



# Operation and Maintenance Manual

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## **TH560B Telehandler**

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S/N TBP00100 & After

*Keep this manual with machine at all times.*

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## 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.



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.

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. 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 be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.**

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. Caterpillar® dealers have the most current information available.



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

# EFFECTIVITY PAGE

July 14, 2006 - A - Original Issue Of Manual

February 2, 2007 - B - Added Tier III information. Revised pages 9, 20, 21, 35, 36, 98, 111, 126, 127, 128, 129 and 131.

# EFFECTIVITY PAGE

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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.

## 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.

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## Contact Information

### For:

- Accident Reporting and Product Safety Publications
- Current Owner Updates
- Questions Regarding Product Applications and Safety
- Standards and Regulations Compliance Information
- Questions Regarding Product Modifications

### Contact:

Product Safety and Reliability Department  
JLG Industries, Inc.  
1 JLG Drive  
McConnellsburg, PA 17233  
USA  
or Your Local JLG Office

### In USA:

Toll Free: 877-JLG-SAFE (877-554-7233)

### Outside USA:

Phone: 717-485-5161 or 717-485-6591

**E-mail:** [ProductSafety@JLG.com](mailto:ProductSafety@JLG.com)

# Safety Section

## Safety Messages

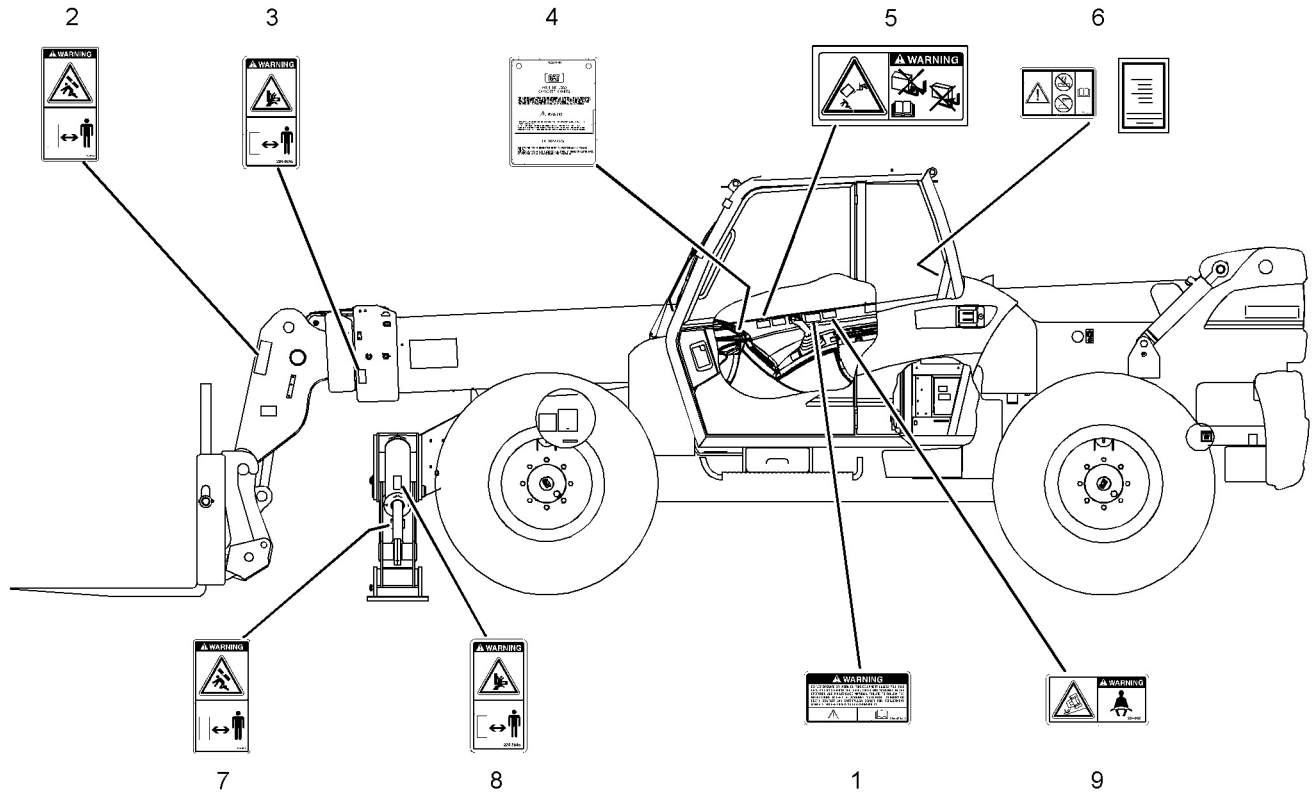


Illustration 2

g01106084

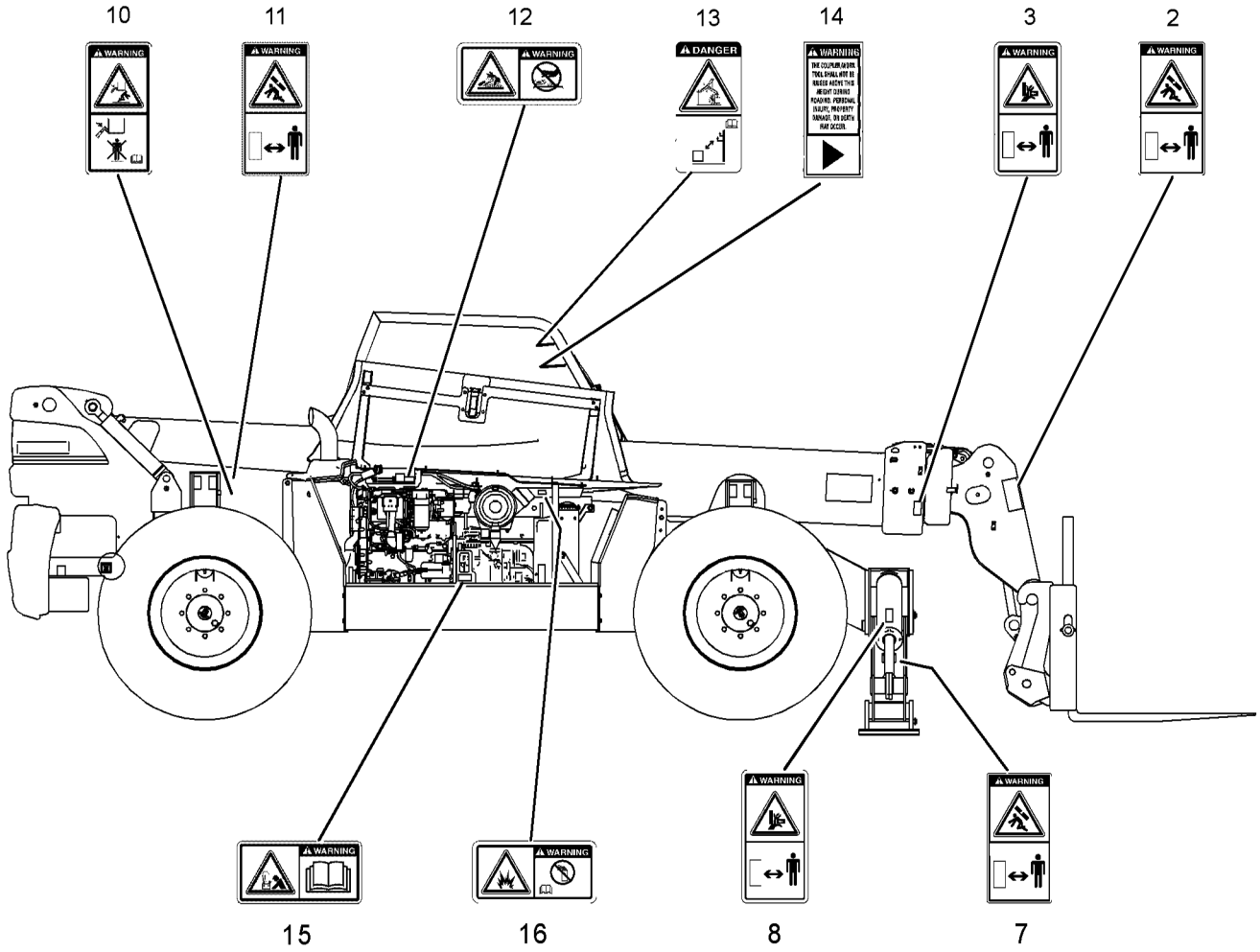


Illustration 3

g01213315

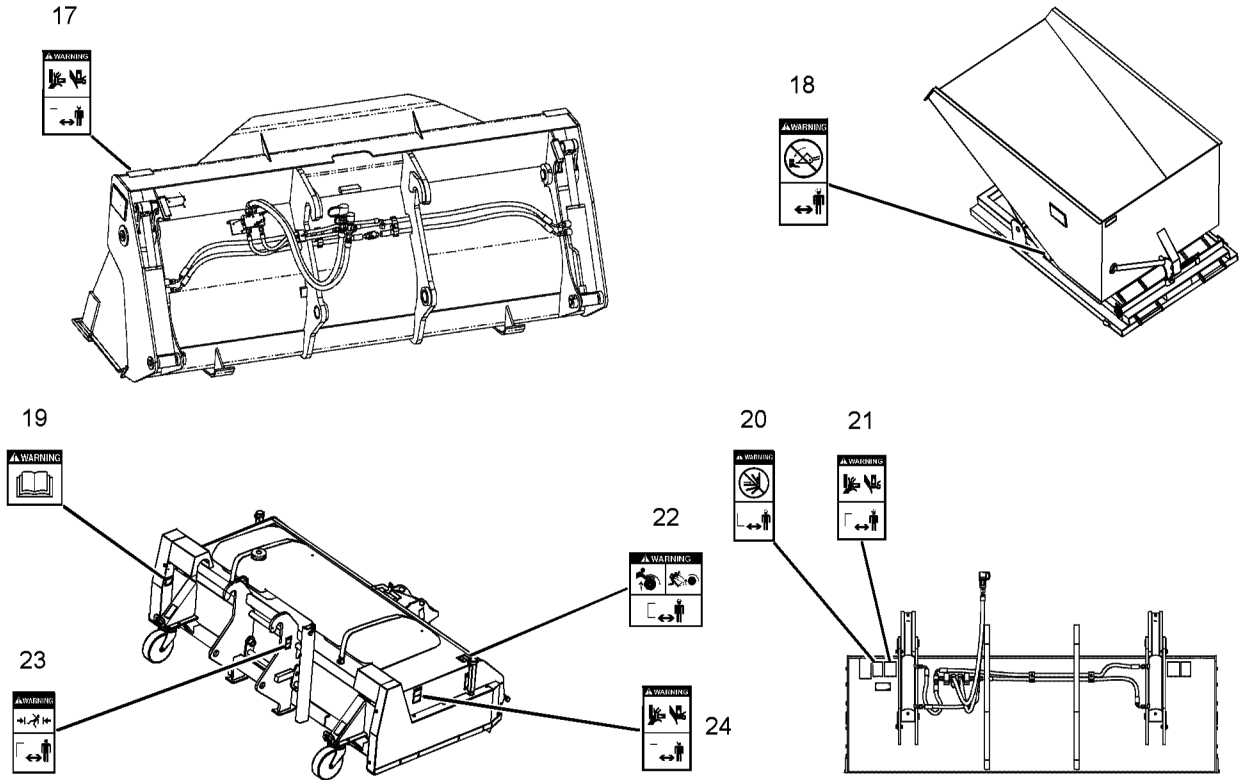


Illustration 4

g01213316

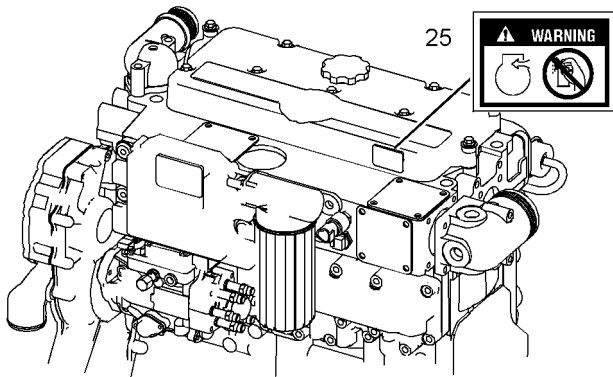
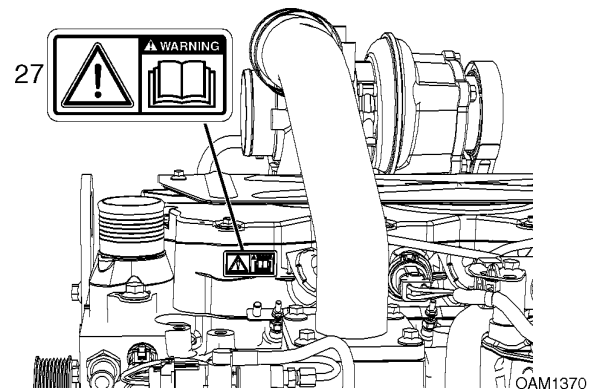


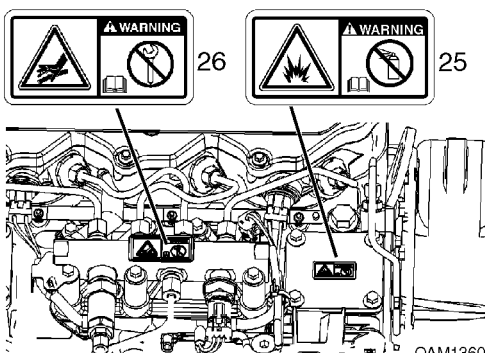
Illustration 5  
Tier II

g01213318



Tier III

OAM1370



Tier III

OAM1360

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

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

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

### Do Not Operate (1)

This safety message is positioned on the panel at the right side of the operator station.



g00931194



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

### Do Not Stand Under the Load (2)

This message is positioned on the side of the boom head on both sides of the machine.



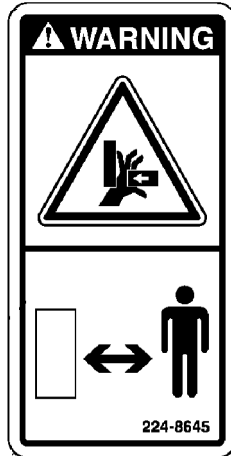
g00930659



**A crushing hazard exists when the boom is lowered or from a falling load. Stay clear of the boom when the machine is in operation. Failure to stay clear of the boom can cause injury or death.**

### No Hands (3)

The message is positioned on the side of the number one boom section on both sides of the machine.



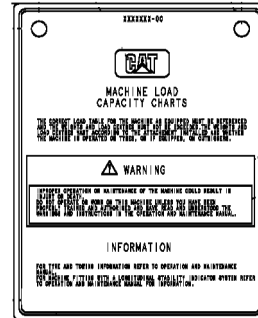
g00930870

**! WARNING**

A crushing hazard exists when the boom sections are being retracted or extended. Stay clear of the boom when the machine is in operation. Failure to stay clear of the boom when the machine is operation can cause injury or death.

### Do Not Operate (4)

This safety message is located on the front dash in the operator compartment.



g00936539

**! WARNING**

Improper operation or maintenance of the machine could result in injury or death. Do not operate or work on this machine unless you have been properly trained and authorized and have read and understood the warnings and instructions in the Operation and Maintenance Manual.

Refer to Operation and Maintenance Manual, "Load Charts" for more information.

### Forks (5)

This safety message is positioned on the panel at the right side of the operator station.



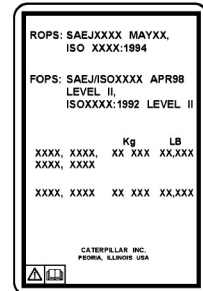
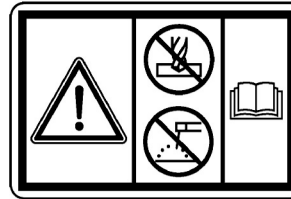
g01059274



Side loading of the forks may cause premature failure of the forks and thus a crush hazard which may cause personal injury or death. Never push loads with the forks and inspect the forks daily for any twisting or bending observed in the forks. Should twisting or bending be observed, change the fork(s) prior to any lifting operation. Read the Operation and Maintenance Manual for more information about the correct use of the forks.

