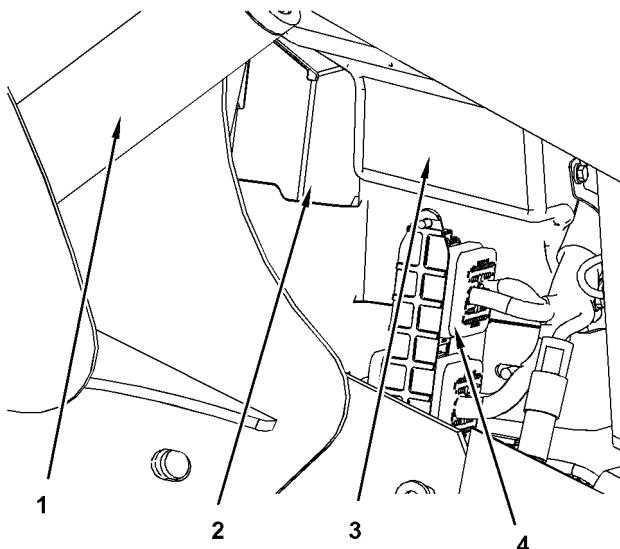


Illustration 109

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- (1) Cylinder for the lift arm
- (2) Air inlet screen
- (3) Hydraulic tank
- (4) Electrical connectors

2. Access the screen from the right side of the machine. Hold the nozzle approximately 6 mm (0.25 inch) away from the screen. Ensure that the spray nozzle is past the electrical connections.

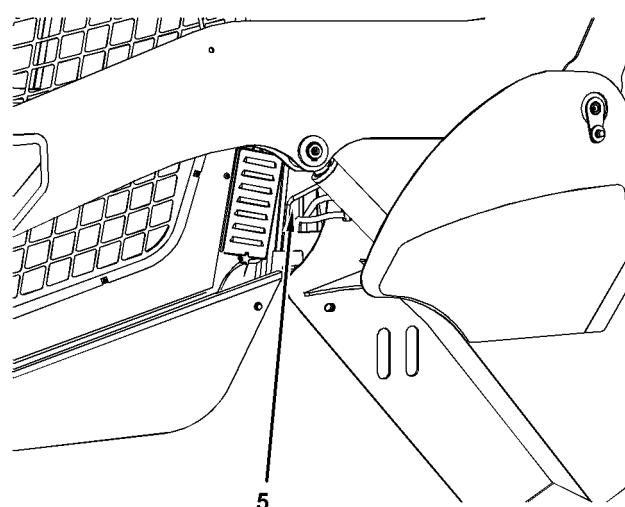


Illustration 110

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3. Access the screen from the left side of the machine. Hold the nozzle approximately 6 mm (0.25 inch) away from the screen.
4. If water is used to clean the screen, ensure that the screen is dry before the engine is started. If necessary, use compressed air to dry the screen.

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## Air Cleaner Dust Valve - Clean/Inspect

**SMCS Code:** 1051-571-VL

Service the air filter elements when the alert indicator for air filter restriction lights. Refer to Operation and Maintenance Manual, "Alert Indicators" for information about the indicator.

1. Open the engine access door.
2. The air filter housing is located on the right side of the engine compartment.

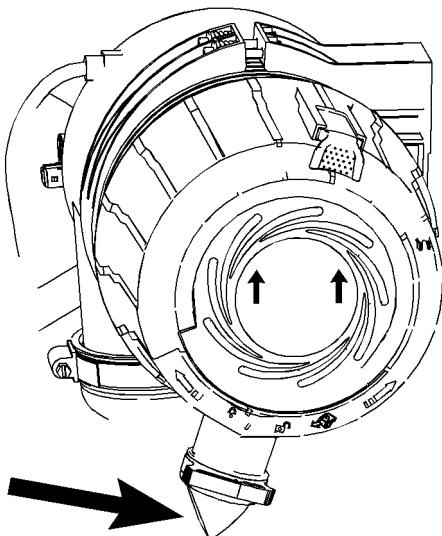


Illustration 111

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3. Check the dust valve after every ten service hours or at the end of each day. Actuate the valve by squeezing the lips of the valve in order to remove any accumulated debris.

- Damaged fins
- Buildup of debris
- Plugged areas

Remove any debris. Clean the condenser with low pressure air or low pressure water. The maximum water pressure for cleaning purposes must be less than 275 kPa (40 psi).

## **272C, 297C, and 299C**

The air conditioner condenser is attached to the side of the fan housing for the aftercooler.

1. Remove the 3 bolts that retain the condenser to the fan housing for the aftercooler.
2. Lift the core and remove the core from the retaining lip.
3. Clean the condenser core in the opposite direction of the air flow.
4. Reinstall the core in reverse order.

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## **Air Conditioner Condenser - Clean (If Equipped)**

**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.

## **246C, 256C, 262C, 277C, 287C, 279C, and 289C**

The air conditioner condenser is located behind the engine on the frame.

Open the engine access door.

Inspect the air conditioner condenser for the following conditions:

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## Axle Bearings - Lubricate

**SMCS Code:** 3282-086-BD

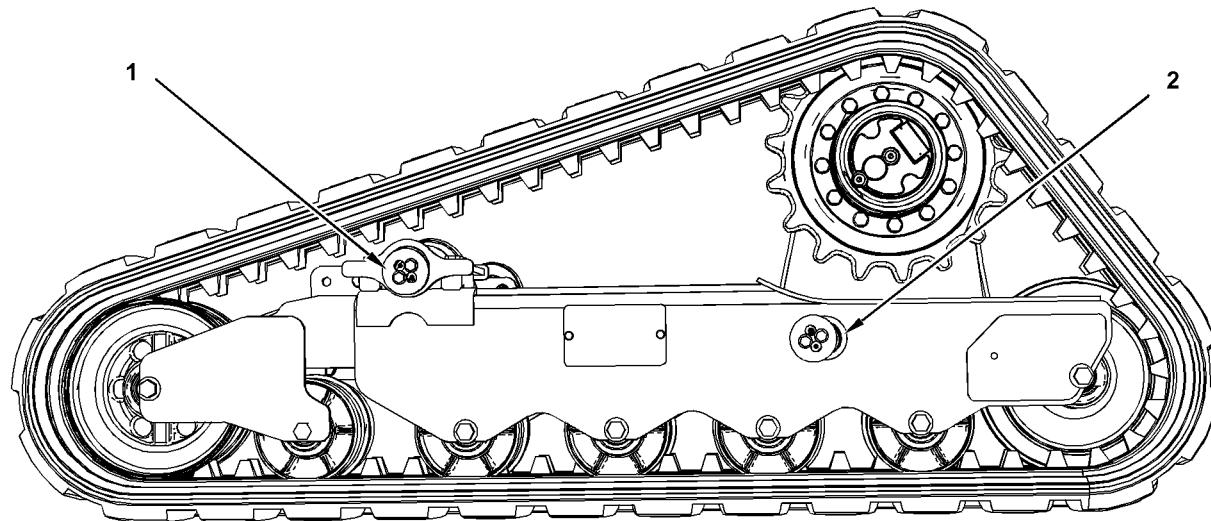


Illustration 112

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(1) Front pivot

(2) Rear pivot

Apply lubricant to all grease fittings.

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Repeat the process for the opposite side of the machine.

## Backup Alarm - Test

**SMCS Code:** 7406-081

To prevent injury, make sure that no people are working on the machine or near the machine. To prevent injury, keep the machine under control at all times.

1. Get into the operator's seat. Fasten the seat belt and pull the armrests downward.
2. Start the engine.
3. Disengage the parking brake.
4. Move the joystick control to the REVERSE position.

The backup alarm should sound immediately. The backup alarm should continue to sound until the joystick control is returned to the NEUTRAL position or to the FORWARD position.

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## Battery or Battery Cable - Inspect/Replace

**SMCS Code:** 1401-040; 1401-510; 1401-561;  
1402-040; 1402-510

1. Turn the engine start switch to the OFF position. Turn all switches to the OFF position.
2. The battery is located on the left side of the machine under the cab. Raise the cab. Refer to Operation and Maintenance Manual, "Cab Tilting" for information on raising the cab.
3. Disconnect the negative battery cable at the battery.
- Note:** Do not allow the disconnected battery cable to contact the negative battery post.
4. Disconnect the negative battery cable from the frame in order to inspect the cable.
5. Disconnect the positive battery cable at the battery.
6. Perform the necessary repairs. Replace the cables or the battery, as needed.
7. Connect the positive battery cable at the battery.

8. Connect the negative battery cable to the frame of the machine.
9. Connect the negative battery cable at the battery.
10. Lower the cab. Refer to Operation and Maintenance Manual, "Cab Tilting" for information on lowering the cab.

## Recycle the Battery

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

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

i02715751

## Belts - Inspect/Adjust/Replace

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

If a new belt is installed, check the belt adjustment after 30 minutes of operation. A belt is considered to be used after 30 minutes of operation.

### Belts

1. Stop the engine in order to inspect the belt.
2. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

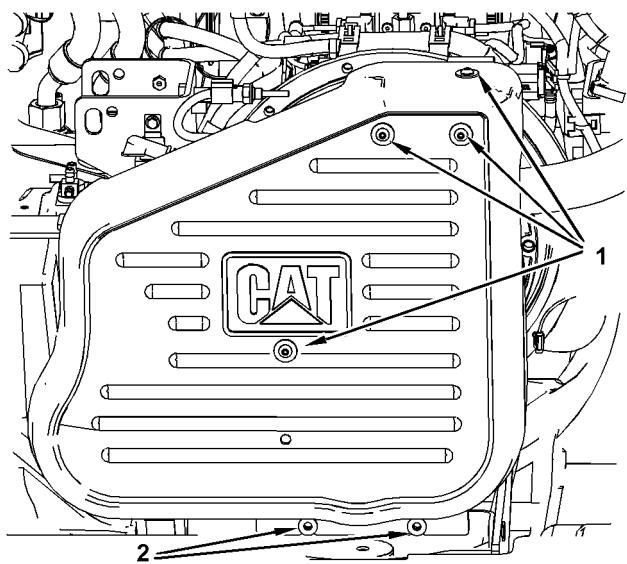


Illustration 113

g01209498

3. Remove the four bolts (1) on the top of the guard. Loosen the two bolts (2) on the bottom of the guard.
4. Slide the guard upward from bottom bolts. Remove the guard for the V-belt.

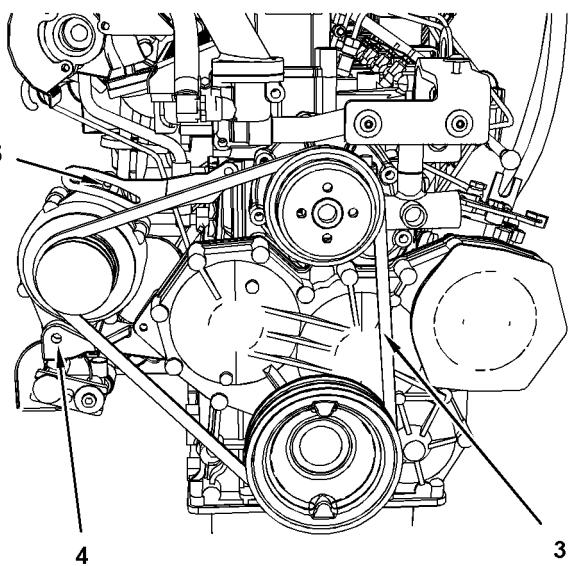


Illustration 114

g01209499

5. Inspect the condition of the belt (3) and the adjustment of the belt. The belt should deflect 10 mm (0.39 inch) under a straight pull of 44 N (10 lb). This measurement should be taken between the alternator pulley and the crankshaft pulley.

**Note:** A 144-0235 Borroughs Belt Tension Gauge may be used to measure belt tension. This measurement should be taken between the alternator pulley and the crankshaft pulley. Refer to the following table for belt tension.

Table 30

Belt Tension Initial	Belt Tension Used
$534 \pm 22 \text{ N} (120 \pm 5 \text{ lb})$	$400 \pm 44 \text{ N} (90 \pm 10 \text{ lb})$

6. Loosen the mounting bolt (4). Loosen the adjusting locknut (5).
7. Move the alternator until the correct tension is reached.
8. Tighten the adjusting locknut. Tighten the mounting bolt.
9. Recheck the belt deflection. If the amount of deflection is incorrect, repeat step 5 to step 8.

## Air Conditioner (if equipped)

**Note:** If your machine is equipped with an air conditioner, use the same procedure and the same measurements for the belt tension.

1. Inspect the condition of the belt and the adjustment of the belt. The belt should deflect 10 mm (0.39 inch) under a straight pull of 44 N (10 lb). This measurement should be taken between the air conditioner compressor pulley and the crankshaft pulley.

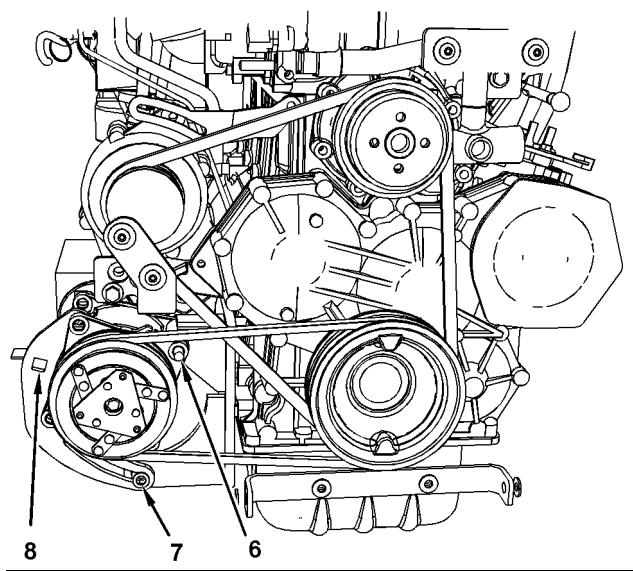


Illustration 115

g01279933

2. Loosen the mounting bolt (6) for the air conditioner compressor. Loosen the adjusting locknut (7) for the air conditioner compressor.

3. Move the air conditioner compressor until the correct tension is reached.

**Note:** A hole (8) in the bracket has been provided in order to aid with the adjustment of the tension.

4. Tighten the adjusting locknut. Tighten the mounting bolt.
5. Recheck the belt deflection. If the amount of deflection is incorrect, repeat step 2 to step 4.

## Finish

1. Apply thread lock compound to the threads on bolts (1).

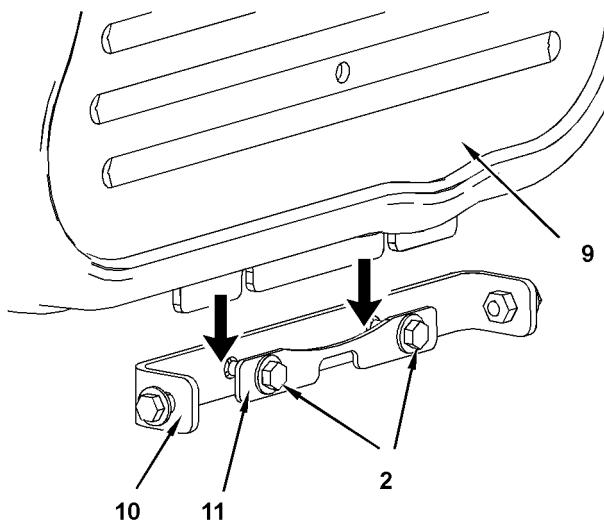


Illustration 116

g01364054

2. Install the guard for the V-belt (9). Ensure that the guard is inserted between the mounting bracket (10) and the spreader plate (11) before you tighten the bolts (2). Tighten the bolts (2) to  $15 \pm 3 \text{ N}\cdot\text{m}$  ( $11 \pm 2 \text{ lb ft}$ ).

I02549571

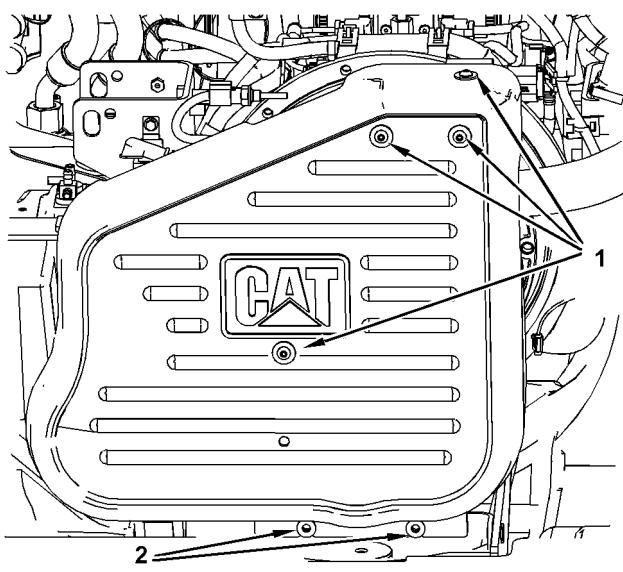


Illustration 117

g01209498

3. Tighten the bolts (1) to  $12 \pm 3 \text{ N}\cdot\text{m}$  ( $9 \pm 2 \text{ lb ft}$ ).

**Note:** Start all the bolts (1) in the holes before you start tightening the bolts. This helps align all the holes.

4. Close the engine access door.

## Blade Frame - Adjust

SMCS Code: 6060-025-BG

### Height Adjustment

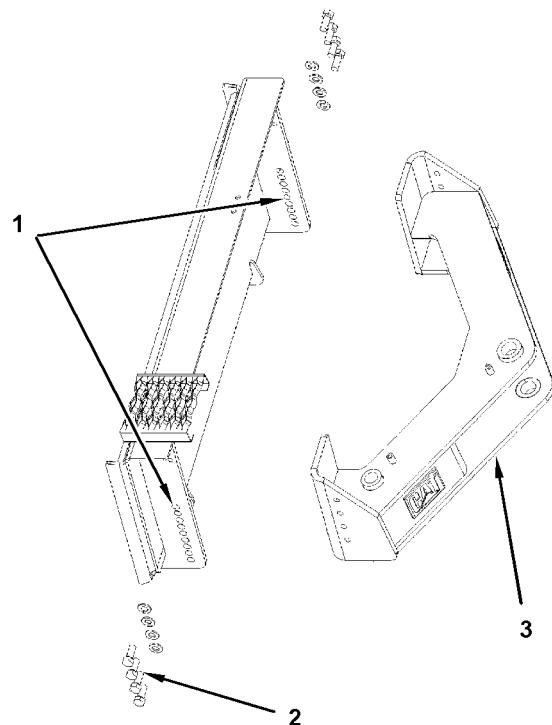


Illustration 118

g01161532

- (1) Height Adjustment for the Frame
- (2) Adjusting Bolts
- (3) Frame

The height of the frame may be adjusted in order to compensate for the wear on the cutting edge. The front portion of the frame needs to be lowered as the cutting edge wears. Remove the bolts (2) and lower the frame (3). Install the bolts. This will keep the blade level with the ground and this will prevent the blade from digging into the ground.

**Note:** In order to properly adjust the blade, the work tool coupler needs to be vertical. The position of the pivot point of the blade is perpendicular to the ground. Follow this procedure in order to ensure that the cutting edge will remain flat on the ground during operation.

## Trunnion Joint

**Note:** The trunnion is a dry joint. Adding grease to the trunnion simply attracts abrasive particles. The tightness of the joint should be monitored. Shims should be removed when the joint becomes too loose. This may be indicated by excessive movement in the blade.

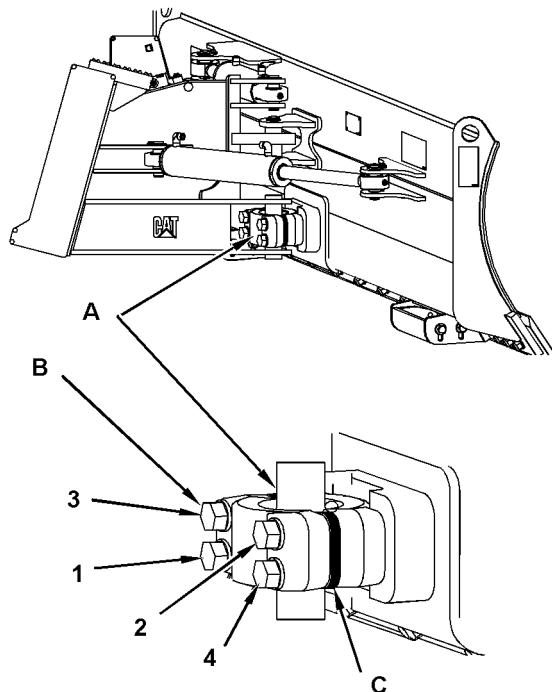


Illustration 119

g01173519

- (A) Trunnion Joint
- (B) Bolts
- (C) Shims

- Remove the four retaining bolts (B) and the cap.
- Remove the necessary shims.
- Replace the cap and bolts.
- The tightening sequence is shown in illustration 119.
- Torque the bolts to  $530 \pm 70 \text{ N}\cdot\text{m}$  ( $391 \pm 52 \text{ lb ft}$ ).

**Note:** Some noise is typical and the noise does not indicate a problem.

i01743875

## Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801-040; 6801-510

### WARNING

Personal injury or death can result from bucket falling.

**Block the bucket before changing bucket cutting edges.**

1. Lower the lift arms fully. Tilt back the bucket so that the bucket cutting edge is accessible.
2. Place blocks under the raised edge of the bucket.
3. Remove the bolts. Remove the cutting edge and the end bits.
4. Clean the contact surfaces.
5. Use the opposite side of the cutting edge, if this side is not worn.
6. Install a new cutting edge, if both edges are worn.
7. Install the bolts.
8. Remove the blocks that are under the bucket.
9. After a few hours of operation, check the bolts for proper torque.

i01764331

## Bucket Tips - Inspect/Replace

SMCS Code: 6805-040; 6805-510

### WARNING

Personal injury or death can result from bucket falling.

**Block the bucket before changing bucket cutting edges.**

1. Lower the lift arms fully. Tilt back the bucket so that the bucket tips are accessible.
2. Place blocks under the raised edge of the bucket.
3. Remove the mounting bolts. Remove the bucket tips.

4. Clean the mounting surface.
5. Replace the bucket tips.
6. Install the bolts.
7. Remove the blocks that are under the bucket.
8. After a few hours of operation, check the bolts for proper torque.

i02417532

## Cab Air Filter - Clean/Replace (If Equipped)

**SMCS Code:** 7342-070; 7342-510

### Fresh Air Filter

**Note:** The cover for the cab air filter is located on the left hand side of the machine behind the cab.

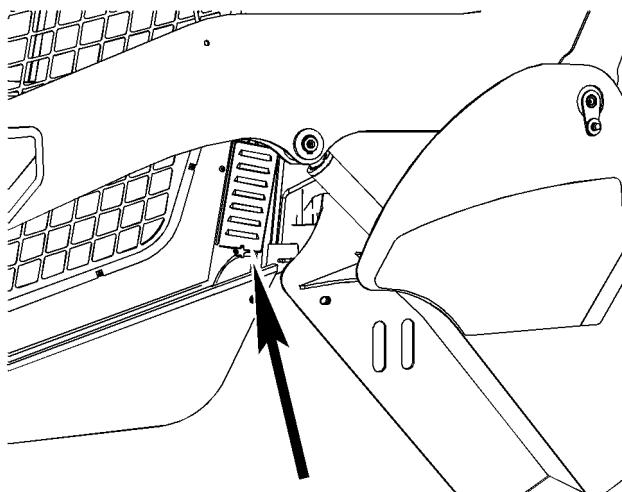


Illustration 120

g01287414

1. Turn the thumb screw until the thumb screw is free from the duct. Lift up on the cover and remove the cover.
2. Remove the air filter element from the duct and clean the filter element with low pressure air (maximum 207 kPa (30 psi)). Direct the air flow up the pleats and down the pleats from the side of the filter opposite of the air flow. Replace the element if the element is damaged or if the element seal is damaged. Replace the element if the air conditioner performance is low.

**Note:** Do not use water for cleaning the filter.

3. Install the element. Replace the cover and tighten the thumb screw.

### Recirculation Filter

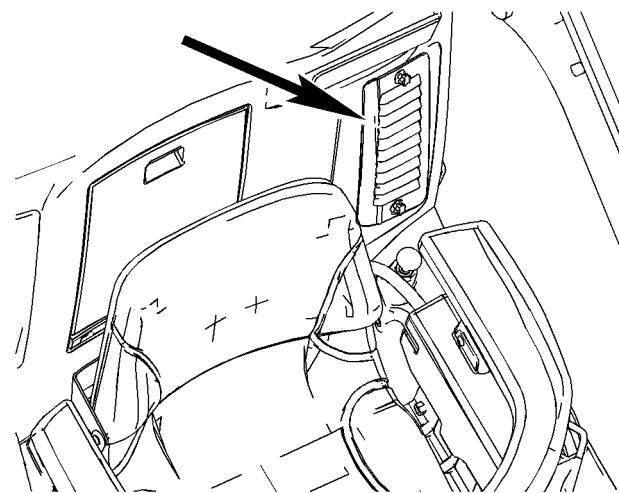


Illustration 121

g01209486

1. Turn the thumb screws until the thumb screws are free from the duct. Remove the cover.
2. Remove the air filter element from the duct and clean the filter element with low pressure air (maximum 207 kPa (30 psi)). Direct the air flow up the pleats and down the pleats from the side of the filter opposite of the air flow. Replace the element if the element is damaged or if the element seal is damaged. Replace the element if the air conditioner performance is low.

**Note:** Do not use water for cleaning the filter.

3. Install the element. Replace the cover and tighten the thumb screws.

i02616708

### Cab Interior - Clean

**SMCS Code:** 7301-070

The floor mat is removable. The floor mat has sides in order to help retain the material.

I02807909

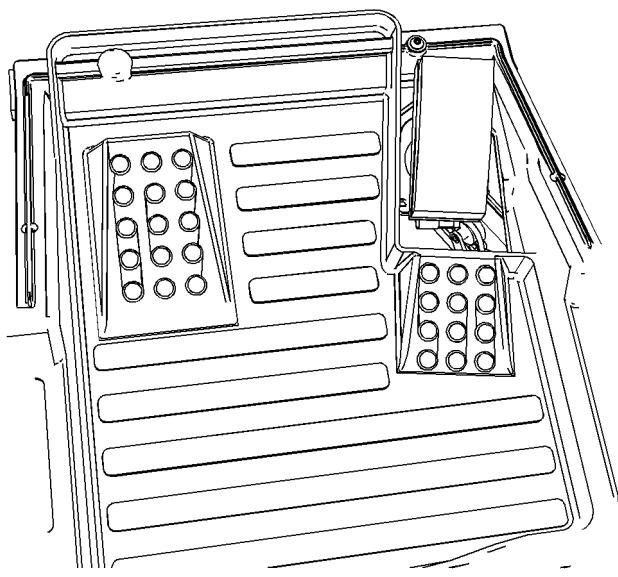


Illustration 122

g01312450

Floor mat in the cab

The floor mat does not protect the foot pedal and the pedal linkage. Debris may accumulate around the foot pedal. The foot pedal must be kept clear of excessive dirt and debris in order to ensure proper activation of the pedal. Debris must be cleaned from the area around the pedal. This can be done after you remove the floor mat.

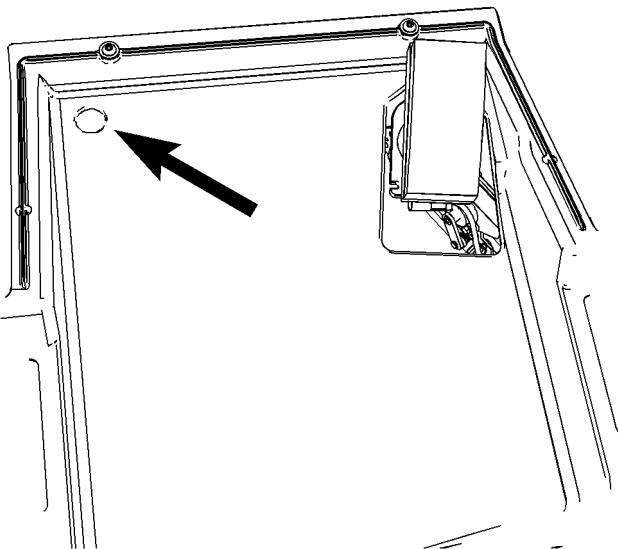


Illustration 123

g01312452

The drain on the left side of the machine

You can wash the floor of the cab with water. There is a drain in the front, left corner of the floor of the cab.

## Cooling System Coolant (ELC) - Change

SMCS Code: 1395-044-NL

### WARNING

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

### NOTICE

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:** The machine was shipped from the factory with Extended Life Coolant (ELC) in the cooling system.

For information about the addition of Extender to your cooling system, see the Operation and Maintenance Manual, "Cooling System Coolant (ELC) Extender - Add" or consult your Caterpillar dealer.

Drain the coolant whenever the coolant is dirty or whenever the coolant is foaming.

The radiator cap is located under the radiator guard on the top of the engine compartment.

Allow the machine to cool before you change the coolant.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Raise the radiator guard. Refer to Operation and Maintenance Manual, "Radiator Tilting".

**Note:** The radiator cap is located on the right side of the radiator.

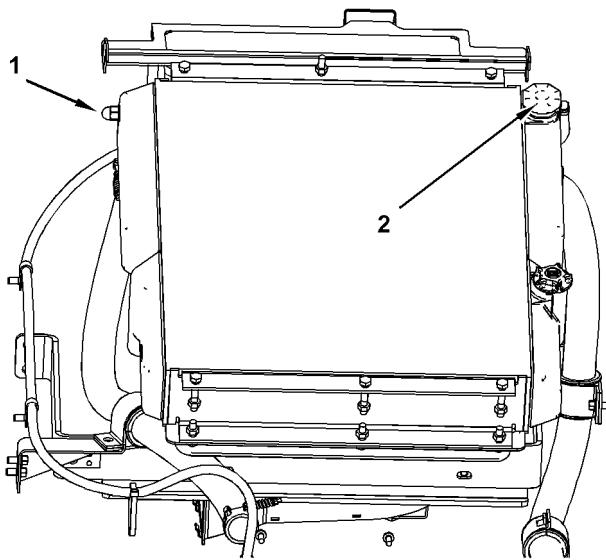


Illustration 124

g01210063

- (1) Sight gauge  
 (2) Radiator cap

- 3.** Slowly loosen the radiator cap (2) in order to relieve system pressure. Remove the radiator cap.

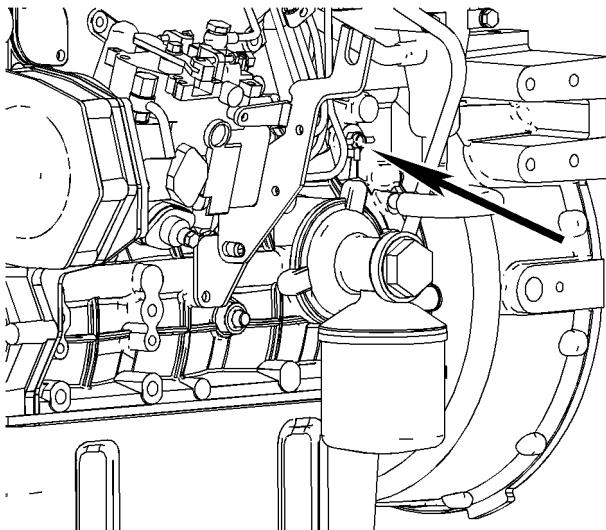


Illustration 125  
 Coolant drain

g01279512

- 4.** Locate the drain hose for the coolant system. The drain hose is attached to the drain valve that is shown in illustration 125.

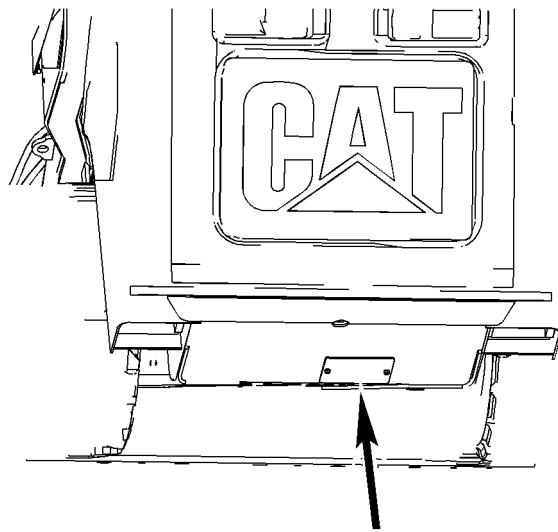


Illustration 126

g01264593

- 5.** Remove the access panel under the rear of the machine. Pull the drain hose through the access hole.
- 6.** Open the drain and allow the coolant to drain into a suitable container.
- 7.** Close the drain.
- 8.** Push the hose back into the engine compartment. Replace the access panel.
- 9.** Replace the thermostat. See Operation and Maintenance Manual, "Cooling System Water Temperature Regulator - Replace" for the process for replacing the thermostat.
- 10.** Add the coolant solution directly to the radiator. Do not use the coolant overflow reservoir as a filler for the coolant. Refer to Operation and Maintenance Manual, "Capacities - (Refill)". Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

**Note:** Premix the coolant solution before filling the cooling system. The coolant solution should contain 50 percent coolant and 50 percent distilled water.

**Note:** Add the coolant solution at a maximum rate of five liters per minute. This will reduce the chance of trapping air inside the engine block. A large amount of trapped air can cause localized heating to occur upon start-up. Localized heating may result in engine damage, which may lead to failure of the engine.

- 11.** Start the engine. Run the engine without the radiator cap until the thermostat opens and the coolant level stabilizes. If necessary, add coolant.

**Note:** The sight gauge for the coolant level is located on the left side of the radiator.

- 12.** Check the coolant level in the sight gauge on the radiator. Maintain the coolant level to the top of the sight gauge with the radiator in the LOWERED position.

- 13.** Stop the engine. Inspect the radiator cap and the gasket. Replace the cap if the cap or the gasket is damaged. Install the radiator cap.

- 14.** Pull the radiator guard downward.

- 15.** Close the engine access door.

i02417747

g01210063

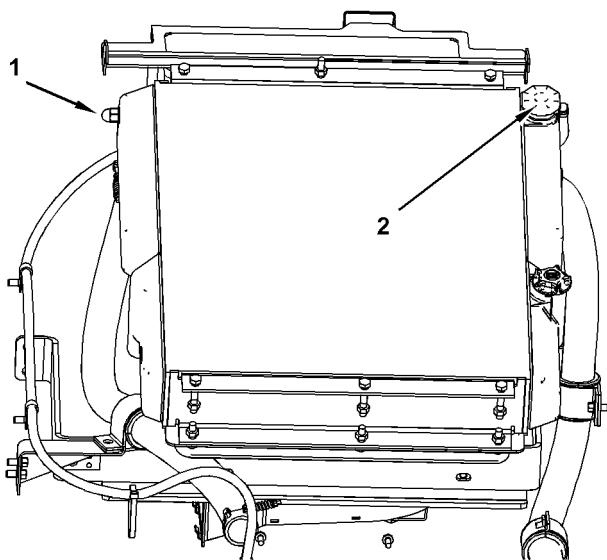


Illustration 127

- (1) Sight gauge  
(2) Radiator cap

**Note:** The radiator cap is located on the right side of the radiator.

- 3.** Slowly loosen the radiator cap in order to relieve system pressure. Remove the radiator cap.

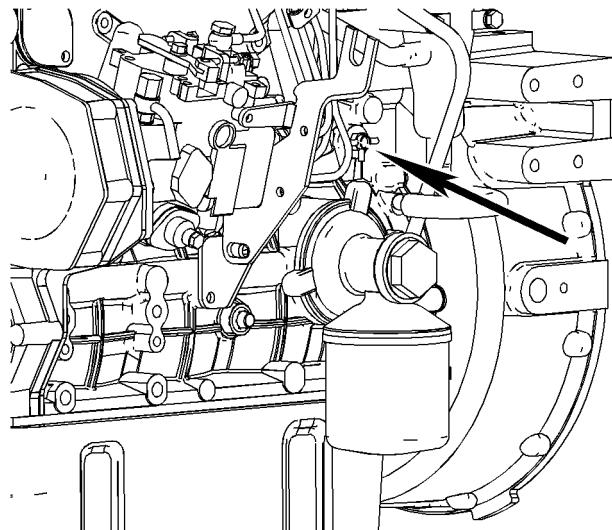


Illustration 128

g01279512

Coolant drain

- 4.** If necessary, drain enough coolant from the radiator in order to allow the addition of the coolant additive.
- 5.** Add 0.17 L (0.18 qt) of cooling system additive.

6. Inspect the radiator cap and the gasket. If the cap or the gasket is damaged, replace the cap. Install the radiator cap.

**Note:** The sight gauge for the coolant is located on the left side of the radiator on machines that are equipped with the 3044 engine.

7. Check the coolant level in the sight gauge on the radiator. Maintain the coolant level to the top of the sight gauge with the radiator in the LOWERED position.
8. Add the extender directly to the radiator. Do not use the coolant overflow reservoir as a filler for the extender.
9. Tilt the radiator guard downward.
10. Close the engine access door.

For additional information on the addition of extender, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

i02664591

## Cooling System Coolant Sample (Level 1) - Obtain

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

### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contamination may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

**Note: Level 1 results may indicate a need for Level 2 Analysis.**

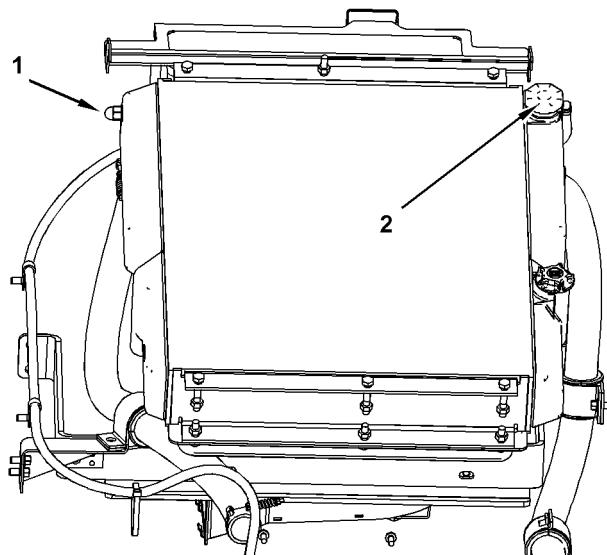


Illustration 129

g01210063

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

### 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.**

Obtain the sample of the coolant from the radiator. When the system is cool, slowly remove the radiator cap (2).

**Note:** Do not take the sample from the Coolant Overflow Reservoir.

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:

- Keep the unused sampling bottles stored in plastic bags.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.

## Maintenance Section

## Cooling System Coolant Sample (Level 2) - Obtain

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Use a designated pump to collect the sample in order to avoid contamination.
- Obtain coolant samples directly from the coolant tank. You should not obtain the samples from any other location.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- 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.

i02664598

## Cooling System Coolant Sample (Level 2) - Obtain

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

### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contamination may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

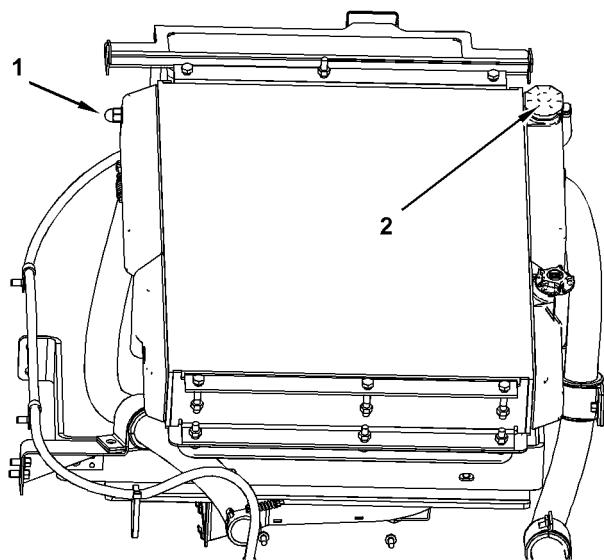


Illustration 130

g01210063

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

### 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.**

Obtain the sample of the coolant from the radiator. When the system is cool, slowly remove the radiator cap (2).