### Do Not Weld On The ROPS/FOPS Structure (6)

This safety message is positioned behind the seat near the window.



g01211890



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

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

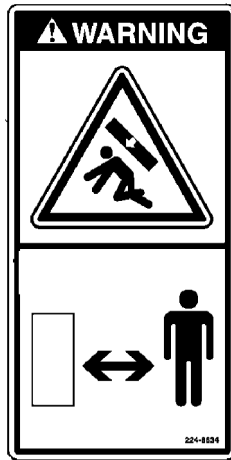
A typical example of the warning film and certification film are shown above.

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



## Crushing Hazard (7)

The message is positioned on the underside of the stabilizer beam on both sides of the machine.



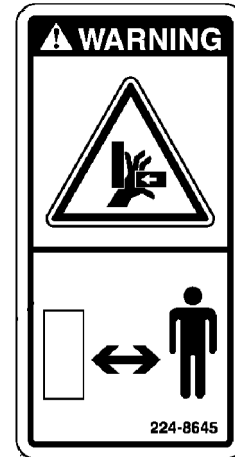
g00930659

### **WARNING**

A crushing hazard exists when raising or lowering the stabilizers. Ensure that personnel stand clear when the stabilizers are being raised or lowered. Operating the stabilizers when personnel are nearby could result in personal injury or death.

## No Hands (8)

The message is positioned on the top of stabilizer cylinders on both sides of the machine.



g00930870

### **WARNING**

A crushing hazard exists when raising or lowering the stabilizers. Ensure that personnel stand clear when the stabilizers are being raised or lowered. Operating the stabilizers when personnel are nearby could result in personal injury or death.

## Seat Belt (9)

This safety message is positioned on the panel at the right side of the operator station.



g00931188



**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.

## Crushing Hazard (10)

This message is positioned on the chassis on the right side of the machine.



g01212730

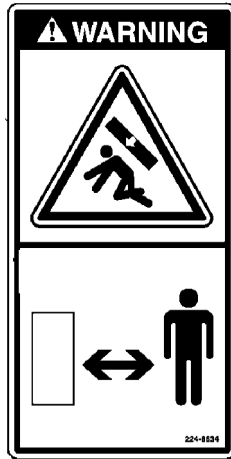


**A crushing hazard exists when the boom is lowered or from a falling load. Stay clear of the boom when the machine is in operation. Failure to stay clear of the boom can cause injury or death.**

Refer to the "Procedure for Retracting and Lowering the Boom with the Emergency Lower System (If Equipped)" topic in Operation and Maintenance Manual, "Equipment Lowering with Loss of Hydraulic Power" for more information.

## Crushing Hazard (11)

This message is positioned on the chassis on the right side of the machine.



g00930659

### **WARNING**

A crushing hazard exists when the boom is lowered or from a falling load. Stay clear of the boom when the machine is in operation. Failure to stay clear of the boom can cause injury or death.

## Engine Coolant (12)

This safety message is positioned on the coolant tank in the engine enclosure.



g00931247

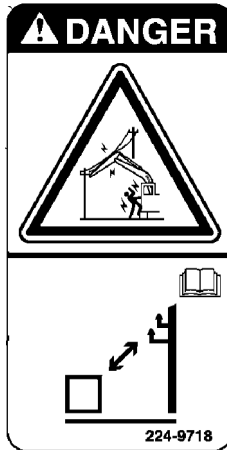
### **WARNING**

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

Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct procedure to remove the pressure cap.

## Avoid Power Lines (13)

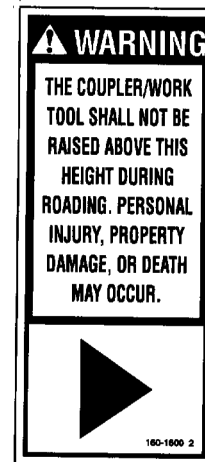
This safety message is positioned in the operator station on the right side of the window.



g00936329

## Low Bridge (14)

This safety message is positioned in the operator station on the right side of the window. This message is only located on machines that will be used in the United Kingdom.



g00931533

### **DANGER**

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

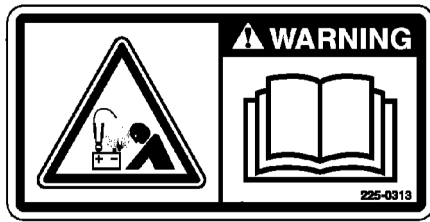
Always check for power lines before raising the boom. Failure to check for power lines before raising the boom could result in injury or death by electrocution. Refer to Operation and Maintenance Manual, "Before Starting Engine" for more information.

### **WARNING**

**The coupler/work tool shall not be raised above this height during roading. Personal injury, property damage, or death may occur.**

## Jump Start Cables (15)

This safety message is positioned on a bracket next to the batteries.



g00931020

### **WARNING**

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

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

## Ether (16)

This safety message is positioned on the intake for the air cleaner.



g00931562

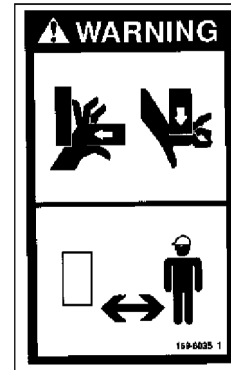
### **WARNING**

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

Refer to Operation and Maintenance Manual, "Fire Prevention and Explosion Prevention" for more information.

## Crushing Hazard (17)

This message is located on both sides of the multipurpose bucket on the top of the bucket.



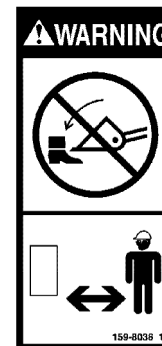
g00943172

### **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.**

## Crushing Hazard (18)

This message is located on both sides of the hopper.



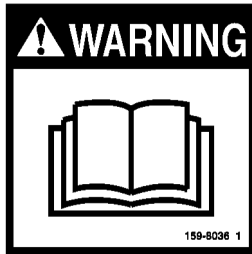
g00951560

### **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.**

### Operation (19)

This message is located on the left hand cover at the rear of the broom.



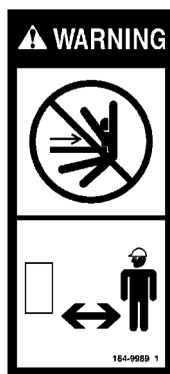
g00984073



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

### Impaling Hazard (20)

This message is located on both sides of the grapple bucket.



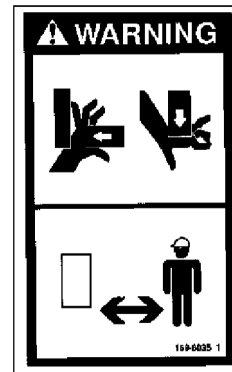
g00951569



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.

### Crushing Hazard (21)

This message is located on both sides of the grapple bucket.



g00943172



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.

### Entanglement and Flying Objects (22)

This message is located on each side of the top cover for the broom.



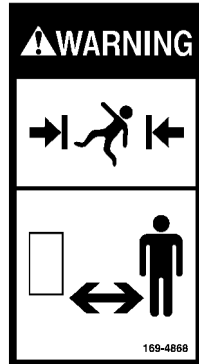
g00984064



Stay clear of this work tool during operation. Entanglement could result in personal injury or death. Flying objects from this work tool could result in personal injury or death.

### Trap Point (23)

This message is located on both sides of the hitch on the broom.



g00984061

### Ether (25)

**Tier II** - This message is located on the side of the valve cover.



g00924889



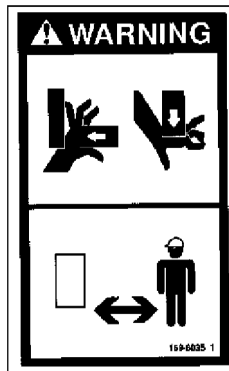
No clearance for person in this area during operation. Severe injury or death from crushing could occur. Stay away from the work tool while it is in operation.



If equipped with an air inlet heater (AIH) for cold weather starting, do not use aerosol types of starting aids such as ether. Such use could result in an explosion and personal injury.

### Crushing Hazard (24)

This message is located on each side of the top cover for the broom.



g00943172

**Tier III** - This message is located on the inlet manifold cover.



OAM1280



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



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.

## Hand (High Pressure) (26)

**Tier III** - This message is located on the top of the fuel manifold.



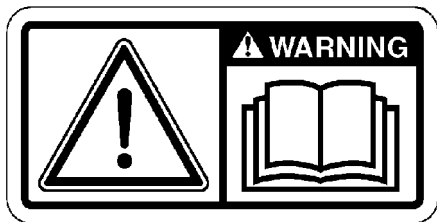
OAM1270

### **WARNING**

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

## Universal Warning (27)

**Tier III** - This message is located on both sides of the valve mechanism cover base.



OAM1260

### **WARNING**

Do not operate or work on this equipment 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 serious injury or death.

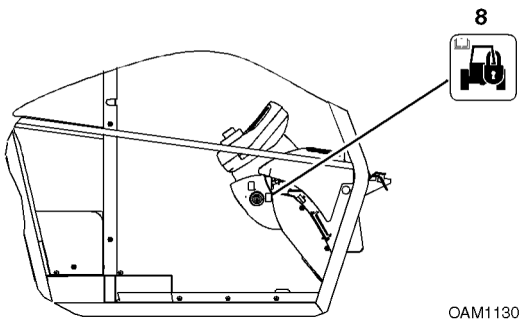
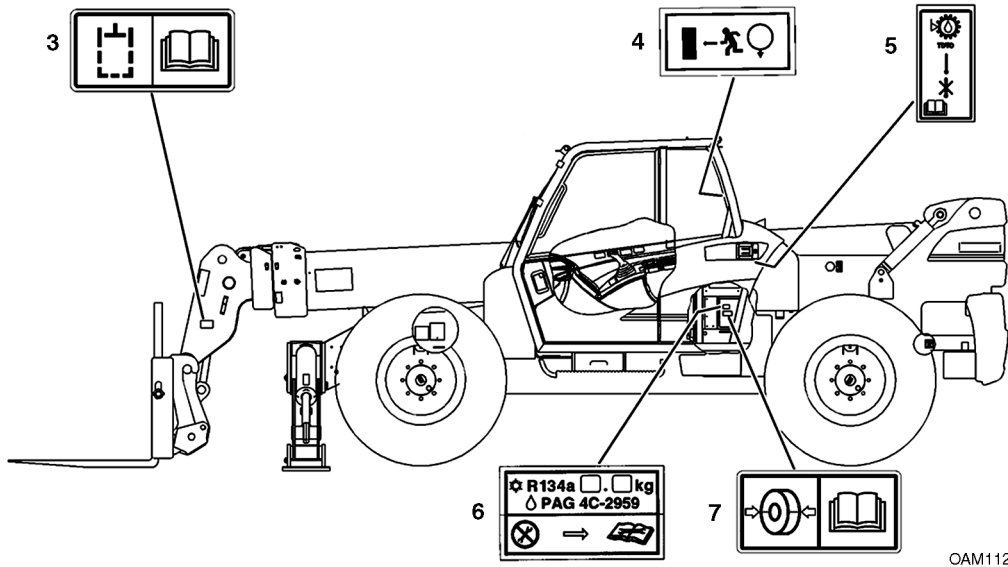
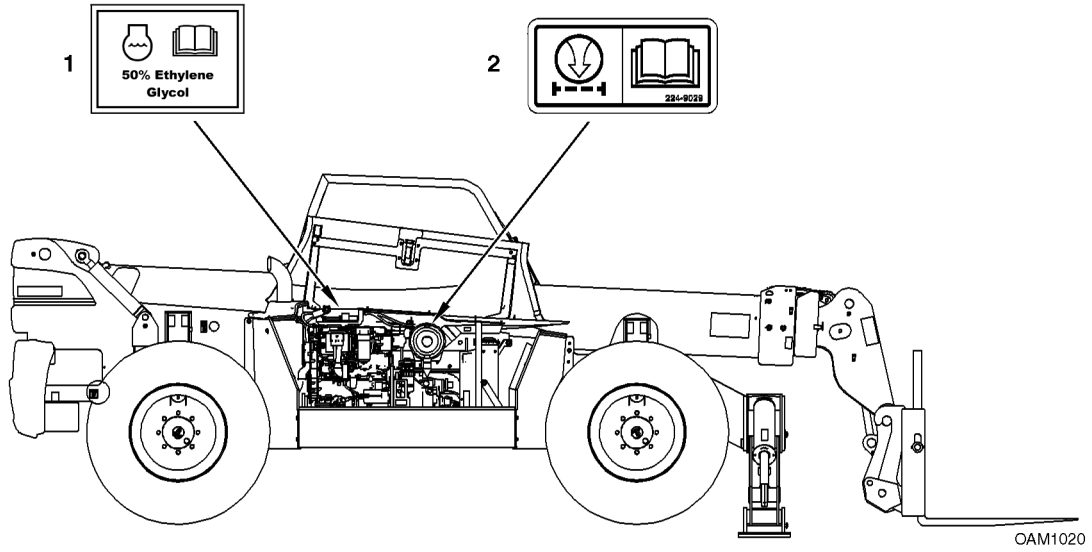
## Additional Messages

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

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

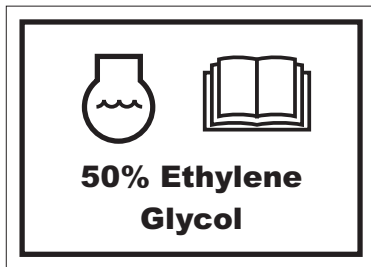
Replace any message that is damaged, or missing. If a message is attached to a part that is replaced, install a message on the replacement part. Any Caterpillar dealer can provide new messages.





### Coolant (1)

This message is located on the coolant tank.



OAM1010

Refill with only 50/50 mixture of ethylene glycol and water. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check" and Operation and Maintenance Manual, "Cooling System Coolant - Change" for more information.

### Air Cleaner (2)

This message is located on the cover for the air cleaner.

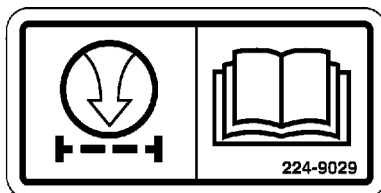


Illustration 10

g00931688

Clean the filter element or replace the filter element when the restriction indicator shows red. Refer to Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace" and Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Repace" for more information.

### Transmission and Hydraulic Oil (5)

If equipped, this message is located next to the sight gauge for the transmission and hydraulic oil.

### Auxiliary Hydraulics (3)

This message is located on the left side of the boom head.

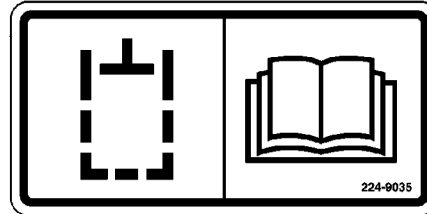


Illustration 11

g00934458

Use only work tools that are approved by Caterpillar. Refer to the topic "Auxiliary Hydraulic Connections" in Operation and Maintenance Manual, "Work Tools" for more information.

### Alternate Exit (4)

This message is located on the rear window of the cab.

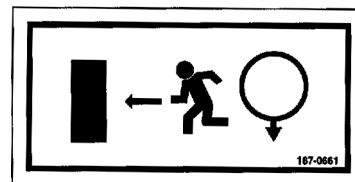


Illustration 13

g00931915

If the primary exit is blocked, exit the machine through the rear window. Use the ring on the rear window latch in order to pull out the retaining pin. This action will unlock the rear window.