**Note:** Do not take the sample from the Coolant Overflow Reservoir.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Refer to Operation and Maintenance Manual, "Cooling System Coolant Sample (Level 1) - Obtain" for the guidelines for proper sampling of the coolant.

Submit the sample for Level 2 analysis.

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

i02417701

## Cooling System Level - Check

**SMCS Code:** 1350-040-HX; 1350-535-FLV;  
1382-070; 1382-510

### WARNING

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

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator guard upward.

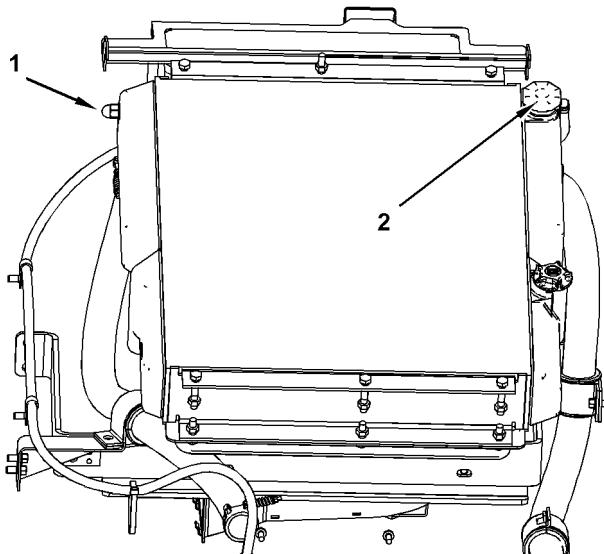


Illustration 131

g01210063

3. Check the coolant level in the sight gauge (1) on the radiator. Maintain the coolant level to the top of the sight gauge with the radiator in the LOWERED position. If you need to add coolant, add the coolant directly to the radiator. Remove the radiator cap (2) slowly in order to relieve system pressure.

**Note:** The radiator cap is located on the right side of the radiator. Inspect the cooling system hoses for any leaks, cracks, or signs of deterioration. Replace any damaged hoses.

4. Inspect the radiator cap and the gasket. Replace the cap if the cap or the gasket is damaged. Install the radiator cap.

5. Tilt the radiator guard downward.

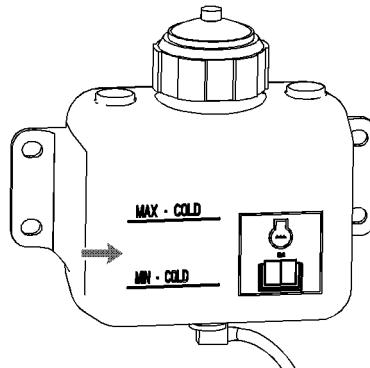


Illustration 132

g01018341

6. The coolant overflow reservoir is located on the rear door. Maintain the coolant level in the coolant overflow reservoir between the "MIN" and "MAX" lines.
7. Close the engine access door.

i03880044

## Cooling System Water Temperature Regulator - Replace

**SMCS Code:** 1355-510; 1393-010

Replace the thermostat on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system. Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

The thermostat should be replaced after the cooling system has been cleaned. Replace the thermostat while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

Caterpillar engines incorporate a shunt design cooling system. It is mandatory to always operate the engine with a thermostat.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Drain the coolant from the machine. See Operation and Maintenance Manual, "Cooling System Coolant (ELC) - Change" for the procedure to drain the cooling system.

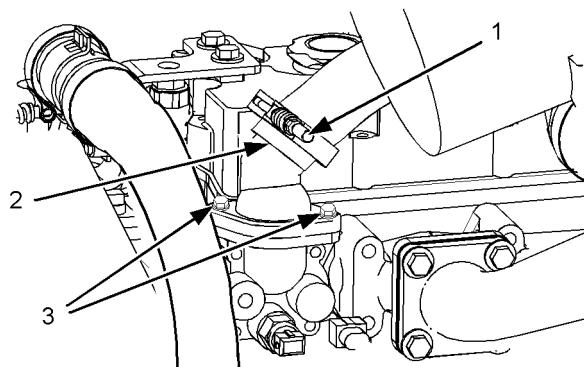


Illustration 133

g01018412

C2.2

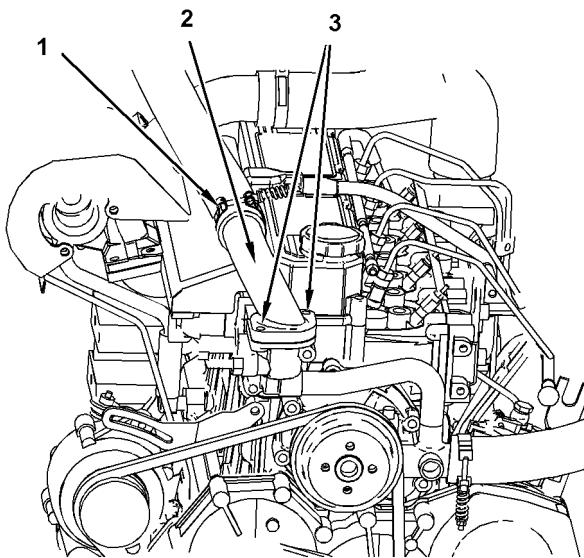


Illustration 134

g01210045

C3.4

3. Loosen the hose clamp (1) and remove the hose from the thermostat housing assembly (2).
4. Remove the two bolts (3) from the thermostat housing assembly. Remove the thermostat housing assembly.
5. Remove the seal and the thermostat from the thermostat housing assembly.
6. Install a new thermostat and a new seal. Install the thermostat housing assembly on the engine cylinder head.
7. Install the hose. Tighten the hose clamp.

8. Refill the cooling system. Refer to Operation and Maintenance Manual, "Capacities - (Refill)". Refer to Operation and Maintenance Manual, "Cooling System Coolant (ELC) - Change" for information about refilling the cooling system. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations" for coolant information.

9. Close the engine access door.

i02417909

## Engine Air Filter Primary Element - Clean/Replace

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

### NOTICE

Never service the air cleaner when the engine is running, to avoid engine damage.

### NOTICE

Caterpillar recommends certified air filter cleaning services that are available at Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

Service the air filter elements when the alert indicator for air filter restriction lights. Refer to Operation and Maintenance Manual, "Alert Indicators" for information about the indicator.

## Clean

**The primary filter element can be used up to three times if the element is properly cleaned and if the element is properly inspected.** When the primary filter element is cleaned, check for rips or tears in the filter material. The primary filter element should be replaced at least one time per year. This replacement should be performed regardless of the number of cleanings.

1. Open the engine access door.
2. The air filter housing is located on the right side of the engine compartment.

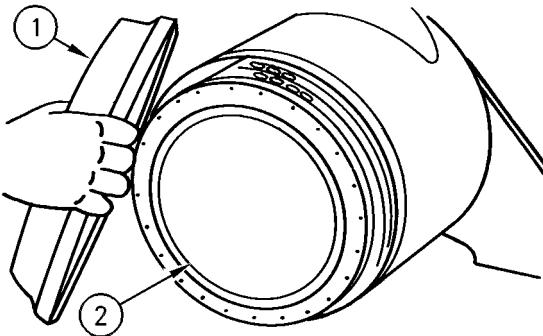


Illustration 135

g00101864

3. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
4. Remove the primary filter element (2).
5. If it is appropriate, clean the primary filter element. Use air pressure to clean the primary filter elements. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

**Note:** When the primary filter elements are cleaned, always begin with the inside in order to force dirt particles toward the 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 filter element.

6. Inspect the cleaned, 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.

**Note:** 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.

7. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
8. Install the primary filter element into the filter housing.
9. Install the cover for the filter housing.

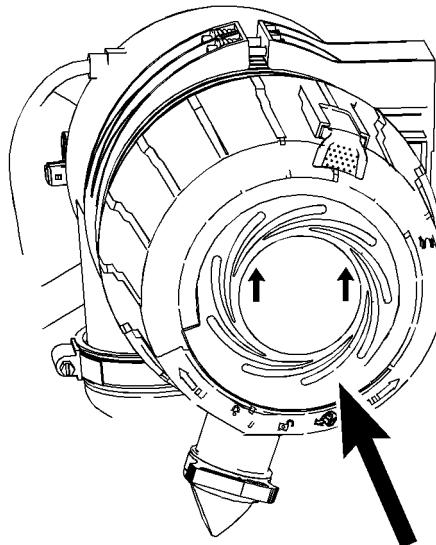


Illustration 136

g01276795

10. Rotate the cover clockwise and latch the cover.

**Note:** Make sure that the cover is properly positioned. The arrows on the air filter cover should point upward when the cover is in the locked position.

11. Close the engine access door.
12. Start the engine. The alert indicator for air filter restriction should turn off. If the alert indicator continues to light, replace the secondary air filter. Refer to Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".

## Replace

The primary filter element should be replaced at least one time per year. **You can clean the primary filter up to three times.**

1. Open the engine access door.
2. The air filter housing is located on the right side of the engine compartment.

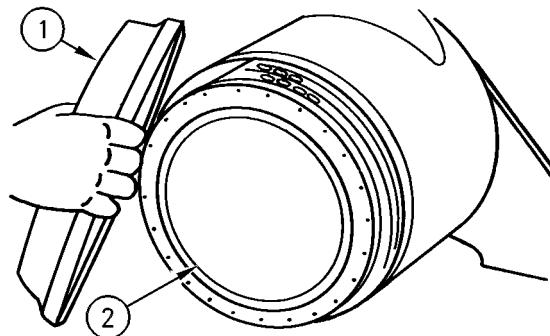


Illustration 137

g00101864

3. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
4. Remove the primary filter element (2).
5. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
6. Install a new primary filter element into the filter housing.
7. Install the cover for the filter housing.

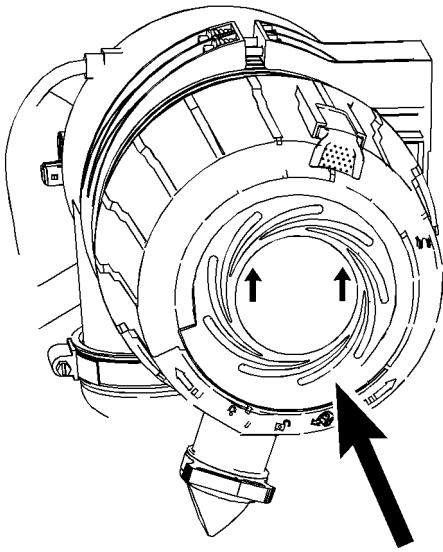


Illustration 138

g01276795

8. Rotate the cover clockwise and latch the cover.

**Note:** Make sure that the cover is properly positioned. The arrows on the air filter cover should point upward when the cover is in the locked position.

9. Close the engine access door.

10. Start the engine. The alert indicator for air filter restriction should turn off. If the alert indicator continues to light, replace the secondary air filter. Refer to Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".

i02417939

## Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

### NOTICE

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

When the primary filter element is cleaned for the third time, the secondary filter element should be replaced.

The secondary filter element should also be replaced if the restricted Air Filter indicator comes on after the installation of a clean primary filter element or if the exhaust smoke is still black.

1. Open the engine access door.
2. The air filter housing is located on the right side of the engine compartment.

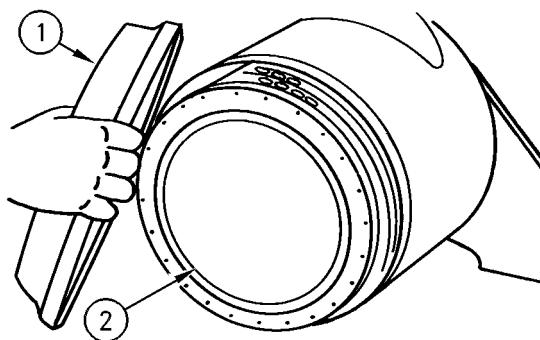


Illustration 139

g00101864

3. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
4. Remove the primary filter element (2).

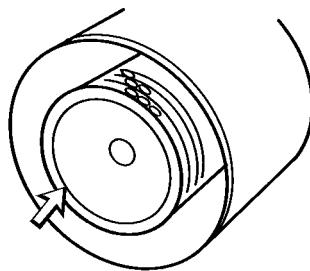


Illustration 140

g00038606

5. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
6. Remove the secondary filter element.
7. Cover the air inlet opening.
8. Clean the inside of the air cleaner housing with a damp cloth, if necessary. Do not use compressed air to clean the housing.
9. Uncover the air inlet opening.
10. Install a new secondary element.
11. Install the primary element.
12. Install the cover for the filter housing.

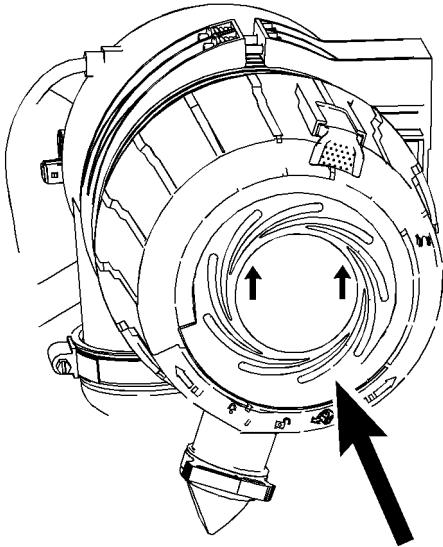


Illustration 141

g01276795

13. Rotate the cover clockwise and latch the cover.

**Note:** Make sure that the cover is properly positioned. The arrows on the air filter cover should point upward when the cover is in the locked position.

14. Close the engine access door.

i02834984

## Engine Compartment - Inspect/Clean

**SMCS Code:** 1000-040-CPA; 1000-070-CPA

Inspect the engine compartment for dirt buildup or debris. Remove any dirt or debris from the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

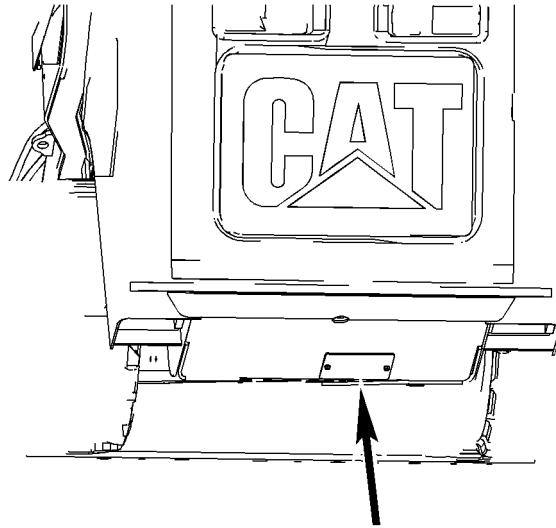


Illustration 142

g01264593

2. Remove any debris or dirt from the engine compartment. If necessary, remove the access panel in order to clean out the engine compartment.

**Note:** Use care when you clean the engine compartment. Damage to the machine may occur.

3. Install the access panel. Close the engine access door.

i02417992

## Engine Oil Level - Check

**SMCS Code:** 1348-535-FLV

### NOTICE

Do not overfill the crankcase. Engine damage can result.

1. Stop the engine and allow the oil to drain back into the oil pan.

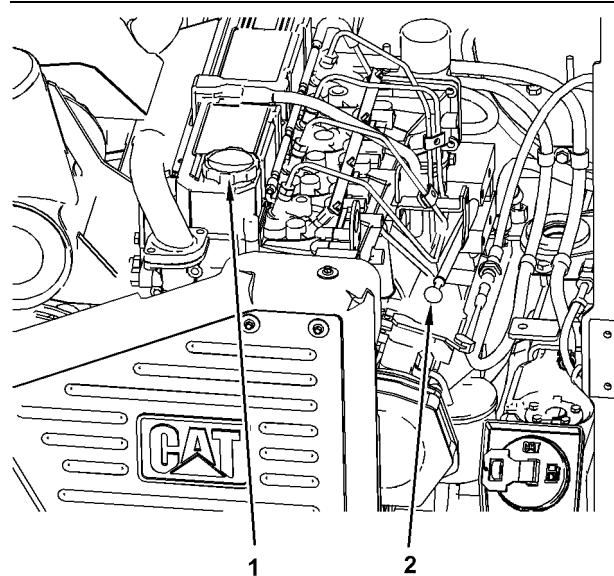


Illustration 143

g01209758

2. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

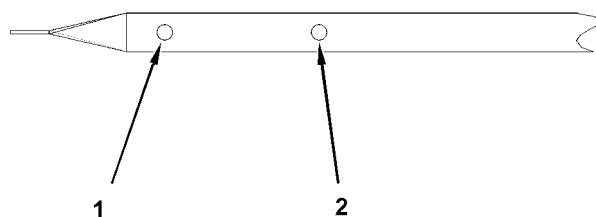


Illustration 144

g01277108

3. Maintain the oil level between the "ADD" (1) mark and the "FULL" (2) mark on the dipstick.

4. If oil is necessary, tilt the radiator upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".
5. Remove the oil filler cap (1) and add oil.
6. Clean the oil filler cap and install the oil filler cap.
7. Tilt the radiator downward.
8. Close the engine access door.

i02743337

## Engine Oil and Filter - Change

**SMCS Code:** 1308-510; 1348-044

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

The normal oil change interval for the machine is Every 500 Service Hours or every year when the following conditions are met:

- Use an engine oil in the Operation and Maintenance Manual, "Lubricant Viscosities".
- Caterpillar filters are used.
- The altitude does not exceed 2300 m (7545 ft).
- Sulfur content in the fuel is between 0.05% and 0.50%.

An oil change interval of Every 250 Service Hours or every six months is required when the following conditions occur:

- Use an engine oil in the Operation and Maintenance Manual, "Lubricant Viscosities".
- The altitude exceeds 2300 m (7545 ft).
- Sulfur content in the fuel is between 0.50% and 1.00%.

An oil change interval of Every 125 Service Hours is required when the following condition occurs:

- Sulfur content in the fuel is above 1.00%.

Refer to the results of the S·O·S oil analysis in order to determine if the oil change interval should be decreased. Consult your Caterpillar Dealer for detailed information regarding the optimum oil change interval.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

**Note:** The crankcase drain is located on the right side of the oil pan.

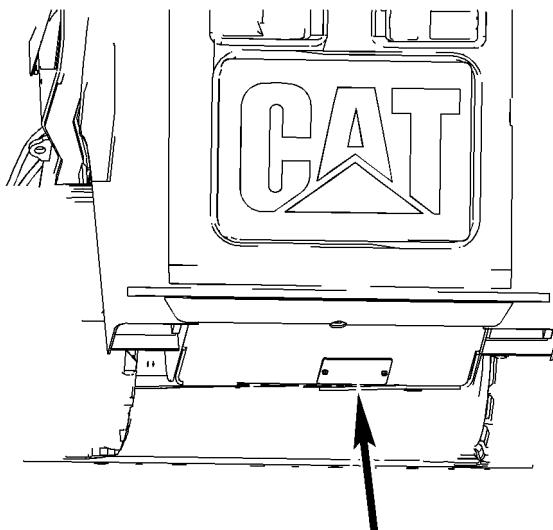


Illustration 145

g01264593

3. Remove the access panel that is located below the drain plug. Remove the drain plug and allow the oil to drain into a suitable container. Install the drain plug and install the access panel.