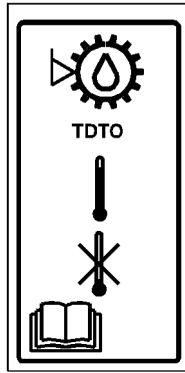


Illustration 14

g01059267

Check the transmission and hydraulic oil when the oil is warm. Do not add oil when the system is cold. If the system is cold and you add oil, you can overfill the system. This could cause machine damage. Refer to Operation and Maintenance Manual, "Transmission and Hydraulic Oil Level - Check" for the correct procedure.

### Air Conditioner (6)

On machines that are equipped with an air conditioner, this label is located behind the protection cover at the rear of the door.

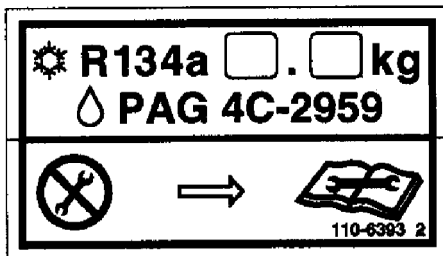


Illustration 15

g00934175

Do not work on the air conditioning system until you have read the service manual and you understand the service manual.

### Tire Pressures (7)

This message is located behind the protection cover on the left side of the cab.

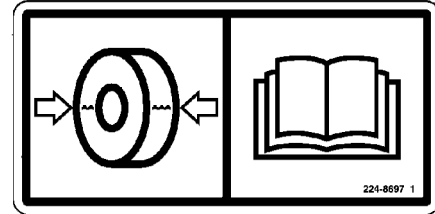


Illustration 16

g00931919

Personal injury can result from improper tire inflation. Refer to Operation and Maintenance Manual, "Tire Inflation Information" for more information.

### Machine Security System (8)

If equipped, this message is located on the left side of the steering column ahead of the engine start switch.



Illustration 17

g00951606

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

## General Hazard Information

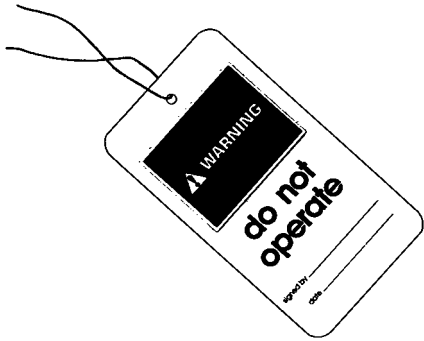


Illustration 18

g00104545

Attach a "Do Not Operate" warning tag or a similar warning tag to the start switch or to the controls before you service the equipment or before you repair the equipment. These warning tags are available from your Caterpillar dealer.

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 will occur from electrocution.

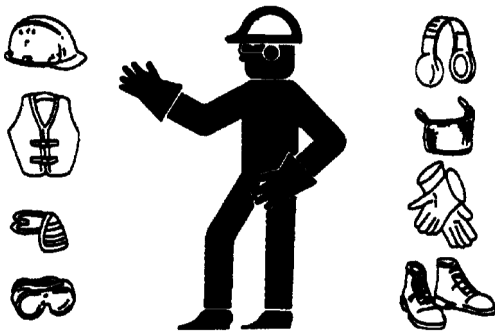


Illustration 19

g00702020

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

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

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

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

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

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

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

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

Obey all local regulations for the disposal of liquids.

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

Do not allow unauthorized personnel on the equipment.

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

## Pressurized Air and Water

Pressurized air and/or water can cause debris and/or hot water to be blown out. This 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 below 205 kPa (30 psi). 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.

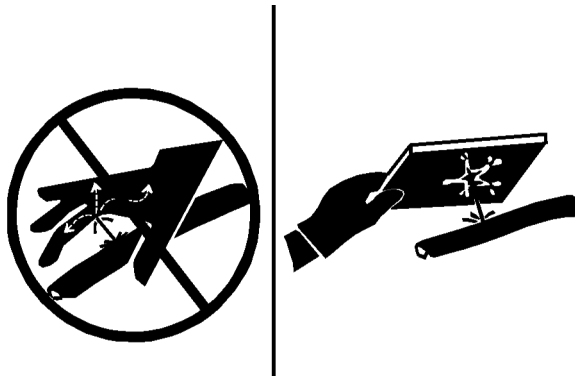


Illustration 20

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.

## Dispose of Waste Properly

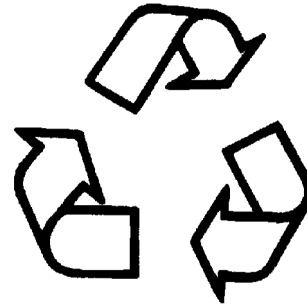


Illustration 22

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.

## Crushing Prevention and Cutting Prevention

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.

## Burn Prevention

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

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes. Always wear protective glasses for servicing batteries. Wash hands after touching the batteries and connectors. Use of gloves is recommended.

## Fire Prevention and Explosion Prevention



Illustration 23

g00704000

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

Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire. Fire may cause personal injury and property damage.

Remove all flammable materials such as fuel, oil, and debris from the machine. Do not allow any flammable materials to accumulate on the machine.

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

Do not operate the machine near any flame.

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 on lines or on tanks that contain flammable fluids. Do not flame cut lines or tanks that contain flammable fluid. Clean any such lines or tanks thoroughly with a nonflammable solvent prior to welding or flame cutting.

Check all electrical wires daily. Repair any wires that are loose or frayed before you operate the machine. Clean all electrical connections and tighten all electrical connections.

Dust that is generated from repairing nonmetallic hoods or nonmetallic fenders can be flammable and/or explosive. Repair such components in a well ventilated area away from open flames or sparks.

Inspect all lines and hoses for wear or for deterioration. The hoses must be properly routed. The lines and the hoses must have adequate support and secure clamps. Tighten all connections to the recommended torque. Leaks can cause fires.



Illustration 24

g00704059

Use caution when you are refueling a machine. Remove debris from the top of the tank before refueling. Do not smoke while you are refueling a machine. Do not refuel a machine near open flames or sparks. Always stop the engine before refueling. Fill the fuel tank outdoors.

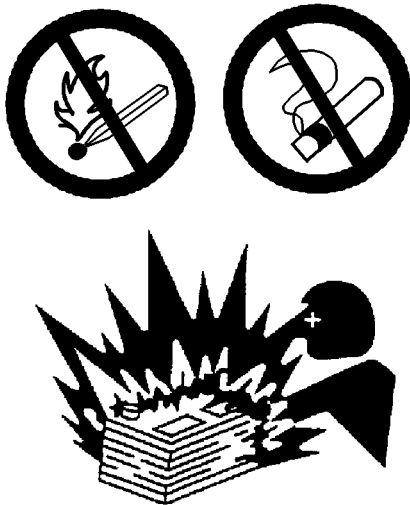


Illustration 25

g00704135

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 or a hydrometer.

Improper jumper cable connections can cause an explosion that can result in injury. Refer to the Operation Section of this manual for specific instructions.

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

## Fire Extinguisher

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

## 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.

Repair any lines that are loose or damaged. Leaks can cause fires. Consult your Caterpillar dealer for repair or for replacement parts.

Check lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Use a board or cardboard to check for leaks. Tighten all connections to the recommended torque.

Replace the 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 ballooning.
- Flexible part of the hoses are kinked.
- Outer covers have 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, and excessive heat.

## Fire Extinguisher Location

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

The recommended location for mounting the fire extinguisher is on the plate for the seat to the right side of the operator.

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

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

## Tire Information

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

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

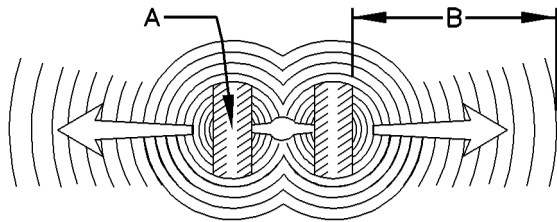


Illustration 26  
(A) At least 15 m (50 ft)  
(B) At least 500 m (1500 ft)

g00847810

Do not approach a warm tire. Maintain a minimum distance, as shown. Stay outside the shaded area in Illustration 26.

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

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

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

## Electrical Storm Injury Prevention

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.

## Before Starting Engine

Operators must have had the proper training and operators must be capable in all aspects of machine operation. To comply with some local requirements, an operator must attain an operators license or a certificate.

You must be familiar with your machine in order to understand the machine's capabilities. Also, before you operate your machine you must become familiar with the job site. If necessary, walk around the area and take note of the following items.

- Check the area for clearance. Check for both vertical clearance and for horizontal clearance.
- Check for the presence of overhead obstructions.
- Check for electrical power lines. Keep the machine and the attachments away from electrical power lines at least 8 m (25 ft).
- Check for steam lines. Check for compressed air lines.
- Check for changes in the stability of the surface of the job site. Check trenches that have been backfilled. Check deteriorated roofs of basements and of tunnels.
- Check sewers and service ducts.

When a load is picked up or when the boom is extended, ensure that the surface on the job site offers even resistance for the tires. Also, when a load is picked up or when the boom is extended, ensure that the surface on the job site offers even penetration for the stabilizers.

Make sure that the load charts and the instruction plates are in place and that the load charts and the instructions can be read. Do not operate the machine until you understand the correct method of using the load charts.

On machines that are equipped with a cab, secure the door in the shut position. Secure the windows in either the open position or in the shut position. Ensure that all windows are clean for the best visibility.



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.

Make sure that all protective guards and covers are secured on the machine.

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 of the machine lights are working properly.

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

Clear all obstacles from the path of the machine.

Before you attempt to start the engine and before you move the machine, ensure that no one is underneath the machine, around the machine, or on the machine. Make sure that the area is free of personnel. Fasten the seat belt.

## Engine Starting

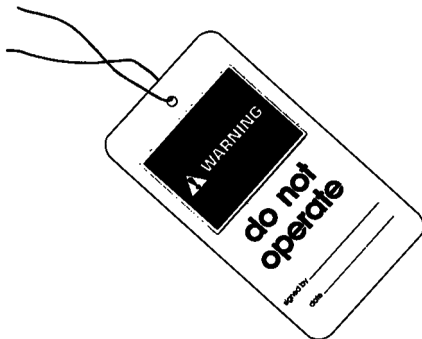


Illustration 27

g00100846

Before you service the machine or before you repair the machine, attach a "DO NOT OPERATE" warning tag or a similar warning tag to the engine start switch or to the controls. This warning tag is available from your Caterpillar dealer.

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

Ensure that the transmission control is in the NEUTRAL position (N). The engine will not start unless the transmission control is in the NEUTRAL position.

Ensure that the parking brake is engaged.

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

Start the engine only when you are properly seated in the operator's compartment. Do not short across the battery terminals and do not short across the batteries. A short could cause a bypass of the engine neutral start system and this could cause the machine to move if the machine was left in gear.

## Before Operation

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

Make sure that all mirrors (if equipped) are clean. For the best vision of the area which is close to the machine, adjust the mirrors. All mirrors should be adjusted for optimal visibility while the operator is seated in the cab.

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

Fasten the seat belt securely.

Make sure that the load charts and the instruction plates are in place and that the load charts and the instructions can be read.

## Operation

### Machine Operating Temperature Range

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

### Machine Operation

Check for proper operation of the steering controls and of the braking controls for the machine while the machine is moving slowly in an open area. Check the steering controls and the braking controls while the boom is retracted fully and the work tool is just clear of the ground. With the machine in a stationary position, check for the proper operation of the other controls for the machine. Unless the machine frame is level, do not raise the boom. The boom should only be extended if the machine frame is level. Extend the boom and retract the boom several times in order to warm the hydraulic oil.

## Travel

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

When you travel on the roadways, operate the machine in two-wheel steer mode only.

Before you maneuver the machine, make sure that no personnel are between the machine and the work tools. Use caution when you change direction of travel. Use caution when you operate the boom. Use caution when you are picking up loads or when you are setting down loads. Travel in the direction of the best visibility. Travel with the boom fully retracted. Also, travel with the boom lowered as far as possible. Maintain adequate ground clearance for conditions. Never travel if a load is raised beyond the travel position. Be careful to avoid any ground condition which could cause the machine to tip. Avoid any conditions that can lead to tipping of the machine. The machine can tip when you work on the following obstacles: banks, hills, and slopes. If the machine is equipped with stabilizers the stabilizers must be fully raised before you move the machine.

## Lifting Capacities

Maintain control of the machine. Do not overload the machine beyond the machine capacity. Ensure that the correct load chart is referenced. Loads must be within the weight limit of the machine and loads must be within the load center limit for the machine. Lifting capacity decreases as the load is moved further from the machine.

**Note:** If an 180-6137 Coupler Adapter Gp for a work tool is installed on the quick coupler, reduce the load carrying capacity of the machine by 200 kg (440 lb) for all work tools and with the boom in any position. Refer to Operation and Maintenance Manual, "Lifting Capacities" for additional information.

Ensure that the tires are serviceable and that the tires are inflated to the correct pressure.

On machines that are equipped with a frame leveling switch, always level the frame before you raise the boom or before you lower the stabilizers. Never operate the frame leveling switch when the boom is raised or when the stabilizers are lowered. Check that the frame is level after you lower the stabilizers. If necessary, adjust the level of the frame. Use the stabilizers in order to make the adjustment. Do not adjust the position of the stabilizers when the boom is raised. If the frame is not level, do not raise the boom.

Before you transport a load or before you elevate a load, the load must be adequately secured on the forks or on the work tool. Any loads such as pipe, scaffolding, lumber and beams must be adequately secured.

Use lifting slings that are approved and use lifting slings that are load tested. Also, all wire ropes or chains must be properly maintained. The wire ropes and chains must meet local regulations. You must know the load carrying capacity of these devices and you must know the correct use of these devices.

## Work Tools

### **WARNING**

**Use of non approved work tools on Telehandler machines could result in injury or death.**

**Before installing a work tool on this machine, ensure that it is approved by Caterpillar and that a Caterpillar load chart covering its use is installed in the machine's cab.**

### NOTICE

When certain work tools are fitted, the work tools can contact the front tires or the front fenders. This situation can occur when the boom is retracted and the work tool is rotated fully forward. Always check for interference when first operating a new work tool.

Before you use a work tool, ensure that the work tool is approved by Caterpillar. Also, ensure that the machine has a Caterpillar load chart. Consult your Caterpillar dealer for information on the proper application and the proper use of a specific work tool.

## Engine Stopping

Do not stop the engine immediately after the machine has been operated under load. This can cause overheating and accelerated wear of engine components.

After the machine is parked and the parking brake is engaged, allow the engine to run for five minutes before shutdown. This allows hot areas of the engine to cool gradually.

For more information, refer to the following topics in the Operation Section of the Operation and Maintenance Manual:

- "Stopping the Engine"
- "Stopping the Engine if an Electrical Malfunction Occurs"

## Work Tools

### **WARNING**

**Use of non approved work tools on Telehandler machines could result in injury or death.**

**Before installing a work tool on this machine, ensure that it is approved by Caterpillar and that a Caterpillar load chart covering its use is installed in the machine's cab.**

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.

## Parking

Park the machine on a level surface. If you must park on a grade, chock the machine's wheels. The boom must be fully retracted. Fully retract the boom and lower the boom until the work tool is on the ground.

Apply the service brakes in order to stop the machine. Move the transmission control to the NEUTRAL position. Move the accelerator control to the LOW IDLE position. Engage the parking brake.

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

Stop the engine.

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

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

## Equipment Lowering with Loss of Hydraulic Power

Before you lower any equipment with loss of hydraulic power, clear the area around the equipment of all personnel. The procedure to lower the equipment will vary with the type of equipment that is being lowered. Most systems use high pressure air or fluid to control the equipment. The procedure may release the pressure in a high pressure system in order to lower the equipment. Wear appropriate protective equipment. Follow the established procedure for lowering equipment without hydraulic power in the Operation Section of the Operation and Maintenance Manual.