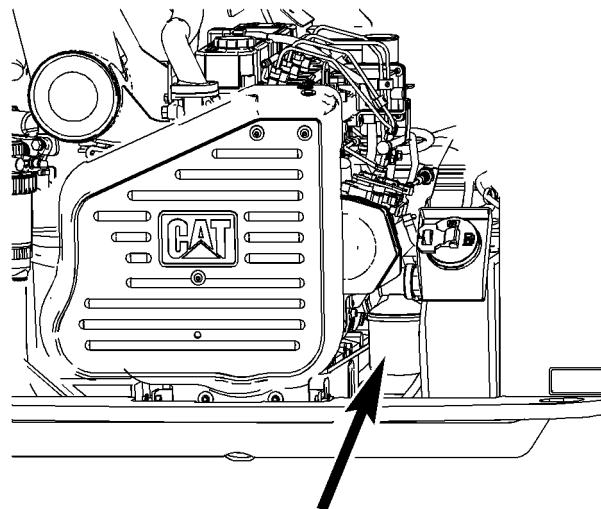


Illustration 146

g01209695

4. Remove the filter element with a 187-2718 Filter Wrench. Refer to Operation and Maintenance Manual, "Oil Filter - Inspect" in order to inspect the used filter for debris.
5. Apply a thin film of clean engine oil to the sealing surface of the new filter element.
6. Install a new engine oil filter hand tight until the seal of the engine oil filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

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

7. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

**Note:** You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

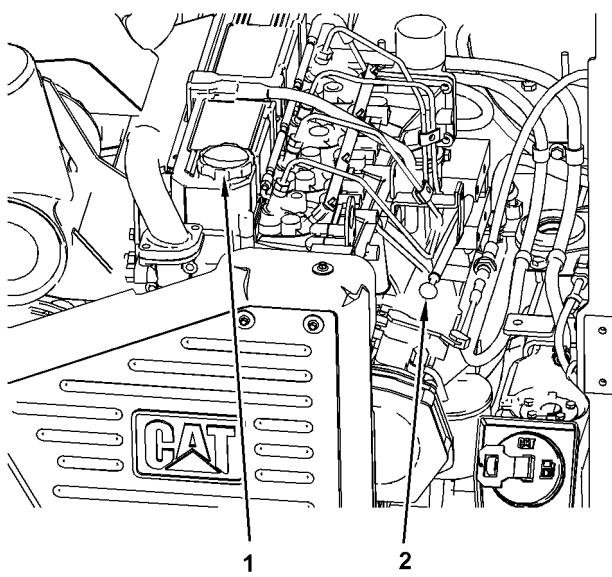


Illustration 147

g01209758

- (1) Oil Filler Cap  
(2) Dipstick

8. Remove the oil filler cap (1). Fill the crankcase with new oil. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Refill Capacities" for information about the oil. Clean the oil filler plug and install the oil filler plug.
9. Start the engine and allow the oil to warm. Check for leaks.

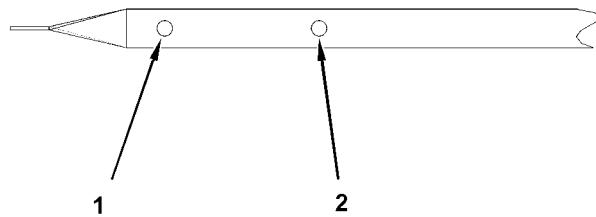


Illustration 148

g01277108

- (1) Oil level add mark  
(2) Full mark

10. Stop the engine and allow the oil to drain back into the oil pan. Fill the crankcase to the "FULL" mark (2) on the dipstick. **Do not exceed the "FULL" mark on the dipstick.** Add oil or drain oil if it is necessary.

11. Tilt the radiator downward.

12. Close the engine access door.

i01020861

## Engine Valve Lash - Check

**SMCS Code:** 1105-025

Refer to the Service Manual for the complete adjustment procedure for the engine valve lash.

A qualified mechanic should adjust the engine valve lash and the fuel injector timing because special tools and training are required.

i02808037

## Equipment Lowering Control Valve - Check

**SMCS Code:** 5147-MA

### WARNING

**Personal injury or death can result from a work tool falling.**

**Keep personnel away from the front of the machine when lowering the work tool.**

Before lowering any equipment, clear the area around the equipment of all personnel.

1. Lower arms to the fully lowered position. Turn the keyswitch to the OFF position.
2. Slide the seat forward. Slide the left hand armrest forward.

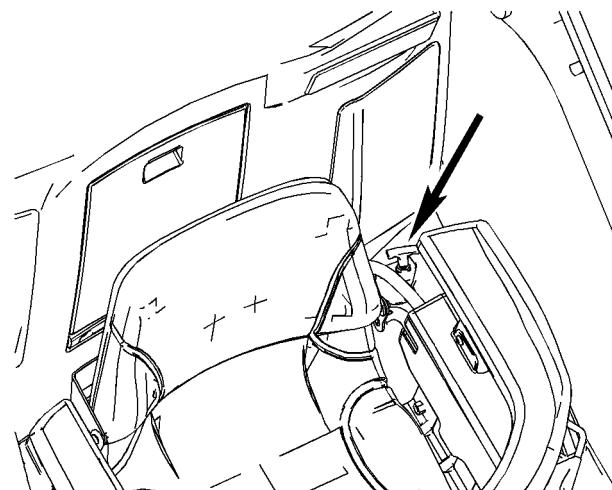


Illustration 149

g01400888

3. Pull up on the red handle in order to fully actuate the valve.
4. Push the red handle to the original position. Ensure that the handle is fully seated.

i02919737

## Final Drive Oil - Change

**SMCS Code:** 4050-044-OC

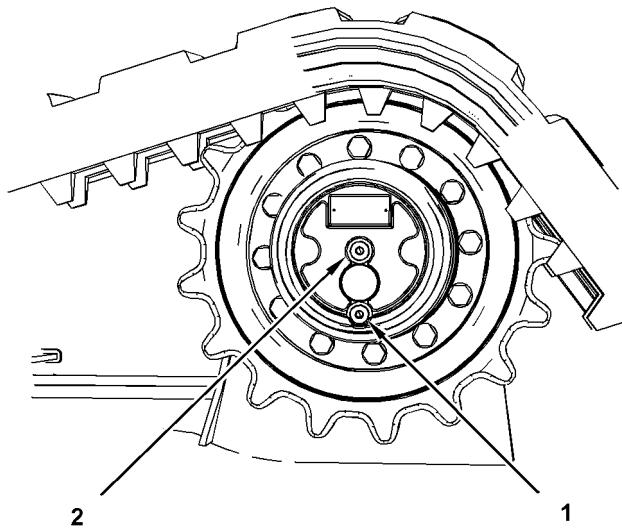


Illustration 150

g01451295

- (1) Oil fill/drain plug  
(2) Oil check plug

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

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

2. Use an 8 mm (5/16 inch) allen wrench. Remove the oil plugs (1) and (2). Allow the oil to drain into a suitable container.
3. Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Caterpillar dealer.

**Note:** Dispose of drained fluids according to local regulations.

4. Clean the plugs and inspect the plugs. Replace a worn plug or a damaged plug.
5. Position the final drive so that the oil fill/drain plug (1) is at the top.

6. Add oil through the opening of the oil fill/drain plug (1) that is now at the top.
7. Fill the final drive to the bottom of the opening for the oil check plug (2). Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".
8. Install the two oil plugs. Tighten the oil plugs to a torque of  $27 \pm 1 \text{ N}\cdot\text{m}$  ( $20 \pm 0.7 \text{ lb ft}$ ).
9. Perform Step 1 to Step 8 on the other final drive.
10. Completely remove any oil that has spilled.
11. Start the engine and allow the final drives to operate through several cycles.
12. Stop the engine.
13. Check the oil level.
14. Maintain the oil level to the bottom of the opening for the fill/drain plug (2).

i02919749

## Final Drive Oil Level - Check

**SMCS Code:** 4050-535-FLV

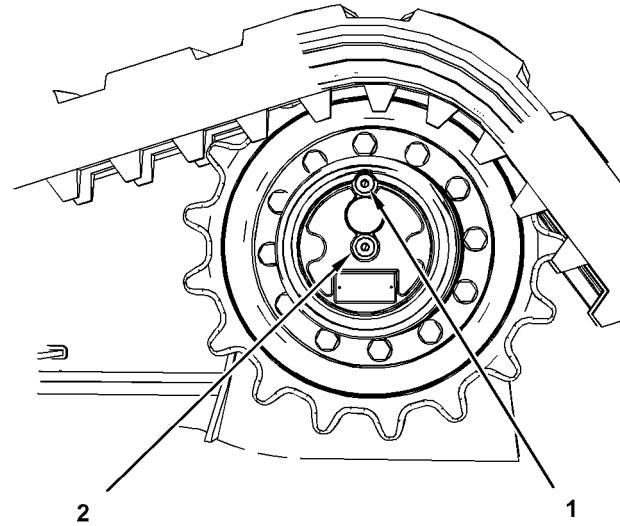


Illustration 151

g01457009

- (1) Oil fill/drain plug  
(2) Oil check plug

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

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

2. Use an 8 mm (5/16 inch) allen wrench. Remove the oil check plug (2).
3. Check the oil level. The oil should be near the bottom of the opening for the oil check plug (2).
4. Add oil through the opening for the oil fill/drain plug (1), if necessary.

**Note:** Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. This may contaminate the final drive.

5. Clean the oil plugs.
6. Install the oil plugs. Tighten the oil plugs to a torque of  $27 \pm 1 \text{ N}\cdot\text{m}$  ( $20 \pm 0.7 \text{ lb ft}$ ).
7. Repeat the procedure for the other final drive.

i00916186

## Fuel Injection Timing - Check

**SMCS Code:** 1251-531

**Note:** The correct fuel timing specification is found on the Engine Information Plate. Fuel timing specifications may vary for different engine applications and/or for different power ratings.

A qualified mechanic should adjust the fuel injection timing because special tools and training are required.

Refer to the Service Manual for the complete adjustment procedure for the fuel injection timing. Refer to your Caterpillar dealer for the complete adjustment procedure for the fuel injection timing.

i02520136

## Fuel System Primary Filter (Water Separator) - Drain

**SMCS Code:** 1263-543

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

The fuel system water separator is located in the left side of the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

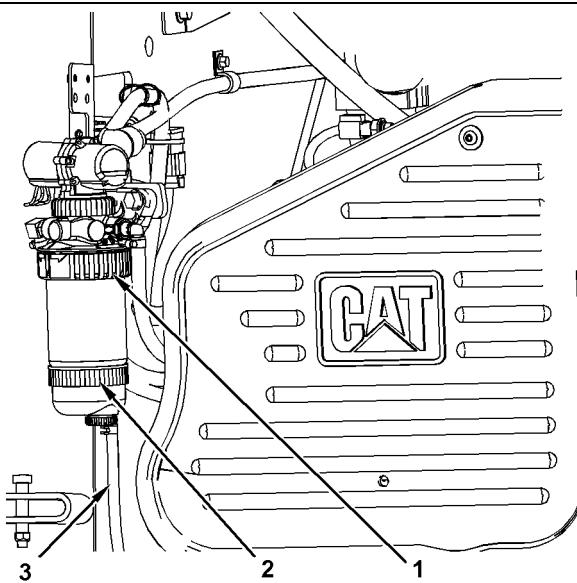


Illustration 152

g01264527

The Fuel Filter/Water Separator is located on the left side of the engine compartment.

2. Insert the drain hose (3) into a suitable container. Loosen the drain valve on the bottom of the water separator.

3. Tighten the drain valve by hand. Do not tighten the drain valve with a tool. Damage to the valve or to the seals may occur.
4. Close the engine access door.
5. Dispose of the water and sediment according to local regulations.

i02520124

## Fuel System Primary Filter (Water Separator) Element - Replace

**SMCS Code:** 1260-510-FQ; 1263-510-FQ

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

**Note:** This unit has a dual purpose. The element serves as a water separator and a fuel filter.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

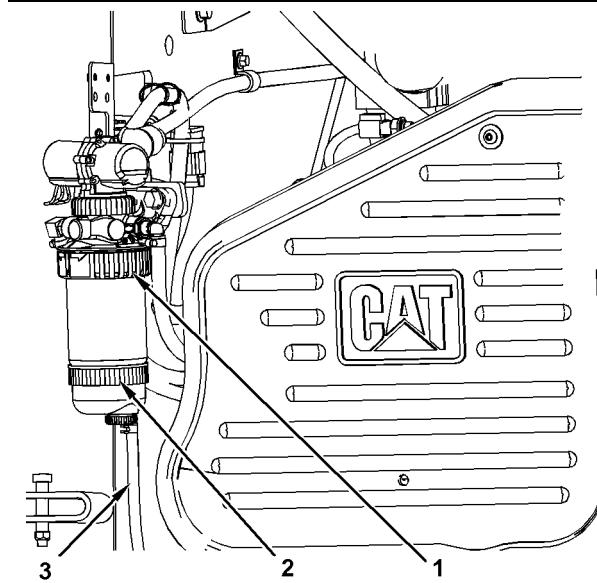


Illustration 153

g01264527

The Fuel Filter/Water Separator is located on the left side of the engine compartment.

2. Open the drain on the fuel filter/water separator (3). Allow the water and fuel to drain into a suitable container.
3. Close the drain valve by hand. Do not tighten the drain valve with a tool. Damage to the valve or to the seals may occur.
4. Support the fuel filter/water separator and rotate the locking ring (1) counterclockwise. Remove the fuel filter/water separator.
5. Rotate the locking ring (2) counterclockwise. Remove the bowl assembly.
6. Clean the mounting base for the fuel filter/water separator.
7. Clean the bowl assembly for the fuel/water separator.
8. Install the bowl assembly onto the new fuel/water separator and rotate the locking ring clockwise.
9. Install the new fuel filter/water separator onto the mounting base. Rotate the locking ring clockwise in order to fasten the fuel filter/water separator to the mounting base.
10. Prime the fuel system in order to fill the fuel filter/water separator with fuel. Refer to Operation and Maintenance Manual, "Fuel System Priming Pump - Operate".
11. Close the engine access door.

i04728809

## Fuel System Priming Pump - Operate

**SMCS Code:** 1258-548

This machine is equipped with a fuel transfer pump that is electric. Two examples that may cause the fuel system to lose prime are listed here:

- The machine runs out of fuel.
- The Fuel System Filter/Water Separator Element is replaced.

Follow the steps below in order to prime the fuel system.

1. Ensure that the engine start switch is in the OFF position. Turn the engine start switch to the ON position.

**Note:** Do not start the engine. This operation only starts the fuel pump. The pump will run approximately 1 minute.

2. The Primary Fuel Filter is located in the left side of the engine compartment.
3. Examine the clear bowl. The bowl must contain only fuel. If the bowl is not full of fuel, repeat Steps 1 and 2.
4. Attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate the engine at low idle until the engine runs smoothly.

**Note:** If the engine fails to start or if the engine continues to misfire or smoke, stop the engine and repeat the procedure. If the problem persists after repeating the procedure, consult your Cat dealer.

**Note:** Do not open any high pressure lines in order to bleed air from the fuel system.

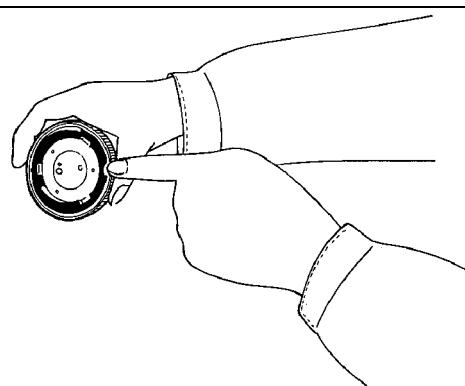


Illustration 154

g00104238

2. Inspect the cap. Replace the cap if the cap is damaged.
3. Wash the fuel cap in a clean, nonflammable solvent and dry the fuel cap.
4. Put a light coating of fuel on the cap gasket.
5. Install the fuel cap.

i02418544

## Fuel Tank Water and Sediment - Drain

**SMCS Code:** 1273-543-M&S

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

**Note:** Drain the water and the sediment from the fuel tank when the tank is almost empty.

1. Slowly remove the fuel tank cap in order to allow the tank to vent while you drain the tank.

i01819309

## Fuel Tank Cap - Clean

**SMCS Code:** 1273-070-Z2

1. Remove the fuel cap.

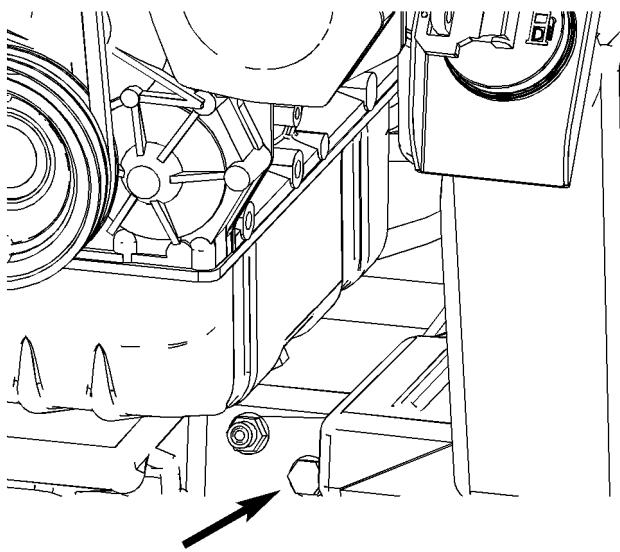


Illustration 155

g01209601

2. The fuel tank drain plug is located on the bottom of the fuel tank in the engine compartment on the right side of the machine. Remove the plug.
3. Allow the water and the sediment to drain into a suitable container.
4. Install the fuel tank drain plug.

**Note:** Apply 5P-3413 Pipe Sealant to the threads on the drain plug.

5. Install the fuel tank cap.

i02417559

## Fuses - Replace

**SMCS Code:** 1417-510; 1417; 7528

### Fuses

**Fuses** – Fuses protect the electrical system from damage that is caused by overloaded circuits. Replace the fuse if the element separates. If the element of a new fuse separates, check the circuit. Repair the circuit, if necessary.

#### NOTICE

Replace the fuses with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to replace fuses frequently, an electrical problem may exist. Contact your Caterpillar dealer

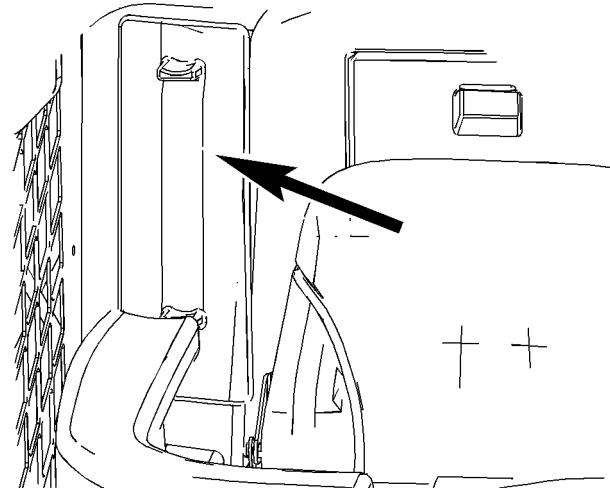


Illustration 156

g01287527

The fuse panel is located behind the seat on the right side.

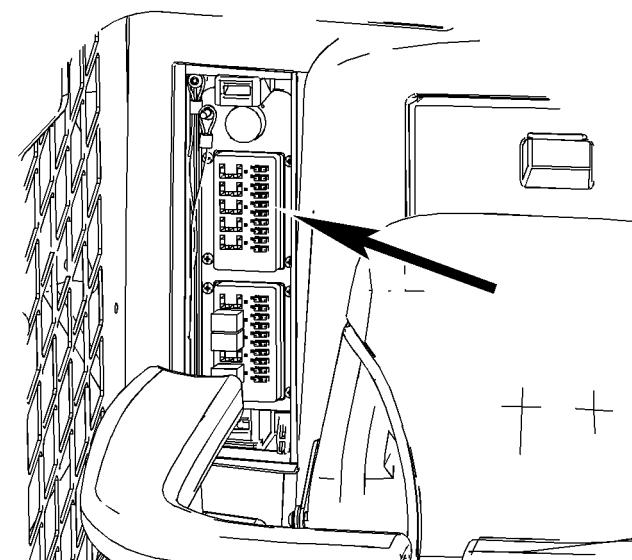


Illustration 157

g01210555

Remove the cover in order to access the fuse panel.

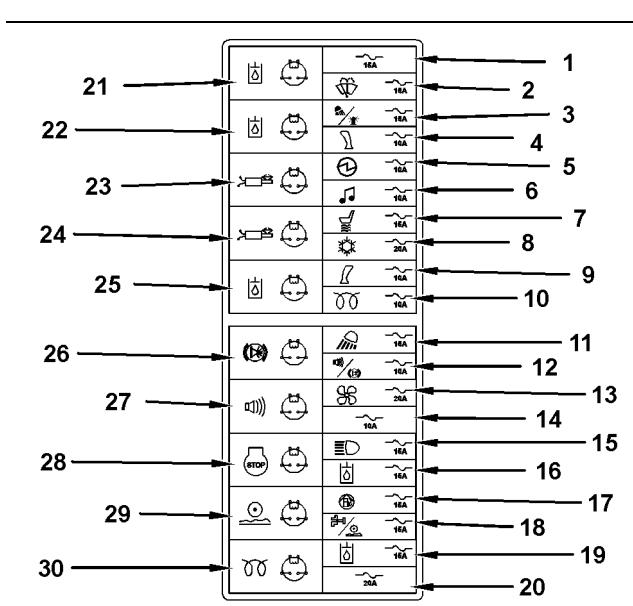


Illustration 158

g01262480

The following is a list of the fuses in the panel:



1 – Spare



2 – Wiper



3 – Front Work Lights and Beacon



4 – Right Joystick



5 – 12 volt power socket



6 – Radio



7 – Solenoid for the Compressor



8 – Air Conditioner



9 – Left Joystick



10 – Cold Start



11 – Rear Work Lights



12 – Backup Alarm and Brake Lights



13 – HVAC Blower Fan



14 – Spare



15 – Headlights



16 – Hydraulic Solenoid



17 – Fuel Shutoff and Secondary Engine Shutoff



18 – Hydraulic Quick Coupler



19 – Hydraulic Solenoid



20 – Spare

## Solenoids



21 – Auxiliary Electrical Control "AUX6(C1)"

**22** – Auxiliary Electrical Control “AUX5(C2)”**23** – Secondary Auxiliary Electrical Control “(C+)”**24** – Secondary Auxiliary Electrical Control “(C-)”**25** – Auxiliary Electrical Control “AUX7”**26** – Stop Lamp**27** – Backup Alarm**28** – Fuel Shutoff**29** – Self-Level and Ride Control**30** – Glow Plugs

## Main Fuse

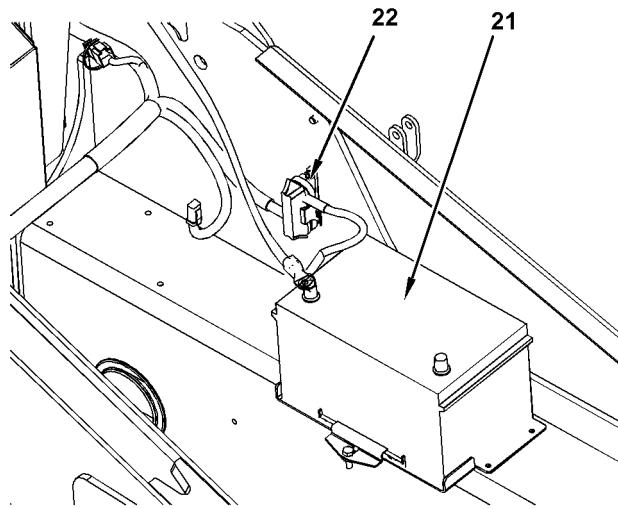


Illustration 159

g01279310

(21) Battery  
(22) Main fuse

The main fuse (22) is located behind the battery (21) on the left side of the machine under the cab. This is a 105 amp fuse. You must disconnect the negative battery cable before you replace this fuse.

## Fuse panel behind cab

There is an additional fuse panel behind the cab on the right side of the machine.

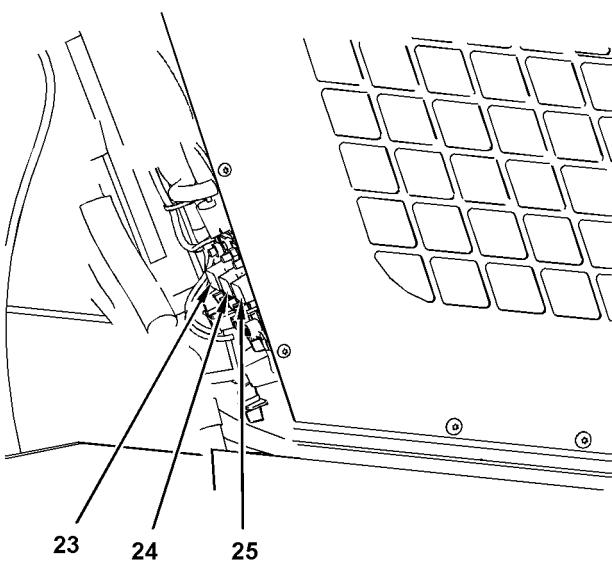


Illustration 160

g01279419

(23) First Pair  
(24) Second Pair  
(25) Third Pair

This panel has 6 fuses. In order to change these fuses, push up on the locking tab on the fuse cover. Pull the cover away from the back of the cab.

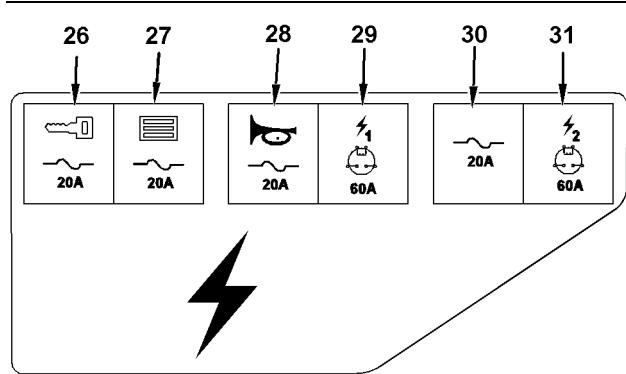


Illustration 161

g01279483

**26** – Ignition switch**27** – ECM**28** – Horn**29** – Main power relay 1**30** – Miscellaneous cab accessories**31** – Main power relay 2

I03741203

## Hydraulic System Oil - Change

SMCS Code: 5095-044

### Selection of the Oil Change Interval

Your machine may be able to use a 4000 hour interval for the hydraulic oil. The hydraulic oil is in the system that is not integral to the service brakes, the clutches, the final drives, or the differentials. The standard change interval is 2000 hours. The oil should be monitored during intervals of 500 hours. The extended 4000 hour interval can be used if the following criteria are met.

### HYDO Advanced 10

Cat HYDO Advanced 10 is the preferred oil for use in most Caterpillar machine hydraulic and hydrostatic transmission systems when ambient temperature is between  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) and  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ). Cat HYDO Advanced 10 has an SAE viscosity grade of 10W. **Cat HYDO Advanced 10 has a 50% increase in the standard oil drain interval** (up to 3000 hours) for machine hydraulic systems over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual. 6000 hour oil drain intervals are possible when using S-O-S Services oil analysis. When you switch to Cat HYDO Advanced 10, cross contamination with the previous oil should be kept to less than 10%. Consult your Cat dealer for details about the benefits from the improved performance designed into Cat HYDO Advanced 10.

### Oil Filters

Caterpillar oil filters are recommended. The interval for changing the oil filter should be 500 hours.

### Oil

The 6000 hour interval for changing the oil is specific to HYDO Advance 10.

The 4000 hour interval for changing the oil is for the following oil types.

- Caterpillar Hydraulic Oil (HYDO)
- Caterpillar Transmission and Drive Train Oil (TDTO)
- Caterpillar TDTO-TMS
- Caterpillar Diesel Engine Oil

- Caterpillar Biodegradable Hydraulic Oils (HEES)
- Caterpillar Multipurpose Tractor Oil (MTO)
- Heavy-duty diesel engine oils with a minimum zinc content of 900 ppm

If Caterpillar oils cannot be used, use heavy-duty oils with the following classification: Caterpillar ECF-1, API CG-4, API CF, and TO-4. These oils must have a minimum zinc additive of 0.09 percent (900 ppm).

**Note:** Industrial hydraulic oils are not recommended in Caterpillar hydraulic systems.

## Monitoring the Condition of the Oil

The oil should be monitored during intervals of 500 hours. Caterpillar's standard SOS Fluids Analysis or an equivalent oil sampling program should be used.

The current guidelines for cleanliness of the oil should be observed. Refer to "Measured Data".

If an oil sampling program is not available, the standard 2000 oil change interval should be used.

## Measured Data

The following information should be monitored through sampling of the oil:

- Significant changes in wear metals should be monitored. These metals include iron, copper, chromium, lead, aluminum, and tin.
- Significant changes in the following additives should be monitored: zinc, calcium, magnesium, and phosphorus.
- Contaminants should not be present. These contaminants include fuel and antifreeze. Water content should be .5 percent or less.
- The silicon level should not exceed 15 parts per million for new oil. The particle counts should be monitored.
- The recommended level of cleanliness for Caterpillar machines that are operated in the field is ISO 18/15 or cleaner. The cleanliness should be monitored by particle count analysis. The levels of contamination should not exceed the normal by more than two ISO codes. Action should be taken in order to determine the cause of the contamination. The system should be returned to the original levels of contamination.
- There should not be significant changes in sodium, silicon, copper, and potassium.

- The allowable level of oxidation is 40 percent (0.12 Abs units).
- The kinematic viscosity of 100 °C (212 °F) oil should not exceed a change of more than 2 cSt from new oil.

## Procedure for Changing the Hydraulic Oil

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

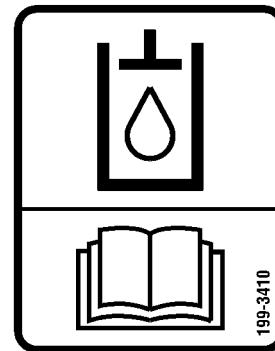


Illustration 162

g00956818

**Note: This film is located near the hydraulic filler cap on machines that are filled with arctic oil.**

Operate the machine for a few minutes in order to warm the hydraulic system oil.

### WARNING

Personal injury or death can result without releasing all of the hydraulic pressure.

Release all the pressure from the hydraulic system before any lines are disconnected.

The machine should be on level ground. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine. Keep the armrest lowered. Turn the engine start switch key to the ON position. Push the parking brake switch. Move all of the joystick controls while you press several times on each side of the auxiliary hydraulic control (if equipped) in order to relieve hydraulic pressure. Move the engine start switch key to the OFF position.

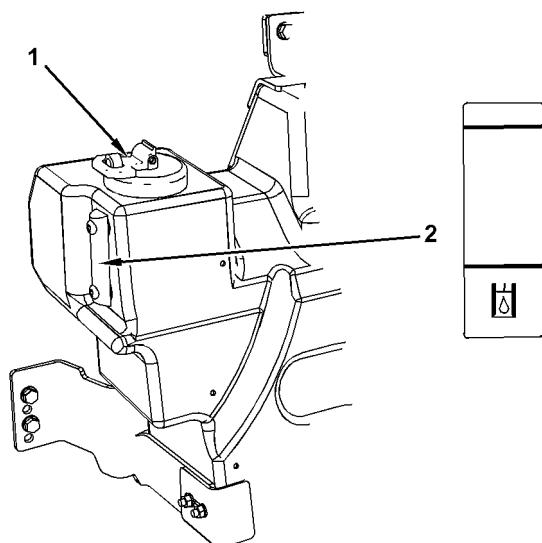


Illustration 163

g01280697

- (1) Hydraulic Tank Filler Cap
- (2) Sight Gauge

#### 1. Remove the hydraulic tank filler cap (1).

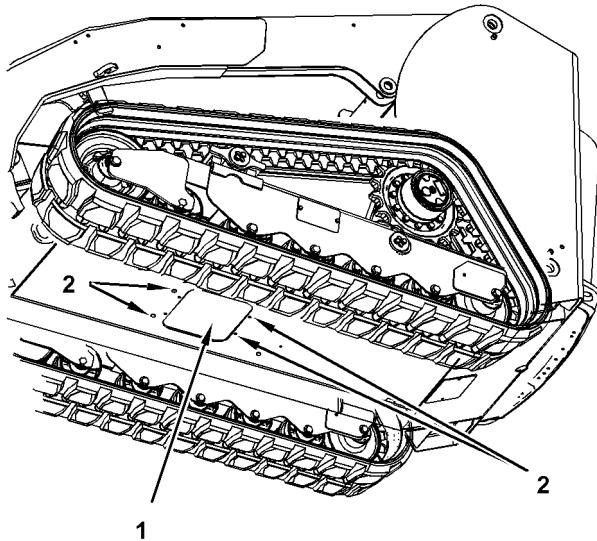


Illustration 164

g01451462

- (1) Access panel
- (2) Retaining bolts

2. Remove the access panel in the belly guard underneath the machine.
3. The hose is located on the right side. Pull the drain hose through the access hole in the belly guard. Remove the plug from the end of the drain hose. Drain the oil into a suitable container.
4. Install the drain plug into the drain hose. Tighten to  $22 \pm 3 \text{ N}\cdot\text{m}$  ( $16 \pm 2 \text{ lb ft}$ ). Pull the drain hose back into the machine.
5. Change the hydraulic system filter. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Filter - Change".
6. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".
7. Maintain the hydraulic oil level approximately in the middle of the sight gauge (2).

Check the oil level with the loader arms in the fully lowered position.

**Note:** The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps.

8. Install the hydraulic tank filler cap.

i02743340

## Hydraulic System Oil Filter - Replace

**SMCS Code:** 5068-510

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

The hydraulic oil filter is located in the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Remove the hydraulic tank filler cap.

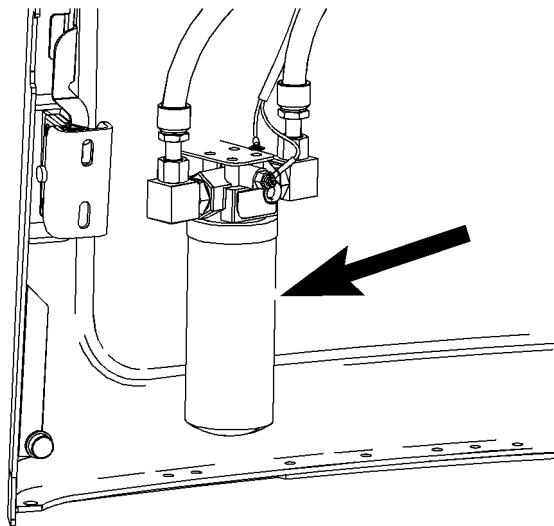


Illustration 165

g01209326

The hydraulic filter is located on the rear door.

3. Remove the filter with a strap type wrench.

**Note:** Place a suitable nonconductive container under the hydraulic oil filter. Use this container in order to catch any oil that may spill from the filter or the filter element mounting base.

4. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.
5. Apply a light coat of oil to the gasket of the new filter element gasket.
6. Install a newfilter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

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

7. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

**Note:** You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

8. Maintain the hydraulic oil level to the middle of the sight gauge. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check". **Do not overfill the hydraulic tank.**
9. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the hydraulic tank filler cap, if necessary. Install the hydraulic tank filler cap.
10. Close the engine access door.

i02418557

## Hydraulic System Oil Level - Check

SMCS Code: 5095-535-FLV

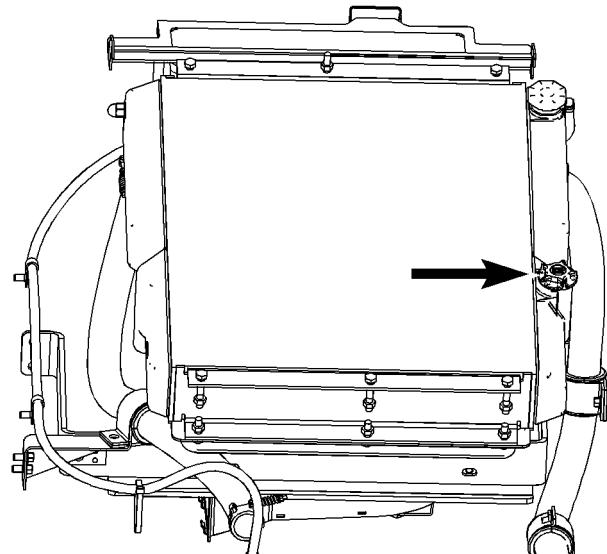


Illustration 166

g01306294

Filler for adding hydraulic oil

## Maintenance Section

## Hydraulic System Oil Sample - Obtain

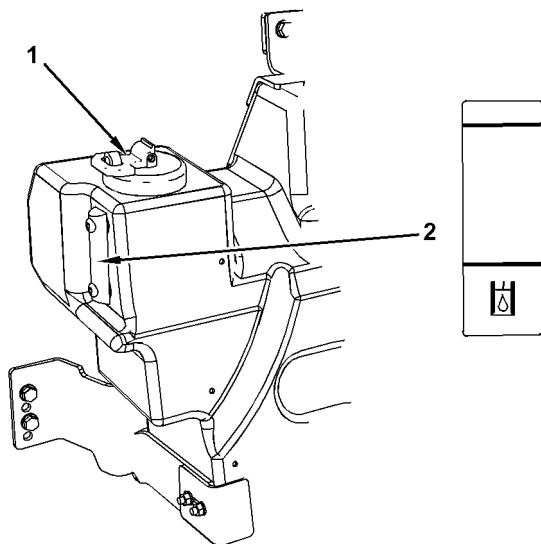


Illustration 167

g01280697

(2) Sight gauge on right side of tank

1. Park the machine on level ground.
2. Lower the work tool to the ground. Turn off the engine.
3. Wait for about five minutes before checking the level of the hydraulic oil.
4. Use the hydraulic oil filler on the radiator in order to top off the hydraulic oil.
5. Maintain the oil level to the middle of the two lines on the sight gauge. **Do not overfill the hydraulic tank.**

i02920120

## Hydraulic System Oil Sample - Obtain

**SMCS Code:** 5050-008; 7542-008

Open the rear access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers" for information about the rear door.

Raise the radiator. Refer to Operation and Maintenance Manual, "Radiator Tilting" for information about the radiator.

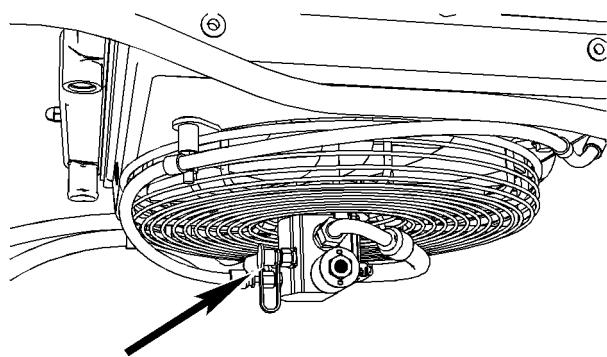


Illustration 168

g01280271

The sampling port for the hydraulic oil is located on the fan motor.

i02557991

## Hydraulic Tank Breather - Replace

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

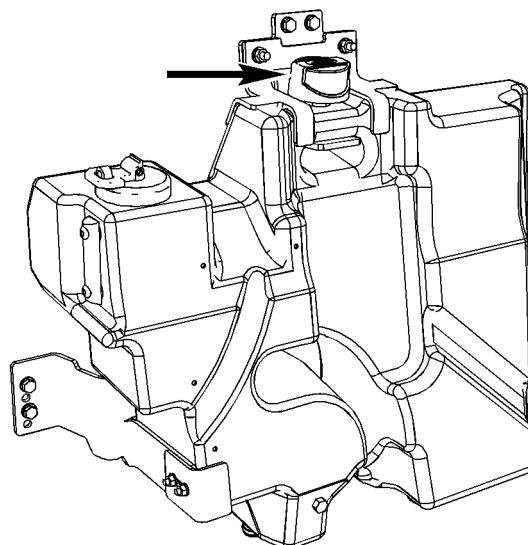


Illustration 169

g01280304

The breather for the hydraulic tank is located on the top of the hydraulic tank.