## Sound Information and Vibration Information

### Sound Level

The operator sound pressure level that is measured according to the test procedure that is specified in "EN 12053:2001" is 80 dB(A) for an enclosed cab. The cab was properly installed and maintained. The test was conducted with the doors and the 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.

### Vibration Level

The hands and arms are exposed to a weighted root mean square acceleration that is less than 2.5 m/sec<sup>2</sup> (8.20 ft/sec<sup>2</sup>).

The whole body is exposed to a weighted root mean square acceleration that is less than 0.5000 m/s<sup>2</sup> (1.70 ft/sec<sup>2</sup>).

The measurements are obtained on a standard machine. The measurements are obtained by using the procedures that are in the following standards:

- "ISO 2631-1:1997"
- "ISO 5349-1:2001"
- "SAE J1166"

## Operator Station

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

## Guards (Operator Protection)

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)

The ROPS/FOPS Structure (if equipped) on your machine is specifically designed, tested and certified for that machine. Excavators are not equipped with ROPS structures. 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.

## Other Guards (If Equipped)

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

A front guard needs to be installed when a work tool that creates flying objects is used. Mesh front guards that are approved by Caterpillar or polycarbonate front guards that are approved by Caterpillar are available for machines with a cab or an open canopy. On machines that are equipped with cabs, the windshield 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

### Lifting Capacities

When a machine is operated on tires, the machine capacities are different from a machine that is operated on stabilizers. Also, the machine capacities for each type of attachment are different.

#### **WARNING**

**Machine instability can result in injury or death. To ensure stability during operation the following conditions must be observed:**

**Tires must be correctly inflated and have the correct amount of ballast (if equipped).**

**The machine frame must be level.**

**The frame level switch must never be operated when the boom is raised.**

**The frame level switch must never be operated when stabilizers are lowered.**

**Stabilizer switches must never be operated when the boom is raised.**

**The correct load chart for the machine as equipped must be referenced and the weights and load centers specified must never be exceeded.**

**The machine must never be moved when the boom is raised.**

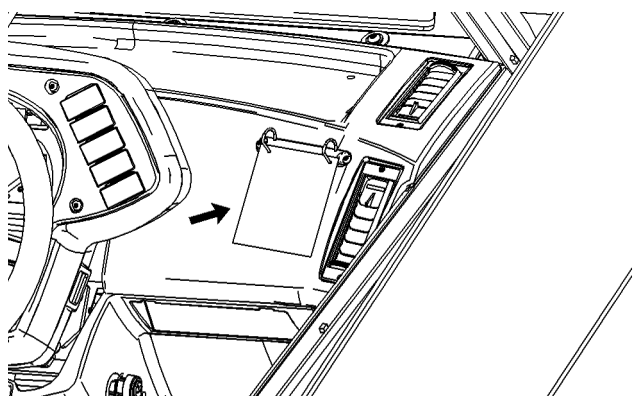


Illustration 28

g00955167

The load charts are located on the dash panel at the right side of the instrument cluster. Ensure that the correct load chart is used. The chart is intended for the type of attachment that is represented by a symbol at the top of the chart. Symbols are also shown for operation on tires or on stabilizers. The load charts may be in metric units (meters and kilograms) or conventional units (feet and pounds).

When the machine is operated on tires, the weight of the intended load determines the maximum height above ground. The weight of the intended load also determines the maximum distance that is between the load center of gravity and the front wheels.

When the machine is operated with lowered stabilizers, the weight of the intended load determines the maximum height above ground. The weight of the intended load also determines the maximum distance that is between the load center of gravity and the stabilizer pads.

The machine boom has two scales which must be used for reference with the load chart in order to assess the lift operation. The boom extension reference scale gives an indication of the boom length. The letters "B", "C" and "D" correspond to the same letters on the load chart. The letter "A" on the load chart corresponds to the fully retracted position of the boom. The letter "E" on the load chart corresponds to the fully extended position of the boom.

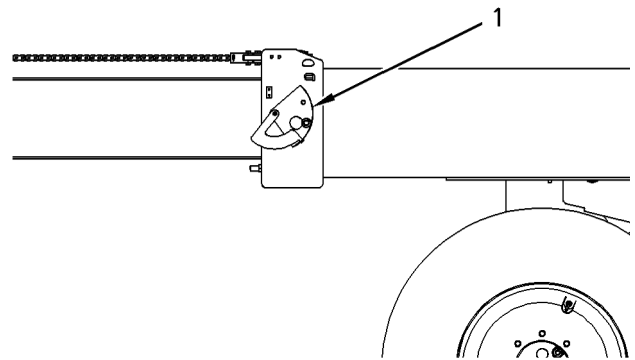


Illustration 29

g00955168

Boom angle reference scale (1) gives an indication of the angle of the boom.

Follow the instructions below in order to assess the intended load:

1. Carefully position the machine. The machine should be as close as possible to the intended load. For more information on operating the machine, refer to the appropriate topic in the Operation Section of the Operation and Maintenance Manual.
2. In order to move the attachment into position for the operation, raise the boom and extend the boom, as required. **Do not make the lift operation.**
3. Look at the boom extension reference scale and the boom angle reference scale and note the readings. Refer to the load chart and use these two values in order to locate the equivalent load zone.

4. If the intended load is equal to the value in the equivalent load zone the lift operation can be attempted with caution. Also, if the intended load is less than the value in the equivalent load zone the lift operation can be attempted with caution.
5. If the intended load is heavier than the value in the equivalent load zone the lift operation cannot be made.

## Examples of Estimating the Lift Operation from the Load Chart

**Note:** In the examples that follow, the numbers are from the load chart that is shown at the end of this section. This load chart is only for illustrative purposes. This load chart does not relate to any particular machine. The numbers that are quoted have no units. The units on the load charts which are installed in a particular machine may be kilograms or pounds.

### Example 1

- The weight of the intended load is 45 units.
- The boom angle reference is 56 degrees.
- The boom extension reference scale is at "D".

With reference to the load chart, "X" is the point of intersection for the values of the boom angle reference and the boom extension reference. This point of intersection is in the load zone for 80 units. The intended load of 45 units is less than the value in the load zone so the load chart indicates that the load is within the capacity of the machine.

### Example 2

- The weight of the intended load is 125 units.
- The boom angle reference is 40 degrees.
- The boom extension reference scale is at "B".

With reference to the load chart, "Y" is the point of intersection for the values of the boom angle reference and the boom extension reference. This point of intersection is in the load zone for 125 units. The intended load of 125 units is the same value as the value in the load zone so the load chart indicates that the load is at the maximum capacity of the machine.

### Example 3

- The weight of the intended load is 27 units.
- The boom angle reference is 22 degrees.
- The boom extension reference scale is approximately 66 percent between "D" and full extension. Full extension is "E" on the load chart.

With reference to the load chart, "Z" is the point of intersection for the values of the boom angle reference and the boom extension reference. This point of intersection is in the load zone for 20 units. The

intended load of 27 units is greater than the value in the load zone so the load chart indicates that the load is beyond the capacity of the machine. **The lift operation must not be attempted.**

If the load chart indicates that the lift operation is within the capacity of the machine, attempt to make the operation but proceed with care. Remember that the load may weigh more than the estimate for the load. The load chart is for estimating the lift operation only.

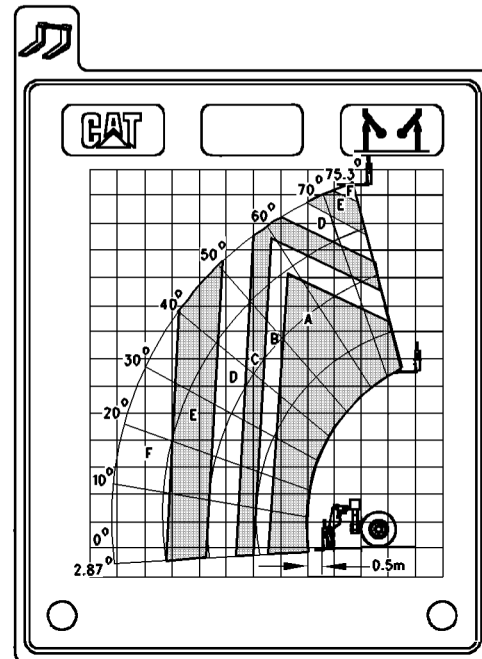


Illustration 30  
Typical Load Chart

g00992051

## Specifications

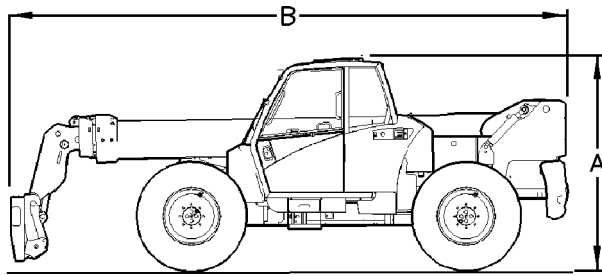


Illustration 31  
Side View

g00855391

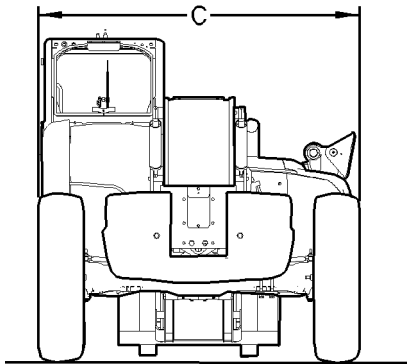


Illustration 32  
Rear View

g00855455

Specifications are shown for basic machines without a work tool on the quick coupler.

Table 1

TH560B Machine	
Overall Height (A)	2548 mm (100.3 inch)
Overall Length (B)	6943 mm (273.3 inch)
Overall Width (C)	2585 mm (101.8 inch)
Wheel Base	3250 mm (128 inch)
Ground Clearance	519 mm (20.4 inch)
Approximate Weight	12000 kg (26455 lb)

## Intended Use

This vehicle is classified either as:

- A self-propelled variable reach truck (Telehandler) as defined in "ISO 3691-2" and "EN 1459:1998"
- An agricultural tractor when meeting the requirements of European Union Directive 74/150/EEC

This vehicle is all wheel drive and has all wheel steer ability. This vehicle has a rigid chassis with a variable

reach boom mounted centrally on to which a range of Caterpillar approved attachments may be attached.

As a machine, the vehicle has a primary use as a material handler to pickup and place materials. As an agricultural tractor, the vehicle has a primary use for towing.

## Application/Configuration Restrictions

Maximum approved operating weight - 13600 kg (29920 lb)

Maximum drawbar towing force - Refer to Operation and Maintenance Manual, "Towing the Machine" for more information.

Maximum drawbar vertical load - Refer to Operation and Maintenance Manual, "Towing the Machine" for more information.

Maximum fore and aft slope on this machine in a static condition to maintain proper lubrication -

- For machines equipped with a 92 kW or 93.1 kW engine, 57.7 percent grade or 30 degrees
- For machines equipped with a 74.5 kW engine, 44.5 percent grade or 24 degrees

# Identification Information

## Plate Locations and Film Locations

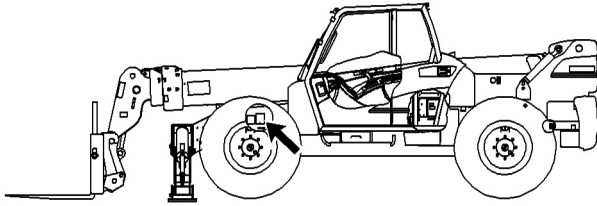
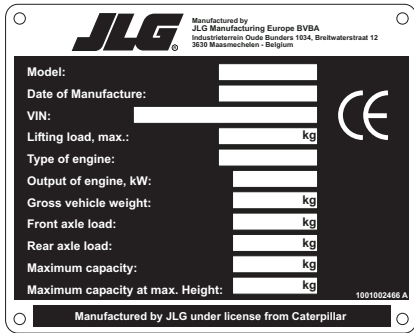


Illustration 33

g00937576



AOM0980

An information plate is installed on these machines. On machines that are delivered into the European Union, the CE mark and the PIN are stamped onto the plate. On machines that are delivered to countries outside the European Union, the PIN is stamped onto the plate. This plate is positioned on the left side of the main frame.

The PIN is used to identify a powered machine that is designed for an operator to ride. The PIN plate is located at the left side of the main frame.

The PIN plate shows the PIN and the number for the arrangement of the machine.

Several pieces of information are stamped onto the PIN plate. For quick reference, record this information in the spaces that are provided below.

- Model \_\_\_\_\_
- PIN \_\_\_\_\_
- Engine serial number \_\_\_\_\_
- Transmission serial number \_\_\_\_\_

## Serial Number

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

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

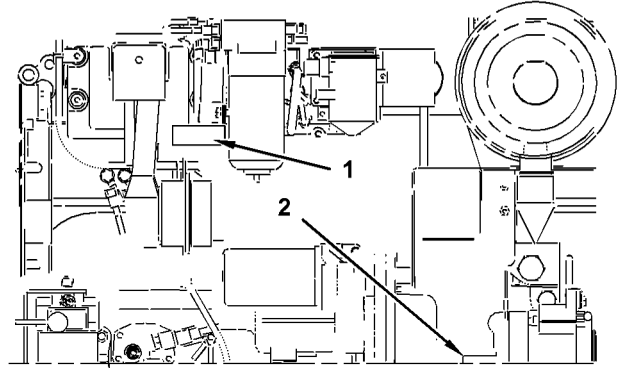
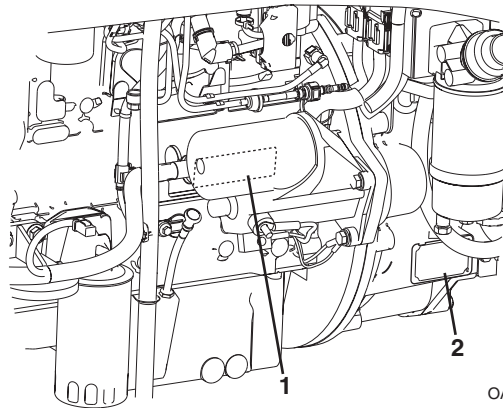


Illustration 35  
Tier II

g01042684

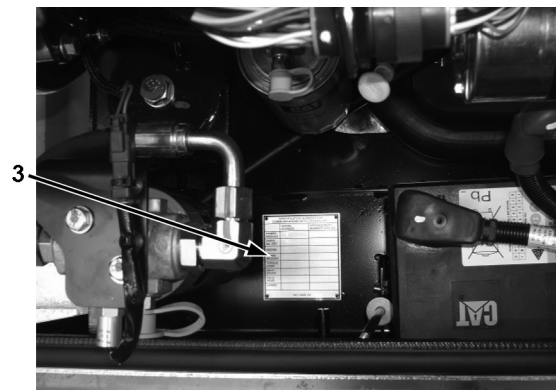


Tier III

OAM1290

(1) Engine Serial Number \_\_\_\_\_

(2) Transmission Serial Number \_\_\_\_\_



(3) Engine Pod Serial Number \_\_\_\_\_



## Certification

### European Union

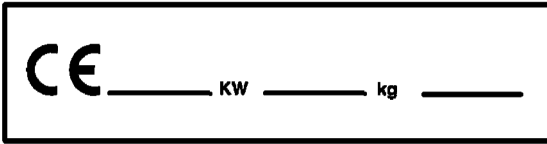


Illustration 36

g00853367

If the machine is equipped with the plate for the European Union, this plate will be attached to the PIN plate. Several pieces of information are stamped onto the CE plate. For quick reference, record this information in the spaces that are provided below.

- Engine Power (kW) \_\_\_\_\_
- Machine Weight (kg) \_\_\_\_\_
- Year of Manufacture \_\_\_\_\_

### Sound

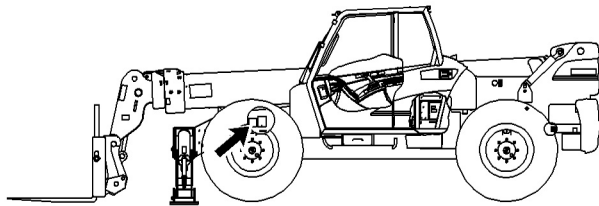


Illustration 37

g00937584

This message is located on the left side of the main frame.