1. Raise the cab. Refer to Operation and Maintenance Manual, "Cab Tilting" for the procedure to raise the cab.
2. Remove the breather.
3. Install the new breather and tighten to  $20 \pm 3 \text{ N}\cdot\text{m}$  ( $15 \pm 2 \text{ lb ft}$ ).

i02418559

## Lift Arm and Cylinder Linkage - Lubricate

**SMCS Code:** 5102-086-BD; 6107-086-BD

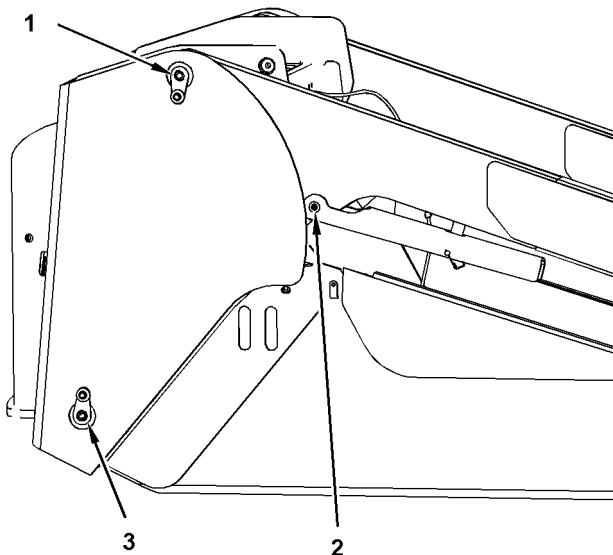


Illustration 170

g01210414

Radial Lift

- (1) Lift Arm Pivot
- (2) Lift Cylinder Rod End
- (3) Head End Fitting

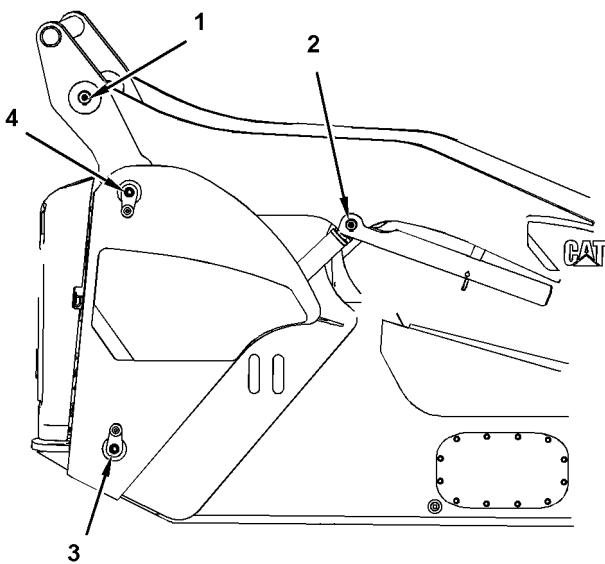


Illustration 171

g01210415

Vertical Lift

- (1) Lift Arm Pivot
- (2) Lift Cylinder Rod End
- (3) Head End Fitting
- (4) Link Arm

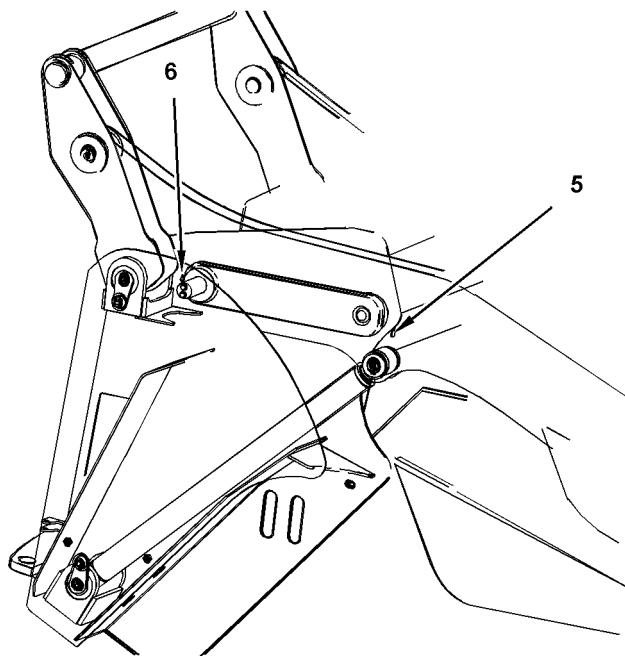


Illustration 172

g01210416

The Link Arm is located behind the loader arm.

- (5) Mounting for Link Pin
- (6) Rear of Link Arm

Apply lubricant to all the grease fittings on one side.

Repeat the process for the opposite side of the machine.

i02919914

## Lower Machine Frame - Clean

**SMCS Code:** 7050-070

1. Tilt the cab upward. Refer to Operation and Maintenance Manual, "Cab Tilting".

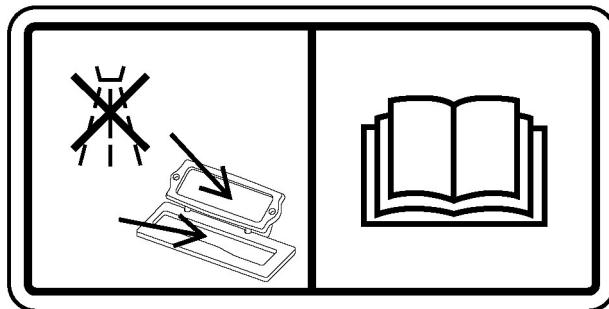


Illustration 173

g01270620

This film is located in the air duct.

**NOTICE**

Do not spray water or cleaning fluids into the ventilation ducts. Cover the opening in order to prevent foreign material or fluid from entering the ventilation ducts.

2. Seal the opening of the ventilation ducts with plastic.

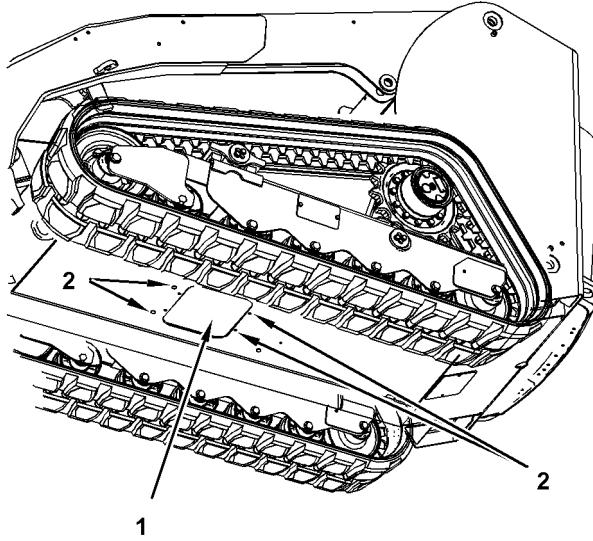


Illustration 174

g01451462

(1) Access panel  
(2) Retaining bolts

3. The access panel (1) is located in the frame underneath the machine.
4. Remove the four retaining bolts (2).
5. Slide the panel forward or slide the panel rearward. Pull the panel downward and remove the access panel from the machine.

6. Remove any debris or dirt from the inside of the frame.
7. Reinstall the access panel.
8. Remove the cover from the ventilation ducts.
9. Tilt the cab downward.

i02106227

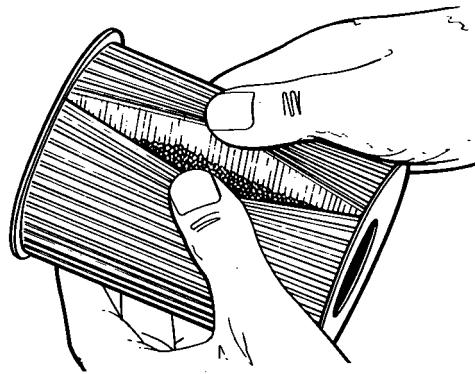
**Oil Filter - Inspect****SMCS Code:** 1308-507; 3067-507; 5068-507**Inspect a Used Filter for Debris**

Illustration 175

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.

i02634143

## Quick Coupler - Clean/Inspect

**SMCS Code:** 6129-040; 6129-070

### ⚠ WARNING

**Personal injury or death can result from improperly checking for a leak.**

**Always use a board or cardboard when checking for a leak. Escaping air or fluid under pressure, even a pin-hole size leak, can penetrate body tissue causing serious injury, and possible death.**

**If fluid is injected into your skin, it must be treated immediately by a doctor familiar with this type of injury.**

**Note:** Do not weld on the quick coupler without consulting your Caterpillar dealer.

1. Clean the quick coupler prior to inspection in order to properly inspect the quick coupler.

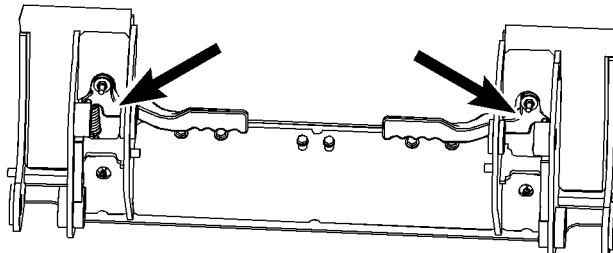


Illustration 176

g01322438

This is the back side of the quick coupler. The lift arm and the tilt cylinder are removed for clarity.

2. Tilt the quick coupler all the way forward in order to clean the debris away from the pins.
3. Move the quick coupler levers. Ensure that the levers are not bent or broken.
4. Make sure that the coupler pins extend through the bottom of the quick coupler assembly. Check the pins for wear and check the pins for damage.

5. Check the top edges of the quick coupler assembly for wear or for damage. Check the face of the quick coupler assembly for wear or for damage.
6. Inspect the components inside the quick coupler for the following problems: loose bolts, oil leaks, broken parts, missing parts, and cracked components
7. Inspect the hydraulic lines and the hydraulic fittings for damage or for wear. Repair any worn components or replace any worn components. Repair any leaking components.
8. Inspect the steel material of the quick coupler for cracks.

**Note:** Perform all repairs before placing the quick coupler back into operation.

i02575087

## Radiator Core - Clean

**SMCS Code:** 1353-070-KO

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

**Note:** Adjust the frequency of cleaning according to the effects of the operating environment. On models 272C and 297C, clean the aftercooler core when you clean the radiator core.

1. Stop the engine. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator guard upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

### ⚠ 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

When you are using compressed air or high pressure water to clean the radiator fins, ensure that the air or water is directed parallel to the fins. If the compressed air or high pressure water is not directed parallel to the radiator fins, the radiator fins could be bent or damaged.

**Note:** Pressurized air is the preferred method for removing loose debris. Hold the nozzle approximately 6 mm (0.25 inch) away from the fins. Slowly move the air nozzle in a direction that is parallel with the tubes. The air nozzle should point in the opposite direction of the flow of the fan. This will remove debris that is between the tubes. Pressurized water may also be used for cleaning. The maximum water pressure for cleaning purposes must be less than 275 kPa (40 psi). Use pressurized water in order to soften mud. Use a degreaser and steam for removal of oil and grease. Wash the core with detergent and hot water. Thoroughly rinse the core with clean water.

**3.** Clean the radiator core from the top toward the fan.

**Note:** If parts of the cooling system appear to be damaged or if parts of the cooling system are repaired, a leak test is highly recommended. Consult your Caterpillar dealer for the most current information about the cooling system.

- 4.** After cleaning, start the engine and accelerate the engine to high idle rpm. This will help in the removal of debris and drying of the core. Stop the engine. Use a light bulb behind the core in order to inspect the core for cleanliness. Repeat the cleaning, if necessary.
- 5.** Inspect the fins and tubes of the radiator core for damage. Some fins and tubes may be worn from abrasive material that has passed through the radiator core. Bent fins may be opened with a "comb".

---

**NOTICE**

Do not clean a rotating fan with high pressure water. Fan blade failure can result.

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- 6.** Remove any dirt or debris from the fan, the fan hub, the oil cooler, the radiator guard and the fan guard.

**Note:** Dirt or debris on the cooling fan can cause an imbalance.

- 7.** Tilt the radiator guard downward.

- 8.** Close the engine access door.

I01968724

## Refrigerant Dryer - Replace (If Equipped)

SMCS Code: 7322-510

 **WARNING**

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

---

**NOTICE**

If the refrigerant system has been open to the outside air (without being plugged) for more than 30 minutes, the receiver-dryer must be replaced. Moisture will enter an open refrigerant system and cause corrosion which will lead to component failure.

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Refer to Service Manual, SENR5664, "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.

**Note:** The receiver-dryer must also be replaced when the air conditioning system is evacuated.

i02418592

i04423622

## Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) - Inspect

**SMCS Code:** 7323-040; 7325-040

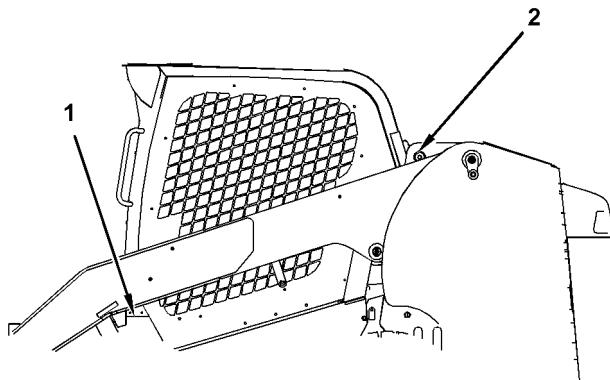


Illustration 177

g01280181

1. Inspect the ROPS for loose bolts. Tighten the bolts (1) to the following torque  $125 \pm 20 \text{ N}\cdot\text{m}$  ( $92 \pm 15 \text{ lb ft}$ ). Check the hinge on the cab (2). Check the ROPS and the FOPS for damaged bolts or missing bolts. Replace any damaged bolts or missing bolts with original equipment parts only.
2. Operate the machine on a rough surface. Replace the ROPS mounting supports if the ROPS emits a noise. Replace the ROPS mounting supports if the ROPS rattles. Refer to Operation and Maintenance Manual, "Cab Tilting" for a description of the mounting support.

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

Consult your Caterpillar dealer for repair of any cracks in the ROPS or the FOPS.

Inspect the Flying Object Guard (if equipped) for damage.

Consult your Caterpillar dealer for repair of any cracks in the Flying Object Guard.

## 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.

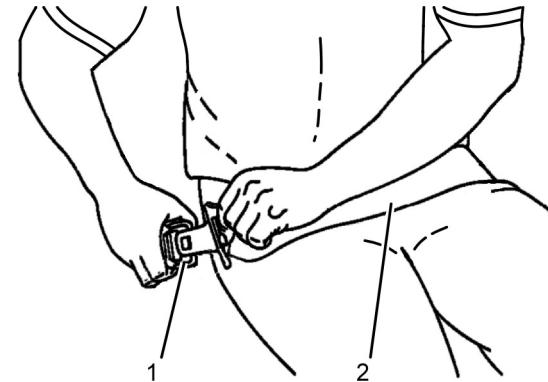


Illustration 178

g02620101

Typical example

Inspect buckle (1) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect seat belt (2) for webbing that is worn or frayed. Replace the seat belt if the webbing is worn or frayed.

Inspect all seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

Contact your Cat dealer for the replacement of the seat belt and the mounting hardware.

**Note:** The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

i04421974

i04782905

## 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).

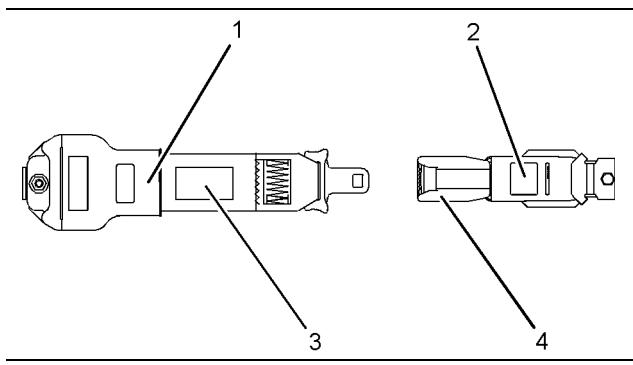


Illustration 179

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.

## Sprocket - Inspect

**SMCS Code:** 4164-040

**Note:** Operating the machine in conditions that are muddy or sandy will cause accelerated wear on the sprocket and other undercarriage components. Clean the undercarriage of the machine daily in order to maximize component life.

### Sprocket Inspection for 279C, 289C, and 299C

#### Inspect

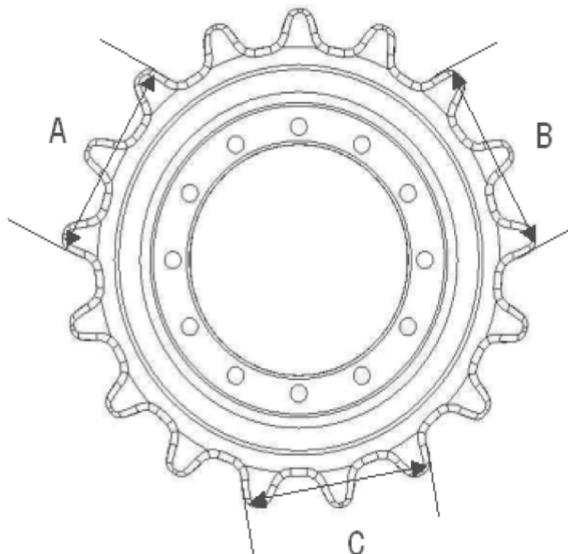


Illustration 180

g02789983

1. Measure the sprocket teeth in three places as shown in illustration 180.
2. Calculate the average of the 3 measurements to determine the 50% wear limit.
3. If the average of 3 measurements is less than 178 mm (7 inch), relocate the sprocket to the opposite side of the machine. Follow the steps in the "Relocate" section. If the average of 3 measurements is less than 165 mm (6.5 inch), then replace the sprocket. Follow the steps in the "Replace" section.

#### Relocate

1. Remove the track on both sides of the machine.
2. Remove the sprocket on the left side of the machine. Move the sprocket to the right side.

3. Remove the sprocket on the right side of the machine. Move the sprocket to the left side.
4. Install the sprockets. Tighten the bolts to the proper torque.
5. Install the track on both sides of the machine.

### Replace

1. Remove the track on both sides of the machine.
2. Remove the sprocket on the left side of the machine. Install the new sprocket.
3. Tighten the bolts to the proper torque.
4. Remove the sprocket on the right side of the machine. Install the new sprocket.
5. Tighten the bolts to the proper torque.
6. Install the track on both sides of the machine.

i01878236

## Tilt Cylinder Bearings and Bucket Linkage Bearings - Lubricate

**SMCS Code:** 5104-086-BD; 6107-086-BD

Wipe all of the grease fittings before you apply lubricant.

Apply lubricant to the grease fittings (1) for the upper bearings for the tilt cylinders.

Apply lubricant to the grease fittings (2) for the lower bearings for the tilt cylinders.

Apply lubricant to the grease fittings (3) for the coupler engagement pins.

Apply lubricant to the grease fitting (4) for the pivot pin of the quick coupler assembly.

There are a total of 8 grease fittings.

i04748093

## Track - Inspect/Adjust

**SMCS Code:** 4170-025; 4170-040

Periodic adjustment of the track tension is necessary in order to avoid damage to the tracks. Maintaining the tracks at the proper tension will maximize the service life of the undercarriage components. The undercarriage components include the final drive sprocket, idlers, rollers, and the track.

### NOTICE

Do not overtighten the tracks. Tracks that are too tight can cause premature failure of the tracks. Tracks that are too tight can cause power loss and bearing failures.