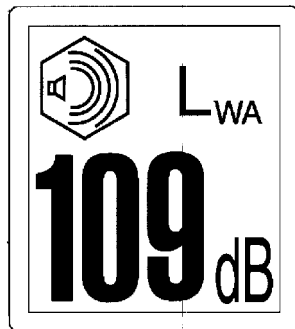


Illustration 38

g00933634

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

If equipped, the certification film is used to verify the environmental sound certification of the machine. The value that is listed on the film indicates the guaranteed sound power level. The guaranteed sound power level is measured at the time of manufacture. The

guaranteed sound power level is measured according to the conditions that are specified in "2000/14/EC".

### ROPS/FOPS Film

This safety sign is positioned behind the seat near the rear window.

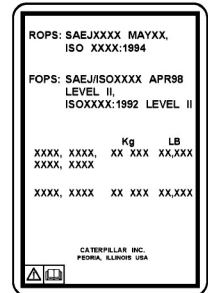
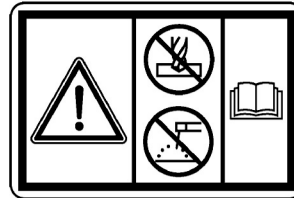


Illustration 39

g01211890

## ⚠ WARNING

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

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

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

### Machine Security System

If equipped, this message is used to verify the certification of the Machine Security System (MSS) as a RF transmitter. The following specifications are provided to aid in ensuring compliance with all local regulations:

Table 2

Field strength(1)	16.12 dB micro-amp/meter
Operating frequency range	134.2 kHz
Operating time(	0.055 seconds (1/18 second)

(1) Field strength at 10 meters

(2) The operating time is measured after the keyswitch is first activated.

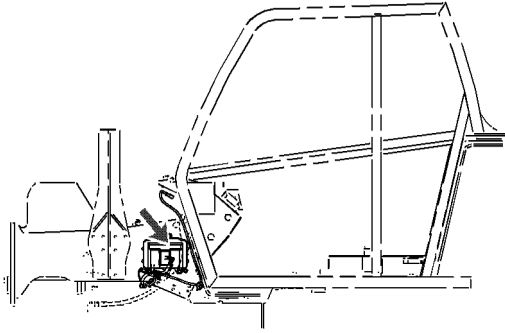


Illustration 40

g01015547

This plate is located on the control group for the MSS. The control group is located in the engine compartment.

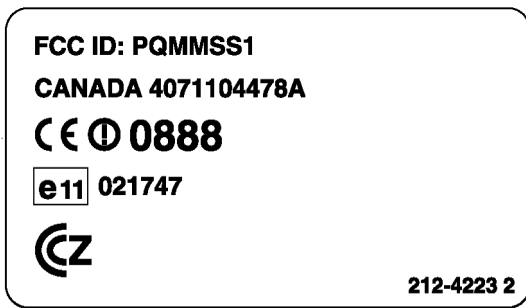


Illustration 41

g00995393

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

## Italian Rading Homologation

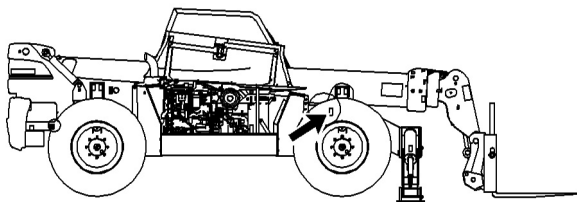


Illustration 42

g00937590

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

CATERPILLAR INC.	
TYPE	
MODEL	
NUMBER OF THIS DOCUMENT	
DATE OF THIS DOCUMENT	
REVISION NUMBER	
FOR PARTS	
NO.	
MARKING INFORMATION:	12
1. ALL INFORMATION IS TO BE MAINTAINED IN THE ORIGINAL LANGUAGE.	
2. ALL INFORMATION IS TO BE MAINTAINED IN THE ORIGINAL LANGUAGE.	
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Illustration 43

g00937218

The following information is stamped on the plate:


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

## Emissions Certification Film

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

If equipped, the EPA/EU Emission Certification Film is located on the side of the engine block.

A typical example is shown.

IMPORTANT ENGINE INFORMATION		#####	Engine Type
Engine Family: #####12#### Displacement: ##4# #####: #####12#### EPA Family: #####12####		 Refer to manufacturer. oil*97/68## #####16##### ##4#: #####15#####	Factory Reset if Setting Applicable <input type="checkbox"/> ##4*/##4# <input type="checkbox"/>
EPA Family Max Values	Advertised kW: ##5## @ RPM: ##4# Fuel Rate at adv. kW: ##5##mm <sup>3</sup> /stK Init. Timing: #####11#### MLIT ##7###		<input type="checkbox"/> ##4*/##4# <input type="checkbox"/> <input type="checkbox"/> ##4*/##4# <input type="checkbox"/> <input type="checkbox"/> ##4*/##4# <input type="checkbox"/>
Settings are to be made at normal operating temperature with transmission in neutral. This engine conforms to ##4# U.S. EPA non-road and California off-road Regulations for large C.I. engines and is certified to operate on commercially available diesel fuel.			<input type="checkbox"/> ##4*/##4# <input type="checkbox"/>
Emissions Control System: #####16#####	Valve Lash Cold (inch): Exhaust##5## Inlet##5##	#####11#### LABEL	Use service tool to verify current engine settings
Hanger No.##3#	Position ##4#	Label No.3181A081	

The EPA/EU Emissions Certification Film (if applicable) is located either on the side, the top, or the front of the engine.



## Operation Section

### Before Operation

#### Mounting and Dismounting

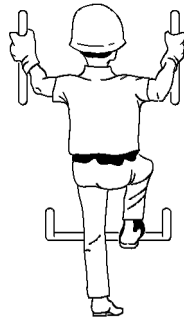


Illustration 46  
Typical example

g00037860

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.

#### Alternate Exit

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

## Daily Inspection

### WARNING

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

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

Steam can cause personal injury.

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

Remove the cooling system pressure cap slowly to relieve pressure.

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

### NOTICE

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

### 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:** For maximum service life of the machine, make a thorough daily inspection before you operate the machine. Inspect the machine for leaks. 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. Inspect all lights and mirrors for damage. If visibility is impaired, adjust or replace the lights and the mirrors. Inspect the brackets for the lights and the mirrors. Replace the brackets if damage or corrosion exists. Check the condition of the fan drive belt. Check the fuel gauge. If necessary, fill the fuel system. Make the needed repairs before you operate the machine.

Perform the following procedures on a daily basis.

- Backup Alarm - Test
- Braking System - Test
- Cooling System Coolant Level - Check
- Engine Oil Level - Check
- Fuel System Water Separator - Drain
- Fuel Tank Water and Sediment - Drain
- Indicators and Gauges - Test
- Seat Belt - Inspect
- Tire Inflation - Check
- Transmission and Hydraulic System Oil Level - Check
- Wheel Nut Torque - Check
- Windows - Clean
- Work Tool - Inspect/Replace

Refer to the Maintenance Section for the detailed procedures. Refer to the Maintenance Interval Schedule for a complete list of scheduled maintenance.

## Machine Operation

### Alternate Exit

The rear window can be used as an alternate exit on machines which are equipped with an enclosed cab. If the primary exit is blocked, exit the machine through the rear window.

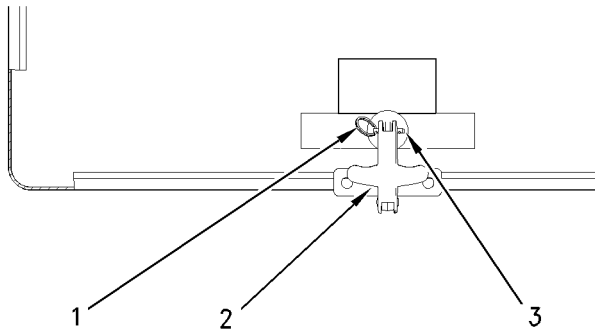


Illustration 47

g00951976

Use ring (1) on rear window latch (2) in order to pull out retaining pin (3). This action will unlock the rear window.

For repair of the window or replacement of the window, consult your Caterpillar dealer.

### Seat

The seat must be adjusted in order to suit the operator. When you are sitting against the back of the seat, the seat must also be adjusted so that you are allowed full travel of the foot controls.

Lock the seat into position before you operate the machine in order to prevent movement of the seat.

Always use the seat belt when you operate the machine.

### Seat Adjustment

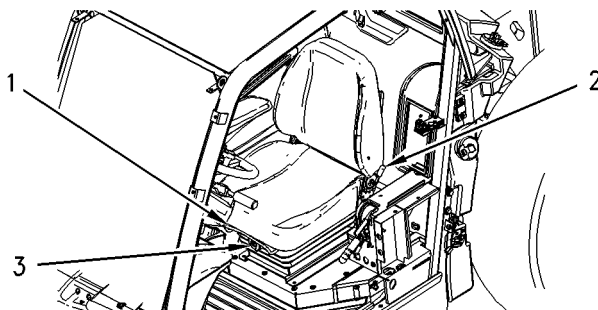


Illustration 48

g00950445

**Fore/aft Lever (1)** - Lift the fore/aft lever and slide the seat to the required position. Release the fore/aft lever in order to lock the seat in place.

**Seat Recline Lever (2)** - This allows the backrest to be set at one of three different angles. Push the seat recline lever rearward and move the backrest to the required angle. Release the seat recline lever in order to lock the backrest in place.

When you have adjusted the seat, ensure that all the controls for the seat are locked in order to prevent unexpected movement.

### Suspension (If Equipped)

#### Adjustment Lever (3) for the Seat Suspension -

Adjust the suspension with the adjustment lever. The suspension must be set while the operator is seated. The indicator for the seat suspension should be in the green zone.

If the indicator for the seat suspension is in the red zone, pull out the handle of adjustment lever (3) and turn the handle counterclockwise until the indicator is in the green zone.

**Note:** The indicator can be anywhere within the green zone. This allows a range of seat heights for a particular operator.

When you have adjusted the seat, ensure that all the controls for the seat are locked in order to prevent unexpected movement.

### Air Suspension (If Equipped)

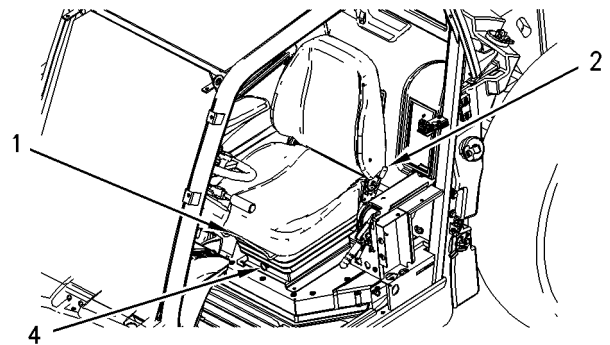


Illustration 49

g00950464



**Weight Adjustment Switch (4)** - Adjust the seat height with the weight adjustment switch. The seat height must be set while the operator is seated. Adjust the seat height until the indicator is in the green zone.

**Note:** The indicator can be anywhere within the green zone. This allows a range of seat heights for a particular operator.

When you have adjusted the seat, ensure that all the controls for the seat are locked in order to prevent unexpected movement.

## Storage Compartment

A storage compartment is located on the back of the operator seat. This may be used for storing documents or other small objects.

## Seat Belt

**Note:** This machine was equipped with a seat belt when the machine was shipped from the manufacturer. At the time of installation, the seat belt and the instructions for installation of the seat belt meet the SAE J386 standards. See your Caterpillar 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

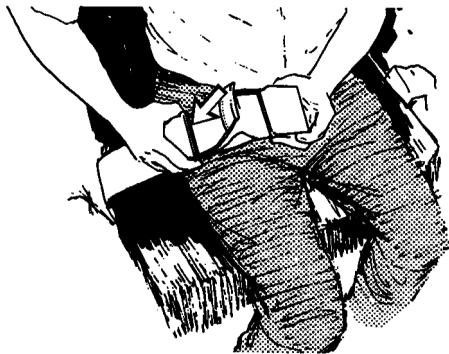


Illustration 50

g00100709

1. Unfasten the seat belt.

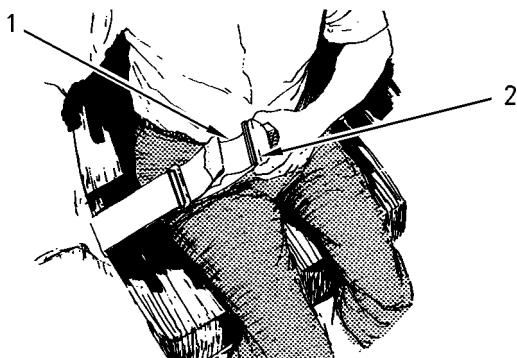


Illustration 51

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

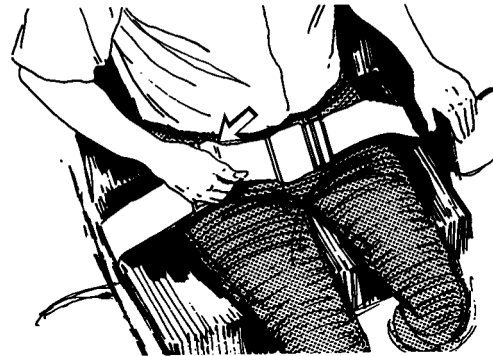


Illustration 52

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

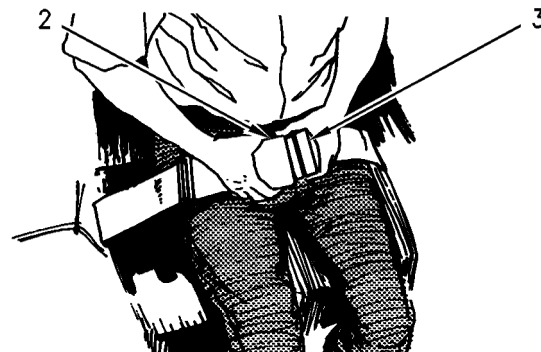


Illustration 53

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.



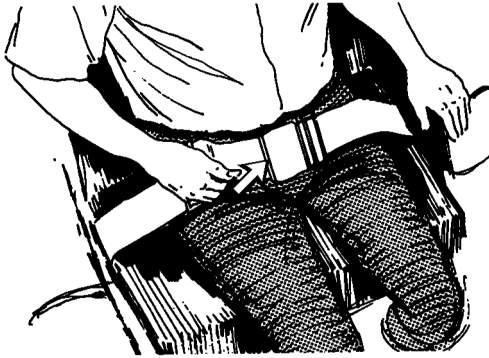
**Releasing The Seat Belt**

Illustration 54

g00100717

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

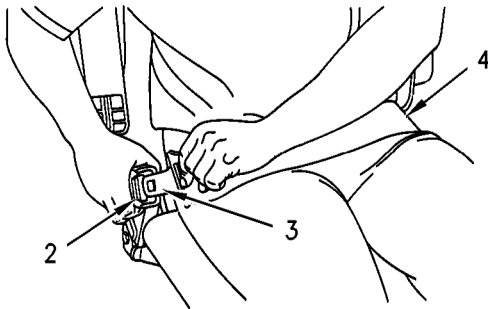
**Seat Belt Adjustment for Retractable Seat Belts****Fastening The Seat Belt**

Illustration 55

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.

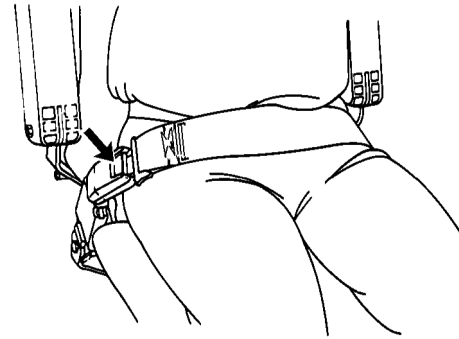
**Releasing The Seat Belt**

Illustration 56

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.