Tracks that are too loose increase the possibility of the track derailing or the drive lugs mis-feeding on the drive sprocket. In aggressive operating conditions, occasional mis-feeding is normal. If consistent mis-feeding is observed, ensure that the track tension is set to the recommended specification. If the track tension is set to the recommended specification and mis-feeding is still observed, then your application may require a tighter track tension. Increase the track tension until consistent mis-feeding is no longer observed.

The intervals for track tension vary depending on the following conditions: the machine application, the operator, the soil conditions, the climate, and the condition of the undercarriage components. Operators are responsible for basic visual inspections of the track tension on a daily basis.

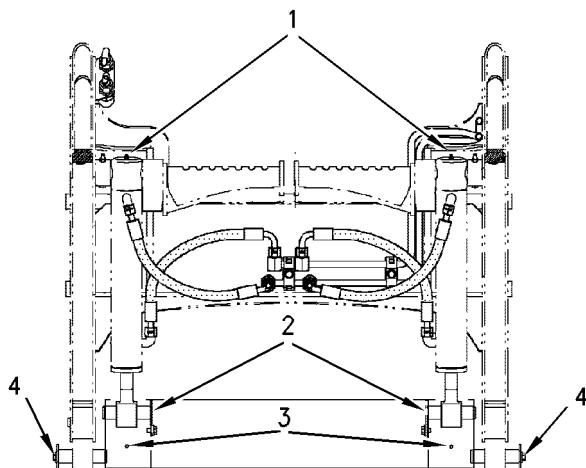


Illustration 181

g00955895

**Note:** Lubricate the fittings with the loader lift arms in the fully lowered position.

## Inspect

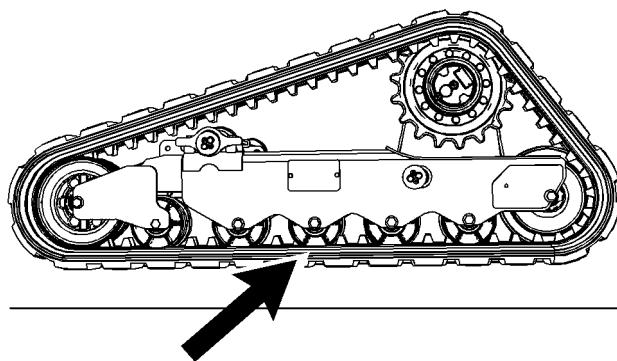


Illustration 182

g01450469

Support the machine so that the track is a minimum of 51 mm (2 inch) above the ground.

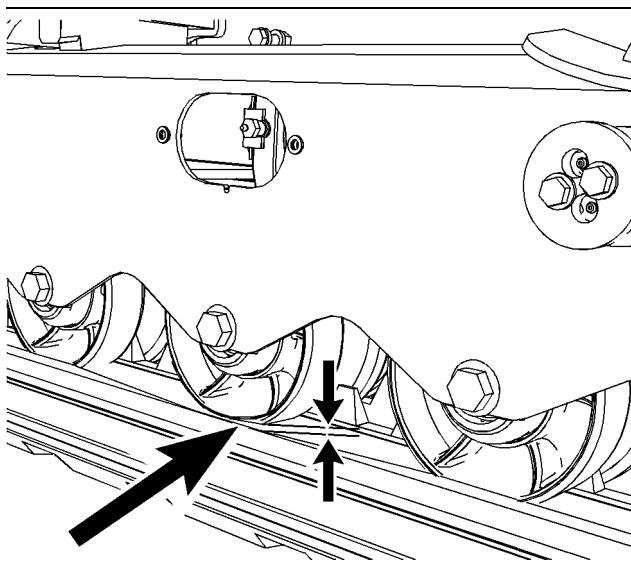


Illustration 183

g01450565

Measure the track sag at the middle track roller. Measure the distance from the bottom surface of the flange on the roller to the inside top surface of the track. The minimum track sag should be 30 mm (1.18 inch). The maximum track sag should be 40 mm (1.57 inch).

## Track Adjustment

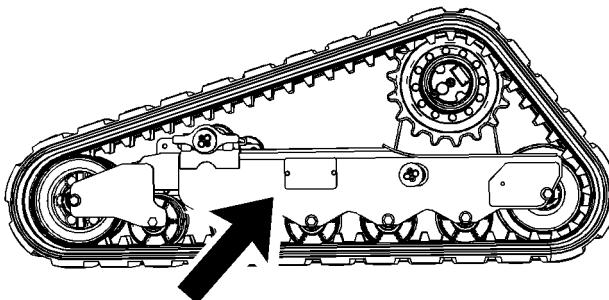


Illustration 184

g01450599

1. In order to adjust the track, remove the access panel on the side of the undercarriage.

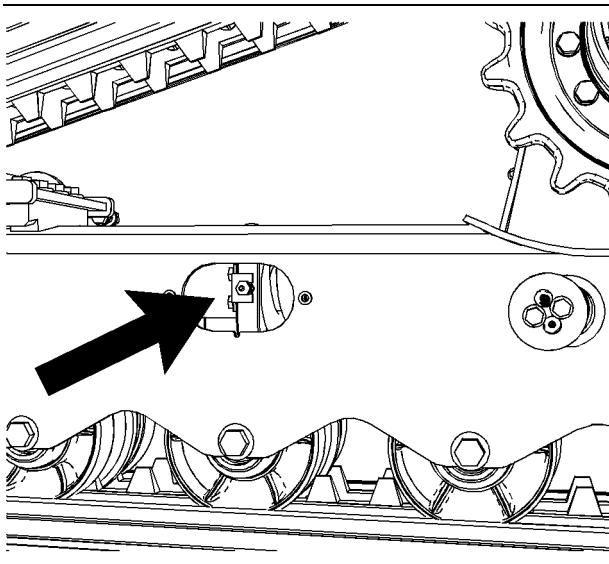


Illustration 185

g01450604

2. Pressurized grease in a cylinder is used in order to provide tension on the track. Use a grease gun in order to apply grease to the grease fitting on the cylinder. The track will be tightened.
3. Recheck the track tension.
4. Replace the access panel when the 30 mm (1.18 inch) sag is achieved.

## Detension the track

### **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 stand directly in front of the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.**

**If track does not loosen, close the relief valve and consult your Cat dealer.**

**Note:** Many operations for maintenance of the undercarriage require the track to be loosened.

1. In order to detension the track, remove the access panel on the side of the undercarriage.
2. Loosen the grease fitting with a suitable device. Loosen the grease fitting carefully until the track begins to loosen.

**Note:** Catch the grease in a suitable container. Dispose of the grease in accordance with all applicable regulations.

**Note:** One turn should be sufficient. If grease does not flow as expected, the lock plate can be temporarily removed. The relief valve can be turned further to allow for increased flow. Do not turn the relief valve more than eight turns.

3. Tighten the grease fitting to a torque of  $74 \pm 14 \text{ N}\cdot\text{m}$  ( $55 \pm 10 \text{ lb ft}$ ) when the desired track tension is reached.
4. Replace the access panel.

i02916506

3. Raise the loader arms and install the brace for the loader lift arm. Refer to Operation and Maintenance Manual, "Loader Lift Arm Brace Operation".

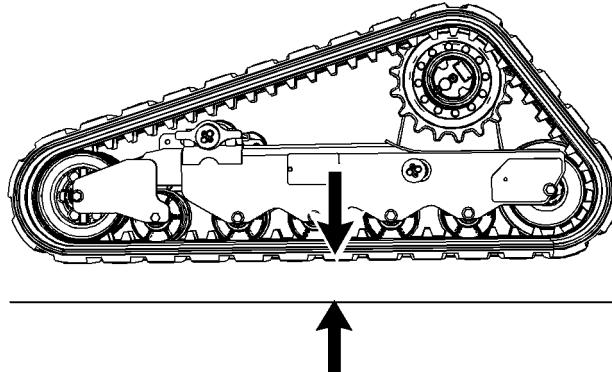


Illustration 186

g01451611

4. Use an appropriate floor jack in order to lift the machine off the ground. Use appropriate jack stands in order to block up the machine. Raise the machine until tracks are approximately 50 mm (2.0 inch) (A) off the ground.
5. Detension the track. Refer to Operation and Maintenance Manual, "Track - Inspect/Adjust".

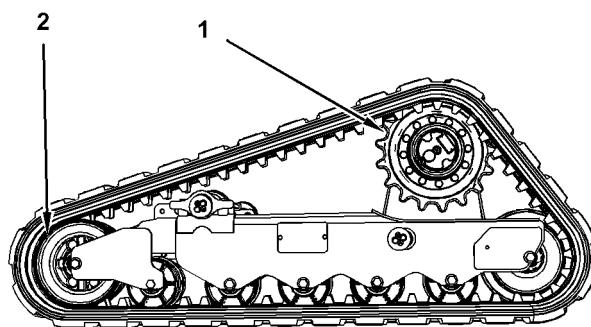


Illustration 187

g01450665

- (1) Final Drive Sprocket  
(2) Front idler wheel

## Track - Remove/Replace

**SMCS Code:** 4170-011; 4170-510

### Removing the Track

1. Position the machine on firm, level ground.
2. Remove any work tool that is attached to the quick coupler.

6. Use a suitable lifting device. Lift the track at middle position between the front idler and the final drive sprocket until the front idler collapses fully.
  7. Keep the track supported with a hoist. Lift the track over the flange of the front idler so that the inner track guides clear flanges.
- Note:** It is helpful to support the bottom of the track in order to maximize the slack between the front idler and the drive sprocket.

8. Lift the track over the sprocket with a suitable lifting device. The inner guides need to clear the sprocket teeth.
9. Lift the track over the rear idler. The inner track guides need to clear the rear idler.

## Installing the Track

**Note:** The approximate weight of the track is 247 kg (545 lb).

1. Use a suitable lifting device. Slide the track onto the rear idler so that the inner track guides straddle the rear idler. If your machine is equipped with an idler with dual flanges, the inner track guides must seat between the flanges.
2. Pull the track forward in order to ensure that the track guides are fully seated on the rear idler.
3. Lift the track over the final drive sprocket so that the inner track guides straddle the sprocket teeth. The sprocket teeth should seat in the openings in the middle of the track.
4. Pull all of the slack forward. This will provide the maximum amount of slack to aid with installation across the front idlers.

**Note:** It is helpful to support the bottom of the track in order to maximize the slack. This will help with installation.

5. Position the track so that the inner track guides seat between the flanges on the front idler.
6. Tension the track. Refer to Operation and Maintenance Manual, "Track - Inspect/Adjust" for the procedure.

i03880910

## Track Roller and Idler - Inspect/Replace

**SMCS Code:** 4159-040; 4159-510; 4180-040;  
4180-510

### Inspect

Clean the undercarriage before inspecting the idlers and the rollers.

Inspect the idlers and the rollers for damage and wear.

The idlers and the rollers should be replaced when the damage to the wheels adversely affects machine performance.

**Note:** The idlers and the rollers contain oil. The idlers and the rollers are sealed for life. Periodically, inspect the idlers and the rollers for leaks or for excessive end play. Contact your Caterpillar dealer if either leaks or excessive end play is found.

i02418610

## Window Washer Reservoir - Fill (If Equipped)

**SMCS Code:** 7306-544-KE

### NOTICE

When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent or equivalent. System damage can result from freezing.

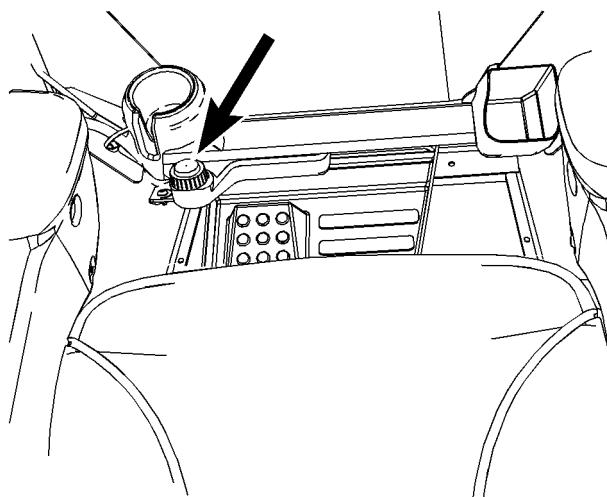


Illustration 188

g01209248

The reservoir for the window washer solvent is located inside the cab by the left footrest.

Fill the reservoir with window washer solvent. Window washer solvent with isopropyl alcohol is recommended.

i02810705

## Window Wiper - Inspect/Replace (If Equipped)

**SMCS Code:** 7305-040; 7305-510

Inspect the condition of the front window wiper blade. Replace the window wiper blade if the window wiper blade is worn or damaged. If the window wiper blade streaks the window, replace the window wiper blade.

i02418633

## Windows - Clean

**SMCS Code:** 7310-070

### Rear Window and Glass Front Door

Use commercially available window cleaning solutions in order to clean the windows.

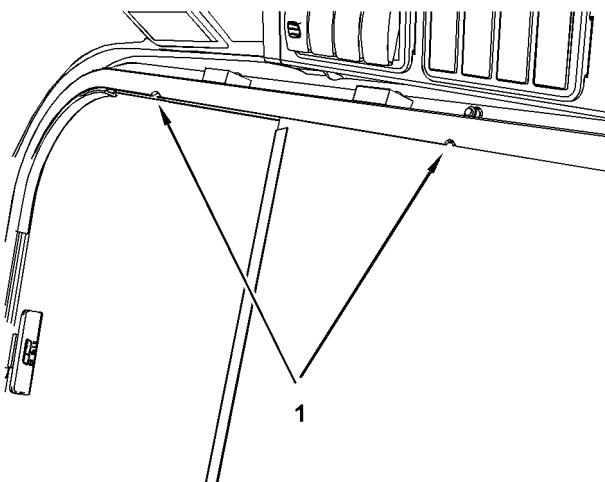
Apply the cleaning solution liberally. Wipe the surface.

Dry the surface in order to prevent spots.

### Side Windows

Use commercially available window cleaning solutions in order to clean the windows.

The side windows of the cab can be removed for cleaning. Refer to the following procedure in order to remove the side windows.



1. Release the latch. Slide the front window rearward between the circular marks (1) in the top of the window frame. Push the window upward in the track. Pull outward on the bottom of the window in order to remove the window.
2. Release the latch. Slide the rear window forward between the circular marks (1) in the top of the window frame. Push the window upward in the track. Pull outward on the bottom of the window in order to remove the window.
3. Pull straight up on the bottom window in order to remove the window from the track. Pull inward in order to remove the window.
4. Reverse the process in order to install the windows. Install the lower window first. Then install the rear window in the outer track. Install the front window in the inner track next.

### Polycarbonate Front Door and Polycarbonate Top Window

**Note:** Do not wipe the window dry. Do not use paper towels. This may scratch the finish of the polycarbonate windows over time.

For cleaning your polycarbonate top window or polycarbonate front door, use a soft cloth, a sponge, or a chamois. Use any of the following cleaners:

- soap and water
- isopropyl alcohol
- kerosene
- denatured alcohol
- commercially available window cleaning solutions

Apply the cleaning solution liberally. Wipe the surface.

i02729220

## Work Tool - Lubricate

**SMCS Code:** 6700-086

### Multipurpose Bucket

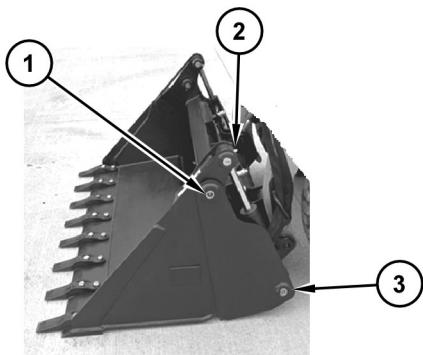


Illustration 190

g01280216

Apply lubricant to the grease fitting (1) for the pivot pin of the apron.

Apply lubricant to the grease fitting (2) for the rod end of the multipurpose bucket cylinder.

Apply lubricant to the grease fitting (3) for the head end of the multipurpose bucket cylinder.

Repeat for the other side of the bucket.

There are six grease fittings.

### Utility Grapple Bucket and Utility Grapple Fork

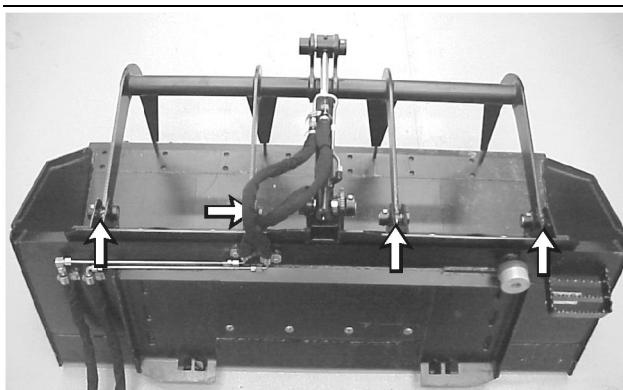


Illustration 191

g00647980

Apply lubricant to the four grease fittings for the grapples.

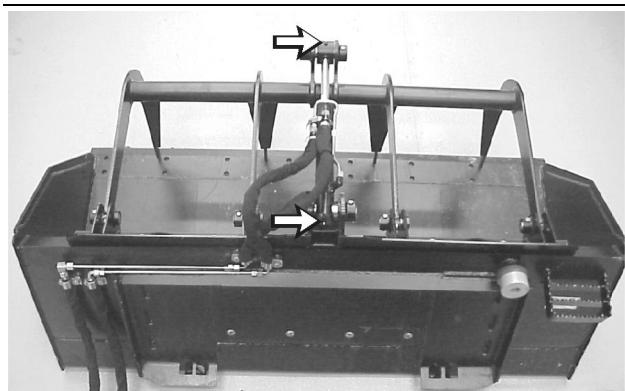


Illustration 192

g00647988

Apply lubricant to the two fittings for the grapple cylinder.

There are six grease fittings.

### Industrial Grapple Bucket and Industrial Grapple Fork

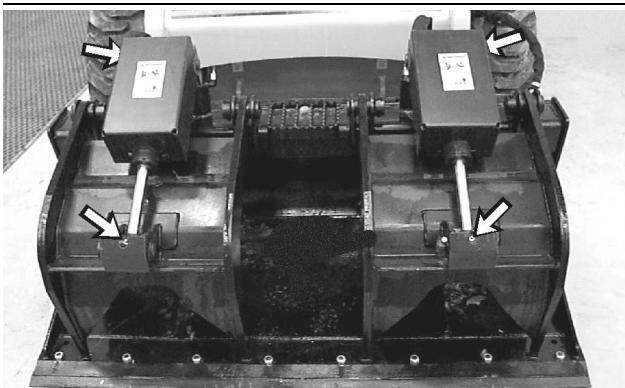


Illustration 193

g00645995

Apply lubricant to the four grease fittings for the fork cylinders.



Illustration 194

g00646004

Apply lubricant to the four grease fittings for the two forks.

There are eight grease fittings.

## Grapple Rake

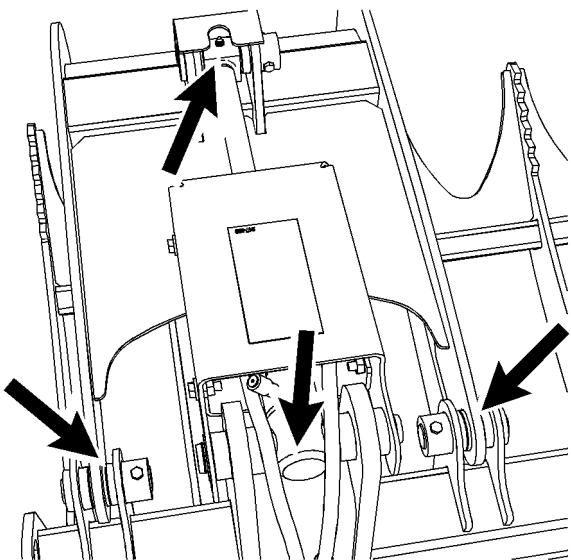


Illustration 195

g01368386

Apply lubricant to the four grease fittings for the grapple cylinders.