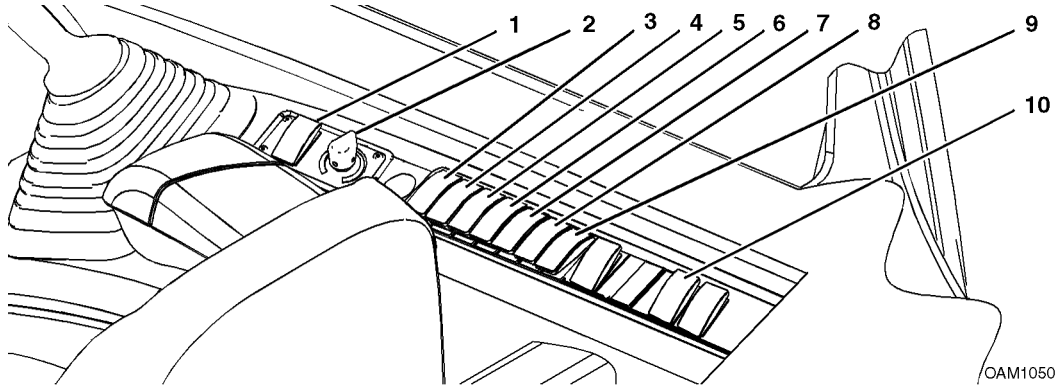
The retractor system may or may not lock up depending on the length of the extension and the size of the person. If the retractor does not lock up, the seat belt will not retain the person.

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

## Operator Controls (Side Console)



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

### Fan Control (1)



**Fan Control** - Push the bottom of the switch in order to operate the fan at low speed. Set the switch in the MIDDLE position to operate the fan at medium speed. Push the top of the switch in order to operate the fan at high speed.

### Temperature Control (2)



**Temperature Control** - Turning the temperature control clockwise provides warmed air. Turning the temperature control counterclockwise provides cooler air.

### Heating and Air Conditioning Control (3)



**Heating and Air Conditioning Switch** - Push the top of the switch in order to operate the heater. Set the switch in the MIDDLE position in order to return the switch to the OFF position. Push the bottom of the switch in order to operate the air conditioning compressor.

**Note:** Use the air conditioning in conjunction with the temperature control and the fan control in order to reduce the temperature of the cab. The air conditioning compressor may be operated intermittently during heater operation in order to remove excess humidity from the cab.

### Front Window Wiper (4)



**Front Window Wiper** - When the bottom of switch is pressed, the switch is in the OFF position. Press the top of the switch one click in order to operate the wiper motor at slow speed. In order to operate the motor at high speed, press the top of switch to the next detent.

### Front Window Washer (5)



**Front Window Washer** - Push the top of switch and hold the top of switch in order to activate the washer motor. Release the switch. The switch will return to the OFF position.

### Roof Wiper/Washer (6)



**Roof Wiper/Washer** - Push the top of switch in order to operate the window wiper for the roof. Push the switch and hold the top of switch in order to activate the pump for the washer and the window wiper for the roof. Release the top of the switch. The switch will return to the OFF position.

### Rear Window Wiper and Washer (7)



**Rear Window Wiper and Washer** - Push the top of the switch in order to operate the rear window wiper. Push the switch and hold the top of switch in order to activate the pump for the washer and the rear window wiper. Release the top of the switch. The switch will return to the OFF position.

### Rear Work Lights (8)



**Rear Work Lights** - Push the top of switch in order to turn on the work light. Push the bottom of the switch in order to turn off the work light.

### Front Work Lights (9)



**Front Work Lights** - Push the top of switch in order to turn on the work light. Push the bottom of the switch in order to turn off the work light.

### Hydraulic Lockout Control (10)

When the top of the switch is pressed, all the machine functions are operational.

When the bottom of the switch is pressed, the switch locks in this position. In this position, only the following machine functions are operational:

- Transmission control
- Steering control

When the bottom of the switch is pressed, the following machine functions are locked out:

- Boom raise
- Boom lower
- Boom extend
- Boom retract

- Quick coupler
- Auxiliary actuators
- Stabilizers

When the machine is driven on public roads, the bottom of the switch should be pressed. This will help prevent accidental movement of hydraulically controlled components.

To allow operation of hydraulic components again, move the red lock on the switch to the left, and press the top of the switch.

## Operator Controls

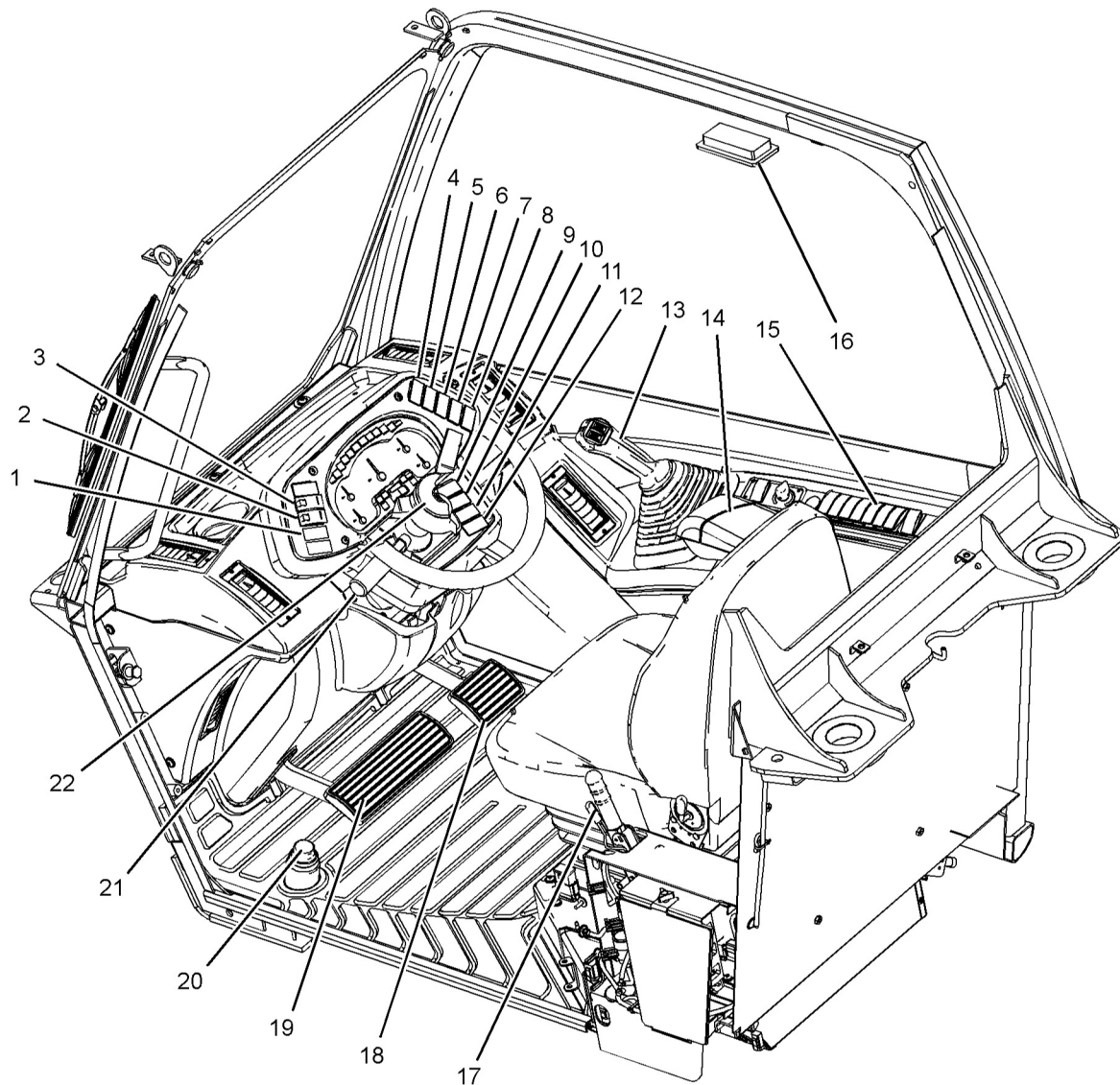


Illustration 58

g01213438

- |                                       |  |
|---------------------------------------|--|
| (1) Quick coupler control             | (12) Rotating beacon light               |
| (2) Transmission neutralizer control  | (13) Joystick control                    |
| (3) Steering mode control             | (14) Adjustable armrest                  |
| (4) Frame leveling control            | (15) Side console                        |
| (5) Left stabilizer control           | (16) Interior light                      |
| (6) Right stabilizer control          | (17) Parking and secondary brake control |
| (7) Continuous auxiliary flow control | (18) Accelerator control                 |
| (8) Fog lights                        | (19) Service brake control               |
| (9) Hazard flashers                   | (20) Differential lock control           |
| (10) Headlight dimmer switch          | (21) Transmission control                |
| (11) Headlight-Parking lights         | (22) Horn                                |

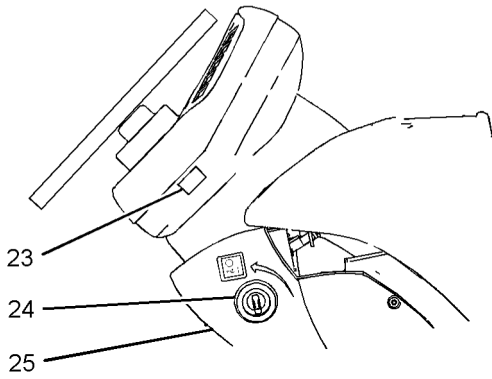


Illustration 59  
(23) Directional turn signal control  
(24) Engine start switch  
(25) Steering column tilt control

g01111391

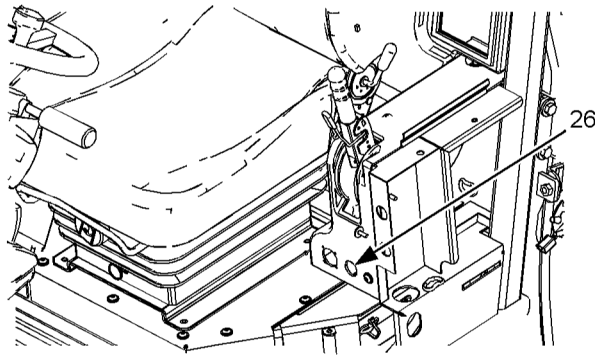


Illustration 60  
(26) 12 volt power receptacle

g01055996

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

### Quick Coupler Control (1)

**Quick Coupler Control** - This is a three-position switch, if equipped. When switch (2) is released, the switch will return to the HOLD position.



**Disengage** - Move the red slider on the switch downward, and push the top of switch. Hold the top of switch until the quick coupler pins are fully disengaged.



**Hold** - When the switch is released, the switch will return to the HOLD position.



**Engage** - Press the bottom of the switch. Hold the bottom of the switch until the quick coupler pins are fully engaged.



## Transmission Neutralizer Control (2)

### ! WARNING

If the transmission neutralizer control switch is in the ON position and the service brake control pedal is pressed, the transmission will shift into NEUTRAL. When the service brake control pedal is released it will take a short period of time for the transmission to reengage the original gear. If the machine is on a hill during this time, the machine can roll forward or the machine can roll backward. The unexpected movement of the machine could cause personal injury or death. Refer to Operation and Maintenance Manual, "Transmission Control" for additional information.



**Transmission Neutralizer Control** - This is a two-position switch, if equipped. Push the top of the switch in order for the transmission neutralizer to be operational. A lamp inside the switch will be illuminated. The transmission will be neutralized whenever the service brake is applied. Push the bottom of the switch in order for the transmission to remain engaged whenever the service brake is applied.

## Steering Mode Control (3)

### ! WARNING

Personal injury or death can result if the machine is roaded in any mode other than two-wheel steer.

Always road the machine with the rear wheels centered and the machine in the two-wheel steer mode.

### NOTICE

To avoid possible damage to the steering system, always center the rear wheels before operating the machine in the two-wheel steer mode.

It is important to check the alignment of the wheels at least once per day. Failure to do this may result in reduced accuracy in the steering system.



**Steering Mode Select Switch** - This three-position switch controls the steering mode. Push the top of switch (3) in order to select crab steer. Set switch (3) to the middle position in order to select two-wheel steer. Push the bottom of switch (3) in order to select circle steer.

**Note:** Always move the front wheels and the rear wheels to the straight ahead position before you change the steering modes.

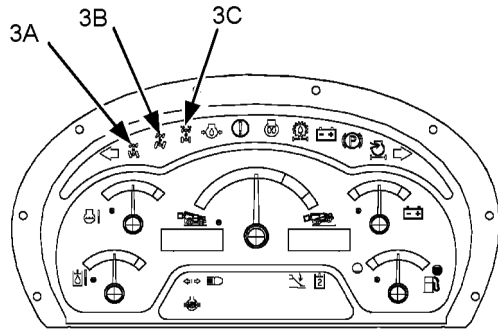


Illustration 61

g01014284



**Circle Steer Mode** - When circle steer mode is selected, indicator (3A) is illuminated.



**Crab Steer Mode** - When crab steer mode is selected, indicator (3B) is illuminated.



**Two-Wheel Steer Mode** - When two-wheel steer mode is selected, indicator (3C) is illuminated.

### Use of Steering Modes

The machine can be operated in the following steering modes:

- Two-Wheel Steer
- Circle Steer
- Crab Steer

Only the front wheels are steered in two-wheel steer mode. This mode must be used when you road the machine. Use circle steer mode for normal operation. When the machine is in circle steer mode, the front wheels and the rear wheels turn in opposite directions. This allows the machine to make tighter turns. When the machine is in crab steer mode, the front wheels and the rear wheels turn in the same direction. When you select the crab steer mode, the machine will move forward and the machine will move to one side. Alternatively, the machine will move backward and the machine will move to one side. This allows the machine to operate in confined locations.

### Checking or Synchronizing the Wheels

#### Machines with Steer Sensors

1. In a static position, select circle steer mode and ensure that the circle steer mode indicator is constantly illuminated. Adjust the steering wheel, as required.
2. Select two-wheel steer mode and ensure that the two-wheel steer mode indicator is constantly illuminated. Adjust the steering wheel, as required.

3. Select your desired steer mode and use as normal.

#### Machines without Steer Sensors

1. In a static position, select circle steer mode. By using your eyes, align the rear wheels to a straight position.
2. Select two-wheel steer mode. By using your eyes, align the front wheels to a straight position.
3. Select your desired steer mode and use as normal.

**Note:** It is important not to try to turn the steering wheel once the ignition is turned to the OFF position. This can lead to steer misalignment, which will result in reduced accuracy of the steering system.

### Steering Arrangement Without Self-Aligning Rear Steering

When you change the steering mode, it is possible for the steering to go out of synchronization. This will happen under the following conditions:

- The rear wheels are not positioned straight when you change from circle steer mode to two-wheel steer mode.
- The rear wheels are not positioned straight when you change from crab steer mode to two-wheel steer mode.
- All four wheels are not positioned straight when you change from circle steer mode to crab steer mode.
- All four wheels are not positioned straight when you change from crab steer mode to circle steer mode.