Apply lubricant to the four grease fittings for the two grapples.

There are eight grease fittings.

## Angle Blade

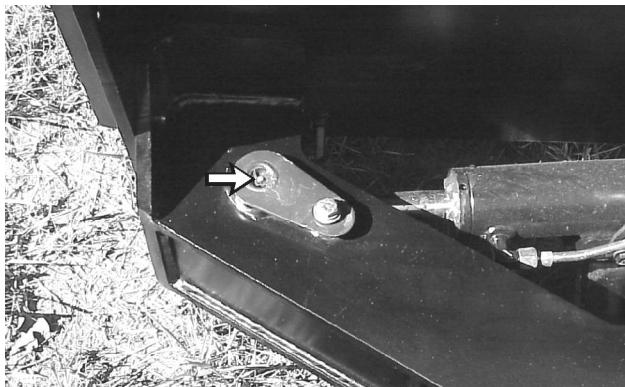


Illustration 196

g00648033

Apply lubricant to the grease fitting on the rod end of the angle cylinder.

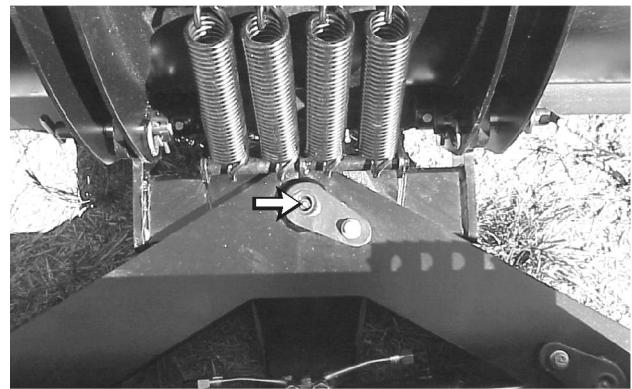


Illustration 197

g00648037

Apply lubricant to the grease fitting on the horizontal pivot point of the blade.

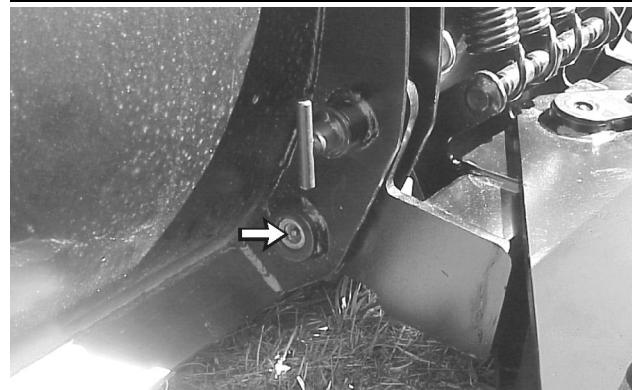


Illustration 198

g00648038

Apply lubricant to the grease fitting on the vertical pivot point of the blade. Repeat for opposite side of the blade.

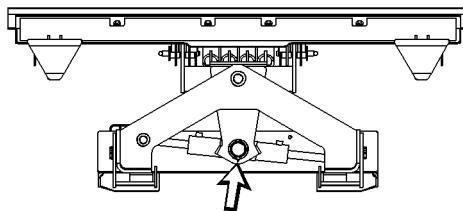


Illustration 199

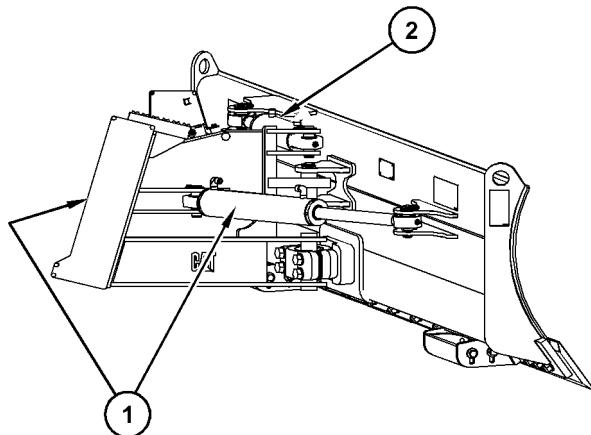
g00677570

This is a bottom view of the angle blade.

Apply lubricant to the grease fitting on the pivot point of the cylinder.

There are five grease fittings.

## Dozer Blade



Inspect upper angled plate (1) and ensure that the plate is not bent or otherwise damaged. Inspect holes (2) for wear and for damage. Inspect lower angled plate (3) and ensure that the plate is not bent or otherwise damaged. If any wear is suspected or any damage is suspected, consult your Caterpillar dealer before you use the work tool.

Illustration 200

g01073259

Apply lubricant to the grease fitting on both ends of the right hand angle cylinder (1). Repeat for opposite side of the blade.

Apply lubricant to the grease fitting on the pivot points on each end of the tilt cylinder (2).

There are six grease fittings.

i01809997

## Work Tool Mounting Bracket - Inspect

**SMCS Code:** 6700-040-BK

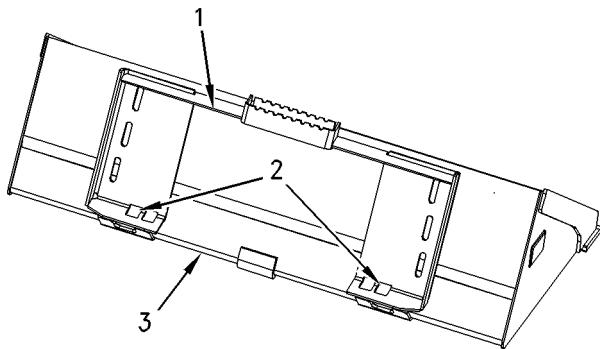


Illustration 201

g00925058

# Reference Information Section

## Reference Materials

i02836324

### Reference Material

**SMCS Code:** 1000; 7000

#### Cooling System

Special Publication, PMEP5027, "Label - ELC Radiator Label"

Special Publication, PEHJ0067, "Product Data Sheet for Caterpillar ELC"

Special Publication, PEHP9554, "Product Data Sheet for Caterpillar DEAC (Diesel Engine Antifreeze/Coolant)"

Special Publication, SEBD0518, "Know Your Cooling System"

Special Publication, SEBD0970, "Coolant and Your Engine"

#### Grease

Data Sheet, NEHP6010, "Cat Ultra 5Moly Grease (NLGI grade 1 and grade 2)"

Data Sheet, NEHP6011, "Cat Arctic Platinum Grease (NLGI grade 0)"

Data Sheet, NEHP6012, "Cat Desert Gold Grease (NLGI grade 2)"

Data Sheet, NEHP6015, "Cat High Speed Ball Bearing Grease (NLGI grade 2)"

Special Publication, PEGJ0035, "Grease Selection Guide"

Data Sheet, PEHJ0088, "Cat Multipurpose Grease (NLGI grade 2)"

Data Sheet, PEHP0002, "Cat Advanced 3Moly Grease (NLGI grade 2)"

#### Hydraulic Oil

Special Publication, PEGP6028, "Caterpillar Hydraulic Systems Management Guide"

Special Publication, PEHJ0009, "Product Data Sheet for Caterpillar Hydraulic Oil (HYDO) (SAE 10W)"

Special Publication, PEHP6047, "Product Data Sheet for Caterpillar Biodegradable Hydraulic Oil (HEES)"

#### Miscellaneous Publications

Special Publication, PECP9067, "One Safe Source"

Special Publication, PEDP9131, "Fluid Contamination - The Silent Thief"

Special Publication, PEWJ0074, "Cat Filter & Fluid Application Guide"

Special Publication, REHS1199, "Installation Procedure for the Multi Terrain Loader Track Guide"

Special Publication, SEBD0400, "Dictionary of Pictographic Symbols"

Special Publication, SEBD0717, "Diesel Fuels and Your Engine"

Special Publication, SEBF1015, "Improving Component Durability - Final Drives and Differentials"

Undercarriage Reconditioning Bulletin, SEBF8501, "Undercarriage Reconditioning Guide"

Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations"

Special Publication, SEBU5898, "Cold Weather Recommendations"

Special Publication, SENR5664, "Air Conditioning and Heater R-134a for All Caterpillar Machines"

Special Publication, SENR9620, "Improving Fuel System Durability"

Special Publication, SMBU6981, "Emissions Control Warranty Information"

#### Oil

Special Publication, PEHP3050, "Product Data Sheet for Caterpillar Multipurpose Tractor Oil (MTO)"

Special Publication, PEHP6001, "How to Take a Good Oil Sample"

Special Publication, PEHJ0007, "Product Data Sheet for Caterpillar Arctic TDTO (SAE 0W-20) (synthetic blend)"

Special Publication, PEHJ0008, "Product Data Sheet for Caterpillar Arctic DEO (SAE 0W-30)"

Special Publication, PEHJ0030, "Product Data Sheet for Caterpillar Synthetic Gear Oil (SAE 75W-140)"

Special Publication, PEHJ0059, "Product Data Sheet for Caterpillar DEO (SAE 10W-30)"

Special Publication, PEHP7506, "Product Data Sheet for Caterpillar TDTO (SAE 10W, SAE 30, SAE 50)"

Special Publication, PEHP7508, "Product Data Sheet for Caterpillar Gear Oil (GO) (SAE 80W-90 and SAE 85W-140)"

Special Publication, PEHP7062, "Product Data Sheet for Caterpillar DEO Synthetic (SAE 5W-40)"

Special Publication, PEHP9530, "Product Data Sheet for Caterpillar FDAO (SAE 60)"

Special Publication, PEHP9570, "Product Data Sheet for Caterpillar FDAO Synthetic (Multigrade)"

Special Publication, PELJ0179, "Caterpillar Engine Crankcase Fluid-1 Specifications (Cat ECF-1)"

Special Publication, PEHP8035, "Product Data Sheet for TDTO Transmission Multi-Season (TMS)"

Special Publication, SEBD0640, "Oil and Your Engine"

## **Operation and Maintenance Manuals**

Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations"

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

Operation and Maintenance Manual, SMBU6981, "Emissions Control Warranty Information"

## **Parts Manuals**

Parts Manual, SEBP5067 279C

Parts Manual - Compact Disc, SERP5067 279C

Parts Manual, SEBP5068 289C

Parts Manual - Compact Disc, SERP5068 289C

Parts Manual, SEBP5069 299C

Parts Manual - Compact Disc, SERP5069 299C

## **ROPS/FOPS Structure**

Special Publication, SEBD1587, "What ROPS/FOPS Certification Means"

Special Publication, SEHS6929, "Inspection, Maintenance and Repair of ROPS and Attachment Installation Guidelines"

## **Safety Manuals**

Safety DVD, TEVD6193, "C-Series Skid Steer Loader and Multi Terrain Loader Safety & Operating Tips"

## **S·O·S Information**

Special Publication, PEDP7036, "S·O·S Services"

Special Publication, PEHP7052, "Making the Most of S·O·S Services"

Special Publication, PEHP7057, "S·O·S Coolant Analysis"

Special Publication, PEHP7076, "Understanding S·O·S Services Tests"

## **Specifications Manuals**

Specifications Manual, SENR3130, "Torque Specifications"

## **Tools**

Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog"

## **Additional Reference Material**

SAE J183, "Classification" This can normally be found in the SAE handbook.

SAE J313, "Diesel Fuels" This can be found in the SAE handbook. Also, this publication can be obtained from your local technological society, from your local library, or from your local college.

SAE J754, "Nomenclature" This can normally be found in the SAE handbook.

Engine Manufacturers Association, " Engine Fluids Data Book"

Engine Manufacturers Association  
Two North LaSalle Street, Suite 2200  
Chicago, Illinois USA 60602  
E-mail: ema@enginemakers.org  
(312) 827-8700  
Facsimile: (312) 827-8737

i03708448

## Caterpillar Approved Work Tools

**SMCS Code:** 6700

Only use Caterpillar approved work tools on this machine.

**Note:** Do not use a Caterpillar work tool on a machine that is not approved by Caterpillar.

**Note:** A Debris Barrier Kit is required for use in applications which create airborne debris. Consult your Caterpillar dealer for information about this kit.

Use of the following equipment may create airborne debris:

- mulching head
- brush cutter
- hammers
- recycling of paper products
- certain agricultural applications

Caterpillar approves the following work tools for use on this machine:

Table 31

Caterpillar Approved Work Tools for Multi Terrain Loaders			
Machine	279C	289C	299C
<b>General Purpose Buckets</b>			
60	N	N	N
66	N	N	N
72	A	A	A
78	O	O	O
<b>High Capacity Buckets</b>			
84	O	O	O
<b>Multipurpose Buckets</b>			
60	N	N	N
66	N	N	N
72	A	A	A
78	O	O	O
84	O	O	O
<b>Dirt Buckets</b>			
54	N	N	N

(continued)

(Table 31, contd)

<b>Caterpillar Approved Work Tools for Multi Terrain Loaders</b>			
<b>Machine</b>	<b>279C</b>	<b>289C</b>	<b>299C</b>
60	N	N	N
66	N	N	N
72	A	A	A
78	O	O	O
<b>Light Material Buckets</b>			
72	A	A	A
78	O	O	O
84	O	O	O
96	O	O	O
<b>Utility Buckets</b>			
60	N	N	N
66	N	N	N
72	A	A	A
<b>Augers</b>			
A14B	O	O	O
A19B	O	O	O
A26B	#	#	#
<b>Backhoes</b>			
BH150	!	!	!
BH160	O	O	O
<b>Angle Blades</b>			
72	N	N	N
84	O	O	O
<b>Dozer Blades</b>			
79	A	A	A
92	O	O	O
<b>Brooms</b>			
BA18	O	O	O
BP15B	A	A	A
BP18B	O	O	O
BU115	A	A	A
BU118	O	O	O
<b>Brush cutters</b>			
BR160	O	O	O
BR166	O	O	O
BR172	O	O	O
BR272	!	!	!

(continued)

(Table 31, contd)

<b>Caterpillar Approved Work Tools for Multi Terrain Loaders</b>			
<b>Machine</b>	<b>279C</b>	<b>289C</b>	<b>299C</b>
BR378	#	#	#
<b>Cold Planers</b>			
PC203	O	O	O
PC204	O	O	O
PC205	#	#	#
PC206	#	#	#
PC210	#	#	#
<b>Carriage and Fork Tines</b>			
	O	O	O
<b>Utility Forks</b>			
66	A	A	A
72	O	O	O
<b>Industrial Grapple Buckets</b>			
60	N	N	N
66	N	N	N
72	A	A	A
78	O	O	O
<b>Industrial Grapple Forks</b>			
66	A	A	A
72	O	O	O
<b>Utility Grapple Buckets</b>			
60	N	N	N
66	N	N	N
72	A	A	A
<b>Utility Grapple Forks</b>			
66	A	A	A
72	O	O	O
<b>Grapple Rake</b>			
72	O	O	O
84	O	O	O
<b>Landscape Rakes</b>			
LR15B	N	N	N
LR18B	O	O	O
<b>Landscape Tillers</b>			
LT13B	N	N	N
LT18B	O	O	O
<b>Material Handling Arm</b>			

(continued)

(Table 31, contd)

<b>Caterpillar Approved Work Tools for Multi Terrain Loaders</b>			
<b>Machine</b>	<b>279C</b>	<b>289C</b>	<b>299C</b>
	O	O	O
<b>Mulcher</b>			
HM312	#	#	#
<b>Power Box Rakes</b>			
PR172 MAN	A	A	A
PR172 HYD	A	A	A
PR184 MAN	O	O	O
PR184 HYD	O	O	O
PR190 MAN	O	O	O
PR190 HYD	O	O	O
<b>Sheer</b>			
S305	O	O	O
<b>Hammers</b>			
H55Ds	O	O	O
H63/H63s	O	O	O
<b>Snowblowers</b>			
SR17	N	N	N
SR18	A	A	A
SR21	O	O	O
SR318	X	X	X
SR321	#	#	#
<b>Stump Grinders</b>			
SG16B	O	O	O
SG18B	#	#	#
<b>Trenchers</b>			
T6B	O	O	O
T9B	O	O	O
T15B	#	#	#
<b>Vibratory Compactors</b>			
CV16B	O	O	O
CV18B	O	O	O
<b>Wheel Saws</b>			
SW45 (3 inches)	#	#	#
SW45 (6 inches)	#	#	#
SW45 (8 inches)	#	#	#
SW60 (6 inches)	#	#	#
SW60 (8 inches)	#	#	#

**O** – The machine performance is optimum with this work tool.

**A** – The machine performance is acceptable with this work tool.

**HF** – The machine is equipped with high flow hydraulics.

**NR** – This work tool is not recommended for use on this machine.

**#** – The machine performance is optimum with the available HF/XPS option.

**X** – The machine performance is acceptable with the available HF/XPS option.

**!** – This work tool is not approved for use on this machine. Do not use this work tool on this machine.

**\*** – This work tool has a lift restriction on this machine. Do not raise the lower pivot pin higher than 1 m (3 ft) above the ground.

Many of the work tools in the table have an Operation and Maintenance Manual. Please refer to the Operation and Maintenance Manual that is provided with the work tool for the proper use of the work tool.

Contact your Caterpillar dealer concerning specific work tools that are approved by Caterpillar for this machine. This list was complete at the time of publication. There may be additional work tools that have been approved since that time. Consult your Caterpillar dealer for an updated list of approved work tools.

## INTENDED USE STATEMENT for the Material Handling Arm

This Work Tool has the intended functions of lifting and transporting suspended loads. Always select sufficiently sized lifting accessories. Always inspect the lifting accessories before use.

Do not use the work tool improperly.

Remove the work tool from the machine before you lift the host machine. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for details.

## INTENDED USE STATEMENT for the Multipurpose Bucket

This Work Tool has the intended functions of dozing, digging, loading, lifting, carrying, and moving material such as earth, crushed rock, or gravel.

Do not use the work tool improperly.

Remove the work tool from the machine before you lift the host machine. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for details.

## INTENDED USE STATEMENT for the Grapple Bucket

This Work Tool has the intended functions of digging, loading, lifting, carrying, and moving material such as earth, crushed rock, gravel, or debris.

Do not use the work tool improperly.

Remove the work tool from the machine before you lift the host machine. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for details.

## INTENDED USE STATEMENT for the Grapple Rake

This Work Tool has the intended functions of raking, loading, carrying, and moving bulky material. The material may be encountered in the following applications:

- Landscape cleanup
- Storm debris cleanup
- Demolition
- Industrial
- Construction

Do not use the work tool improperly.

- Do not pry with one rake tine. Use multiple rake tines in order to loosen material.
- Remove the work tool from the machine before you lift the host machine. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for details.
- Do not place the weight of the host machine on the grapples in the open position.

## INTENDED USE STATEMENT for the Grapple Forks

This Work Tool has the intended functions of loading, carrying, and moving bulky materials.

Do not use the work tool improperly.

Remove the work tool from the machine before you lift the host machine. Refer to Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for details.

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## **Decommissioning and Disposal**

**SMCS Code:** 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations. Consult the nearest Cat dealer for additional information.

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# Product and Dealer Information

**Note:** For product identification plate locations, see the section "Product Identification Information" in the Operation and Maintenance Manual.

**Delivery Date:** \_\_\_\_\_

## Product Information

Model: \_\_\_\_\_

Product Identification Number: \_\_\_\_\_

Engine Serial Number: \_\_\_\_\_

Transmission Serial Number: \_\_\_\_\_

Generator Serial Number: \_\_\_\_\_

Attachment Serial Numbers: \_\_\_\_\_

Attachment Information: \_\_\_\_\_

Customer Equipment Number: \_\_\_\_\_

Dealer Equipment Number: \_\_\_\_\_

## Dealer Information

Name: \_\_\_\_\_ Branch: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

	<u>Dealer Contact</u>	<u>Phone Number</u>	<u>Hours</u>
Sales:	_____	_____	_____
Parts:	_____	_____	_____
Service:	_____	_____	_____