Use the following procedure in order to synchronize the steering:

1. Stop the machine while either crab steer mode or circle steer mode is selected.

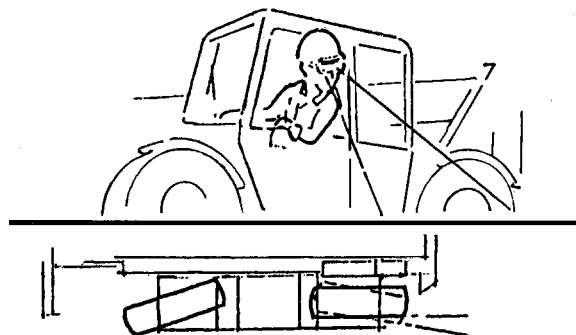


Illustration 62

g00603627

2. Turn the steering wheel until the left rear wheel is in line with the side of the machine.

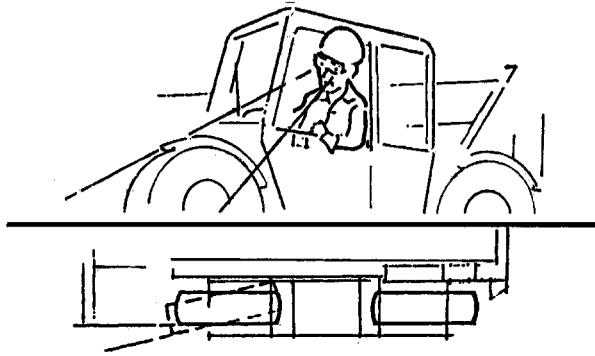


Illustration 63

g00603632

3. Change to two-wheel steer and turn the steering wheel until the left front wheel is in line with the side of the machine.
4. Change to either crab steer mode or circle steer mode, as required.

### Steering Arrangement with Self-Aligning Rear Steering

Your machine may be equipped with self-aligning rear steering. The self-aligning feature ensures that the rear wheels are aligned before the steering mode is changed.

When switch (3) is pressed by the operator, the machine will not change to the desired steering mode unless the rear wheels are in the straight ahead position.

If switch (3) is pressed by the operator and the rear wheels of the machine are not aligned, the current steering mode will remain selected. The indicator for the current steering mode on the display panel will remain on, and the desired mode indicator will flash. When the rear wheels are moved to the straight ahead position by the operator, the steering mode will then change to the desired mode.

### Frame Leveling Control (4)

If equipped, the frame leveling control (switch) is a three-position switch.

The frame leveling control is used to level the machine when the machine is on an uneven surface. The frame leveling control can cause the frame to tilt to the left or to the right. The maximum amount of tilt is 10 degrees in either of these directions.

Lower the boom before you use the frame leveling control. The boom must be close to the ground.

Press the right side of the switch in order to lower the right side of the frame. The frame rotates clockwise in relation to the axles.

Press the left side of the switch in order to lower the left side of the frame. The frame rotates counterclockwise in relation to the axles.

When the switch is released, the frame leveling control returns to the HOLD position.

Use the level indicator to determine when the frame is level. The frame is level when the bubble is in the middle of the sight glass.

### Stabilizer Controls (5), (6)

#### **WARNING**

Machine instability could result if the following conditions are not observed:

**The proper load chart is used. The capacities that are shown on the load charts are not exceeded.**

**The boom is fully retracted and lowered to the travel position before raising the stabilizers.**

**The areas adjacent to the stabilizers are clear and will provide uniform support for weight of the machine and intended load.**

**The machine is not leveled using the frame level control when the stabilizers are lowered.**

**The stabilizers are not used except as described in the following instructions. Incorrect use of stabilizers could result in injury or death.**

#### **WARNING**

**Do not operate the stabilizers when personnel are nearby. Ensure that personnel stand clear when the stabilizers are being raised or lowered. Ensure that both stabilizers are fully raised before moving the machine. Operating the stabilizers when personnel are nearby could result in personal injury or death.**



**Left Stabilizer (5) (if equipped)** - This is a spring return switch with three positions.

Push the right of the switch in order to raise the left stabilizer. Release the switch in order to stop the stabilizer from rising. The switch will return to the HOLD position. Push the left of the switch in order to lower the stabilizer. Release the switch in order to stop the stabilizer from lowering. The switch will return to the hold position. When the switch is returned to the HOLD position, the switch will be locked.



**Right Stabilizer (6) (if equipped)** - This is a spring return switch with three positions.

Push the right of the switch in order to raise the right stabilizer. Release the switch in order to stop the stabilizer from rising. The switch will return to the HOLD position. Push the left of the switch in order to lower the stabilizer. Release the switch in order to stop the stabilizer from lowering. The switch will return to the HOLD position.

When the stabilizers are lowered, the machine is capable of operating with heavier loads when the boom is at certain combinations of angle and length.

When the stabilizers are lowered, the forward stability of the machine is increased when the boom is at all combinations of angle and length. Never rely on the stability of the machine as a guide to the maximum capacity. Always refer to the proper load chart. Never exceed the capacities that are shown on the load charts.

Use the following procedure for lowering the stabilizers:

1. Run the engine at a speed that is sufficient to supply enough hydraulic power.
2. Level the machine by operating frame leveling control (4) and observing the level indicator. Never use the frame leveling control after you lower the stabilizers.
3. Push the left of switch (5) and hold the switch in order to lower the left stabilizer. Observe the area around the left stabilizer in order to ensure that no personnel or obstructions are nearby.

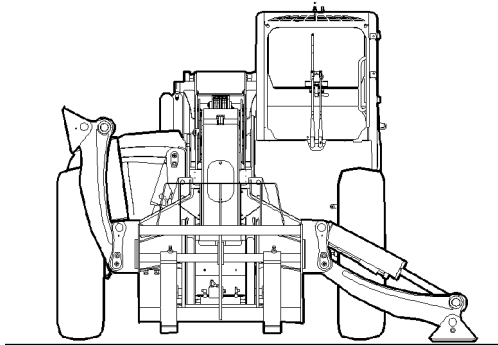


Illustration 64

g00855679

4. Release the switch when the stabilizer has reached the desired position.
5. Push the left of switch (6) and hold the switch in order to lower the right stabilizer. Observe the area around the right stabilizer in order to ensure that no personnel or obstructions are nearby.

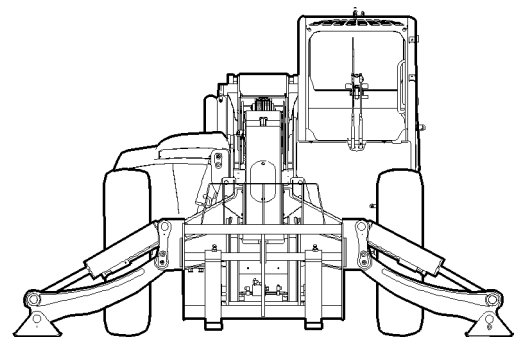


Illustration 65

g00855680

6. Release the switch when the stabilizer has reached the desired position.
7. Adjust the position of the stabilizers in order to level the machine. The machine frame is level when the bubble is in the middle of the level indicator sight glass window. The front tires must remain slightly raised above the ground.

Do not attempt to level the machine by operating the frame leveling control when the stabilizers are lowered.

Before you raise the stabilizers, fully retract the boom. Then, lower the boom to the travel position. Ensure that both stabilizers are fully raised before you move the machine.


### Continuous Auxiliary Flow Control (7) (Single Thumb Wheel)

Depress the switch when the auxiliary hydraulics are being operated. This will provide continuous flow to the auxiliary hydraulics. The button on joystick (13) that is pressed will determine the direction of flow. The flow rate is fixed when continuous flow is requested. In order to resume normal operation, depress the switch again. Alternately, press one of the buttons on the joystick. Normal operation will resume.


### Continuous Auxiliary Flow Control (7) (Double Thumb Wheel)

Depress switch (7) when the auxiliary hydraulics are being operated. This will provide continuous flow to the auxiliary hydraulics. The direction of movement of the right thumb wheel on joystick (13) will determine the direction of flow. The flow rate is fixed when continuous flow is requested. In order to resume normal operation, depress the switch again. Alternately, move the right thumb wheel upward or move the right thumb wheel downward. Normal operation will resume.


### Fog Lights (8)

 **Fog Lights** - Push the right side of switch in order to turn on the fog lights. Push the left side of switch in order to turn off the fog lights.

### Hazard Flashers (9)

 **Hazard Flashers** - Push the right side of the switch in order to activate the hazard flashers. All the turn signal lights will flash simultaneously. Push the left side of the switch in order to deactivate the hazard flashers.

### Headlight Dimmer Switch (10)

 **Dimmer Control** - Push the right side of switch (10) in order to activate the high beam headlights. Switch (11) for the headlights must be in the HEADLIGHTS position in order to activate the high beam. The headlights remain on



high beam until the left side of switch (10) is pushed to the LOW BEAM position.

### Headlight-Parking Lights (11)

**Low Beam Headlights** - Push the right side of switch (11) in order to turn on the parking lights and the rear lights. Push the right side of switch (11) again in order to turn on the headlights, the parking lights and the rear lights. Push the left side of switch (11) in order to turn off the headlights. Push the left side of switch (11) again in order to turn off the parking lights and the rear lights.

### Rotating Beacon Light (12)

**Rotating Beacon (if equipped)** - Push the right side of switch in order to activate the rotating beacon. Push the left side of switch in order to deactivate the rotating beacon.

### Joystick Control (13)



## WARNING

Improper use of the boom and work tools could result in injury or death. The operator must be fully aware of all the functions for the joystick control and proper operating techniques.

The following information describes two types of operating arrangement for the joystick control. A decal that shows the configuration is located forward of joystick control. The decal indicates the movements that will be produced when you operate the joystick control.

**You must understand all of the functions of the joystick control before you operate the machine.**

### Type A Control Arrangement (Single Thumb Wheel)

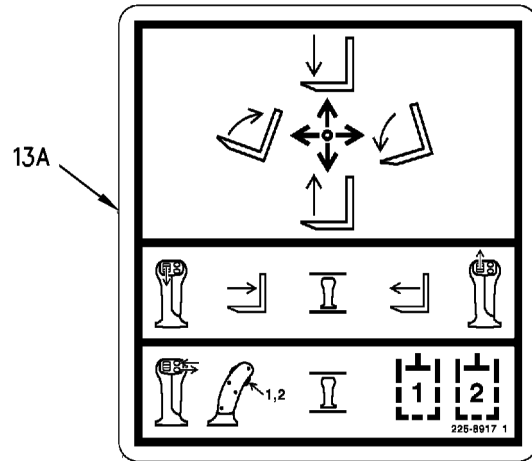


Illustration 66

g00978774

Machines that have the Type A control arrangement are equipped with decal (13A) that is shown above. The joystick control operates in the following way:

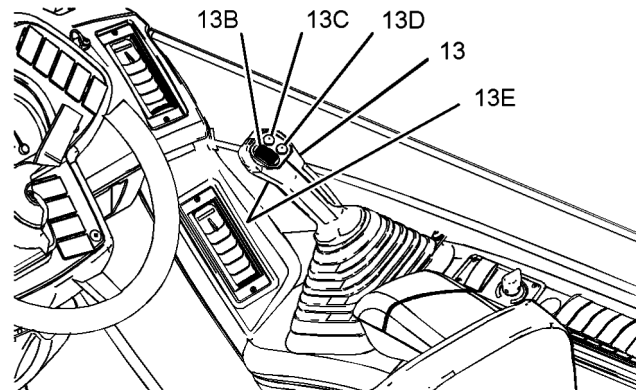


Illustration 67


g01213463

**Boom Raise** - Pull the joystick control backward in order to raise the boom. When the joystick control is released the joystick control will return to the HOLD position.


**Boom Lower** - Push the joystick control forward in order to lower the boom. When the joystick control is released the joystick control will return to the HOLD position.


**Quick Coupler (Tilt Forward)** - Push the joystick control to the right in order to tilt the quick coupler forward. When the joystick control is released the joystick control will return to the HOLD position.

**Quick Coupler (Tilt Backward)** - Push the joystick control to the left in order to tilt the quick coupler backward. When the joystick control is released the joystick control will return to the HOLD position.

 **Boom Extend** - Push thumb wheel (13B) forward in order to extend the boom. When the thumb wheel is released the thumb wheel will return to the HOLD position.

**Note:** The boom will not extend when the transmission control is in the REVERSE position. The function for extending the boom will resume if the transmission is neutralized by the service brake, the parking brake, or the transmission neutralizer button.

 **Boom Retract** - Pull thumb wheel (13B) backward in order to retract the boom. When the thumb wheel is released the thumb wheel will return to the HOLD position.

 **Auxiliary Controls** - Press switch (13E) in order to toggle between the hydraulic circuits for the auxiliary 1 and auxiliary 2. Press switch (13C) in order to operate an actuator for a work tool in the positive direction. Press switch (13D) in order to operate an actuator for a work tool in the negative direction. Switches (13D), (13C) and (13E) are not operated proportionally.

The speed of the following functions is governed by the amount of movement of the joystick control and engine speed:

- Boom raise
- Boom lower
- Quick coupler (tilt forward)
- Quick coupler (tilt backward)

For smooth operation, first increase the engine speed from low idle. Then move joystick control (13) slowly until the attachment is moving at the required speed.

The speed of the boom extend and boom retract is governed by the amount of movement of thumb wheel (13B).

Move joystick control (13) diagonally in order to simultaneously tilt the quick coupler forward or backward while the boom is being raised or lowered.

Move joystick control (13) diagonally. At the same time operate thumb wheel (13B) in order to simultaneously tilt the quick coupler while the boom is being operated in two directions.

### Type A Control Arrangement (Double Thumb Wheel)

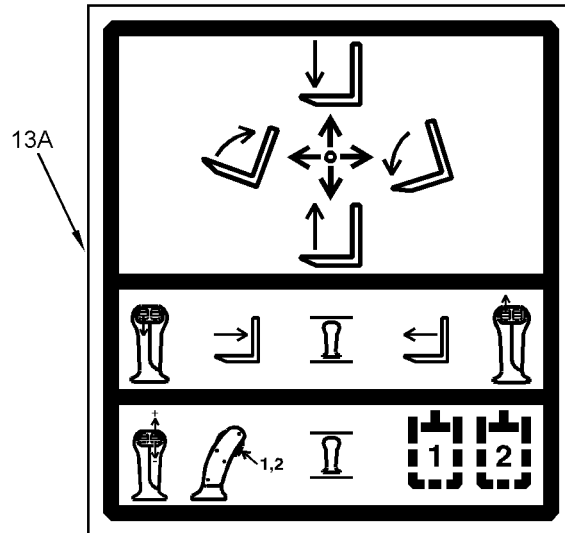


Illustration 68  
Film for joystick with double thumb wheel

g01051074

Machines that have the Type A control arrangement are equipped with decal (13A) that is shown above. The joystick control operates in the following way:

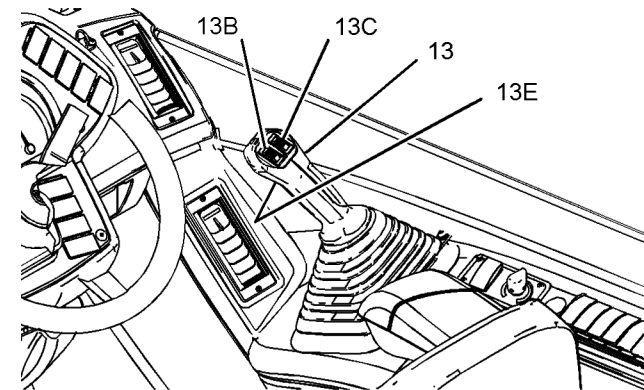






Illustration 69

g01213466

 **Boom Raise** - Pull the joystick control backward in order to raise the boom. When the joystick control is released the joystick control will return to the HOLD position.

 **Boom Lower** - Push the joystick control forward in order to lower the boom. When the joystick control is released the joystick control will return to the HOLD position.

 **Quick Coupler (Tilt Forward)** - Push the joystick control to the right in order to tilt the quick coupler forward. When the joystick control is released the joystick control will return to the HOLD position.

 **Quick Coupler (Tilt Backward)** - Push the joystick control to the left in order to tilt the quick coupler backward. When the joystick control is released the joystick control will return to the HOLD position.

control is released the joystick control will return to the HOLD position.



**Boom Extend** - Move thumb wheel (13B) forward in order to extend the boom. When the thumb wheel is released the thumb wheel will return to the HOLD position.

**Note:** The boom will not extend when the transmission control is in the REVERSE position. The function for extending the boom will resume if the transmission is neutralized by the service brake, the parking brake, or the transmission neutralizer button.



**Boom Retract** - Move thumb wheel (13B) backward in order to retract the boom. When the thumb wheel is released the thumb wheel will return to the HOLD position.



**Auxiliary Controls** - If equipped, press switch (13E) in order to toggle between the hydraulic circuits for the auxiliary 1 and auxiliary 2. Move thumb wheel (13C) forward in order to operate an actuator for a work tool in the positive direction. Move thumb wheel (13C) backward in order to operate an actuator for a work tool in the negative direction. Switch (13E) is not operated proportionally.

The speed of the following functions is governed by the amount of movement of the joystick control and engine speed:

- Boom raise
- Boom lower
- Quick coupler (tilt forward)
- Quick coupler (tilt backward)

The amount of auxiliary flow is governed by the amount of movement of the right thumb wheel and engine speed.

For smooth operation, first increase the engine speed from low idle. Then move joystick control (13) slowly until the attachment is moving at the required speed.

The speed of the boom extend and boom retract is governed by the amount of movement of thumb wheel (13B).

Move joystick control (13) diagonally in order to simultaneously tilt the quick coupler forward or backward while the boom is being raised or lowered.

Move joystick control (13) diagonally. At the same time operate thumb wheel (13B) in order to simultaneously tilt the quick coupler while the boom is being operated in two directions.

## Type B Control Arrangement (Single Thumb Wheel)

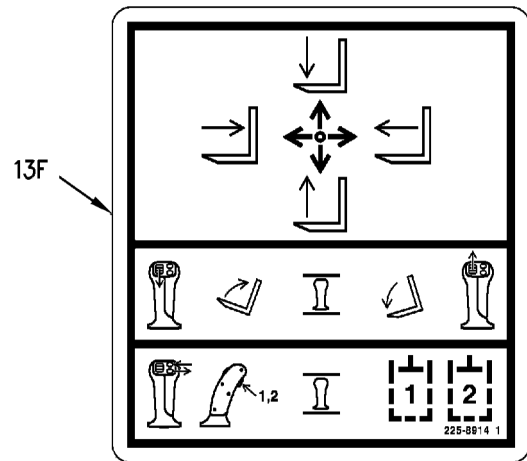


Illustration 70

g00978869

Machines that have the Type B control arrangement are equipped with decal (13F) that is shown above. The joystick control operates in the following way:

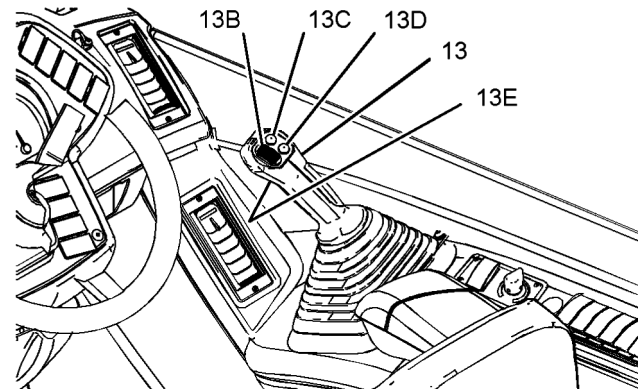


Illustration 71

g01213463



**Boom Raise** - Pull joystick control (13) backward in order to raise the boom. When the joystick control is released the joystick control will return to the HOLD position.




**Boom Lower** - Push joystick control (13) forward in order to lower the boom. When the joystick control is released the joystick control will return to the HOLD position.





**Boom Extend** - Push joystick control (13) to the right in order to extend the boom. When the joystick control is released the joystick control will return to the HOLD position.


**Note:** The boom will not extend when the transmission control is in the REVERSE position. The function for extending the boom will resume if the

transmission is neutralized by the service brake, the parking brake, or the transmission neutralizer button.

 **Boom Retract** - Pull joystick control (13) to the left in order to retract the boom. When the joystick control is released the joystick control will return to the HOLD position.

 **Quick Coupler (Tilt Forward)** - Push thumb wheel (13B) forward in order to tilt the quick coupler forward. When the thumb wheel is released the thumb wheel will return to the HOLD position.

 **Quick Coupler (Tilt Backward)** - Pull thumbwheel (13B) rearward in order to tilt the quick coupler backward. When the thumb wheel is released the thumb wheel will return to the HOLD position.

 **Auxiliary Controls** - Press switch (13E) in order to toggle between the hydraulic circuits for the auxiliary 1 and auxiliary 2. Press switch (13C) in order to operate an actuator for a work tool in the positive direction. Press switch (13D) in order to operate an actuator for a work tool in the negative direction. Switches (13E), (13C) and (13D) are not operated proportionally.

The speed of the following functions is governed by the amount of movement of the joystick control and engine speed:

- Boom raise
- Boom lower
- Boom extend
- Boom retract

For smooth operation, first increase the engine speed from low idle. Then move joystick control (13) slowly until the attachment is moving at the required speed.

The speed of the quick coupler (tilt forward) and quick coupler (tilt backward) is governed by the amount of movement of thumb wheel (13B).

Move joystick control (13) diagonally in order to simultaneously extend the boom or retract the boom while the boom is being raised or lowered.

Move joystick control (13) diagonally. At the same time operate thumb wheel (13B) in order to simultaneously tilt the quick coupler while the boom is being operated in two directions.

### Type B Control Arrangement (Double Thumb Wheel)

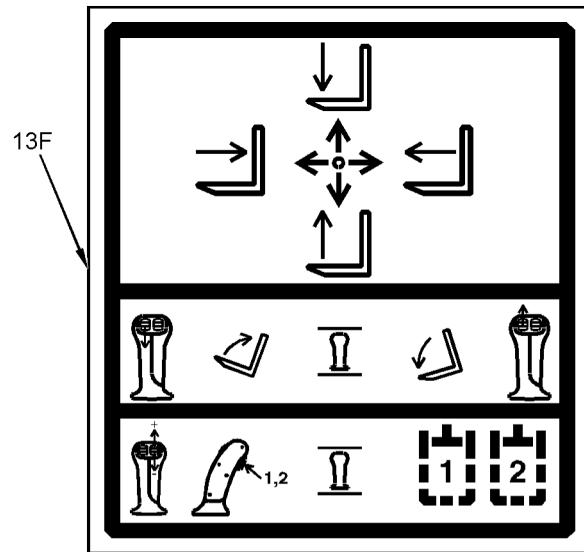


Illustration 72  
Film for joystick with double thumb wheel

g01051075

Machines that have the Type B control arrangement are equipped with decal (13F) that is shown above. The joystick control operates in the following way:

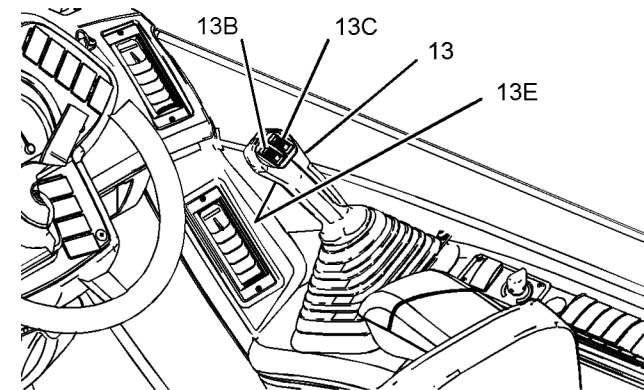





Illustration 73

g01213466

 **Boom Raise** - Pull joystick control (13) backward in order to raise the boom. When the joystick control is released the joystick control will return to the HOLD position.

 **Boom Lower** - Push joystick control (13) forward in order to lower the boom. When the joystick control is released the joystick control will return to the HOLD position.

 **Boom Extend** - Push joystick control (13) to the right in order to extend the boom. When the joystick control is released the joystick control will return to the HOLD position.

**Note:** The boom will not extend when the transmission control is in the REVERSE position. The function for extending the boom will resume if the transmission is neutralized by the service brake, the parking brake, or the transmission neutralizer button.



**Boom Retract** - Pull joystick control (13) to the left in order to retract the boom. When the joystick control is released the joystick control will return to the HOLD position.



**Quick Coupler (Tilt Forward)** - Move thumb wheel (13B) forward in order to tilt the quick coupler forward. When the thumb wheel is released the thumb wheel will return to the HOLD position.



**Quick Coupler (Tilt Backward)** - Move thumb wheel (13B) backward in order to tilt the quick coupler backward. When the thumb wheel is released the thumb wheel will return to the HOLD position.



**Auxiliary Controls** - If equipped, press switch (13E) in order to toggle between the hydraulic circuits for the auxiliary 1 and auxiliary 2. Move thumb wheel (13C) forward in order to operate an actuator for a work tool in the positive direction. Move thumb wheel (13C) backward in order to operate an actuator for a work tool in the negative direction. Switch (13E) is not operated proportionally.

The speed of the following functions is governed by the amount of movement of the joystick control and engine speed:

- Boom raise
- Boom lower
- Boom extend
- Boom retract

The amount of auxiliary flow is governed by the amount of movement of the right thumb wheel and engine speed.

For smooth operation, first increase the engine speed from low idle. Then move joystick control (13) slowly until the attachment is moving at the required speed.

The speed of the quick coupler (tilt forward) and quick coupler (tilt backward) is governed by the amount of movement of thumb wheel (13B).

Move joystick control (13) diagonally in order to simultaneously extend the boom or retract the boom while the boom is being raised or lowered.

Move joystick control (13) diagonally. At the same time operate thumb wheel (13B) in order to simultaneously tilt the quick coupler while the boom is being operated in two directions.

## Adjustable Armrest (14)

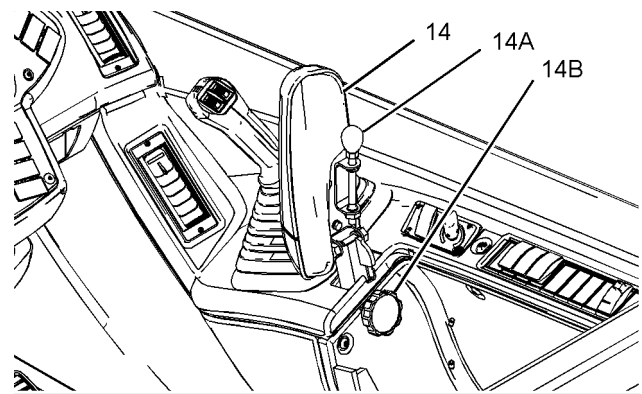


Illustration 74

g01213544

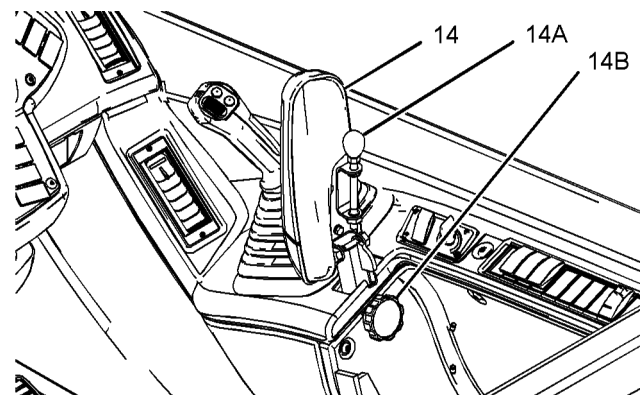


Illustration 75

g01213470

Lift the armrest in order to adjust the armrest.

In order to adjust the angle of armrest, rotate knob (14A). To increase the angle of the armrest, turn the knob clockwise. To decrease the angle of the armrest, turn the knob counterclockwise.

In order to adjust the height of armrest, loosen knob (14B), and raise the armrest to the desired height. To secure the armrest at the desired height, tighten the knob.

## Side Console (15)

The side console contains controls for the following features:

- Heating and air conditioning
- Window wiper and window washer
- Floodlights for the cab
- Boom floodlights
- Hydraulic towing hitch
- Hydraulic lockout
- Access platform

Refer to Operation and Maintenance Manual, "Operator Controls (Side Console)" for more detailed information on each of these controls.

## Interior Light (16)

**Interior Light (if equipped)** - Press either side of the lens in order to turn on the interior light. Press the opposite side of the lens in order to turn off the interior light.

## Parking and Secondary Brake Control (17)

### Parking Brake

**Note:** The parking brake operates on the front axle only.

Engage the parking brake after the machine has stopped and when the transmission control has been moved to the NEUTRAL position.

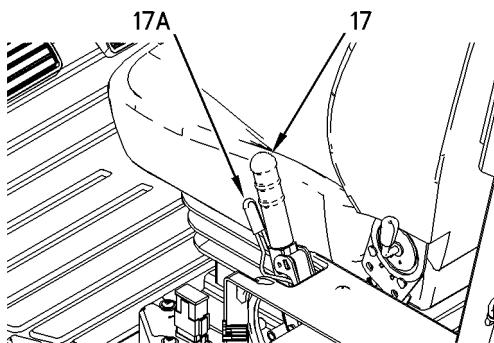


Illustration 76

g00978894

**Parking Brake Engaged** - Pull lever (17) fully upward in order to engage the parking brake. When the lever is pulled fully upward, a latch will lock in order to hold the parking brake in the ENGAGED position.

**Parking Brake Disengaged** - Pull back lever (17) and pull lever (17A) in order to release the latch. Lower lever (17) to the DISENGAGED position.

**Note:** The parking brake has an interlock switch in order to prevent the machine from being driven through the brake. The machine will not move in either FORWARD or REVERSE when the parking brake is engaged. The machine will not move if the parking brake lever is slightly engaged.

### Secondary Brake

The parking brake also functions as a secondary brake. The parking brake must be used to bring the machine to a stop only if the service brakes fail to stop the machine. If the parking brake has been used as a secondary brake for an emergency stop, do not move or operate the machine until the service brake system has been checked and any necessary repairs have been completed.

## Accelerator Control (18)

Depress the pedal in order to increase the engine speed.

Release the pedal in order to decrease the engine speed.

## Service Brake Control (19)

Brakes are installed on the front axle.

Depress the pedal in order to decelerate or stop the machine. Release the pedal in order to disengage the service brakes.

The service brake can be used in conjunction with transmission neutralizer control (switch) (2). When the top of switch (2) is pushed in, the transmission is automatically neutralized when a firm pressure is applied to the brake pedal. This allows a higher engine speed for improved hydraulic response time when you operate the machine implements. This mode of operation should only be used when the boom is retracted and below horizontal. When the bottom of switch (2) is pushed in, the transmission remains engaged when the pedal is depressed. Refer to "Transmission Neutralizer Control (2)" for more information.

## Differential Lock Control (20)

The differential lock can be selected in order to override the normal operation of the front axle differential. The differential lock will help maintain traction when the ground conditions are soft or slippery. When the differential lock is selected, torque is transmitted to both wheels even though one wheel may not have traction.



**Differential Lock Control** - Press the control and hold the control in order to engage the differential lock. In order to disengage the differential lock, release pressure from accelerator pedal (18) and release differential lock control.

### NOTICE

Use the differential lock only in conditions where wheel spin has, or will be encountered. If wheel spin has already developed, release pressure from the accelerator pedal and allow the engine speed to fall sufficiently to stop wheel spin before engaging the differential lock. Failure to follow this procedure can result in machine damage.

Keep steering maneuvers to a minimum when the differential lock is engaged. Steering maneuvers with the differential lock engaged can result in machine damage.

The differential lock should only be engaged with all of the wheels in the straight ahead position. The differential lock should only be engaged when the machine is stopped.

## Transmission Control (21)

### Direction Selection

- F** **Forward (F)** - Push the lever fully upward (F) in order to select forward movement.
- N** **Neutral (N)** - Move the lever to the (N) mid-position in order to select NEUTRAL. Move the lever to the NEUTRAL position when you park the machine. The lever must be in the NEUTRAL position before the engine can be started.
- R** **Reverse (R)** - Pull the lever fully downward in order to select reverse movement.

### Speed Selection

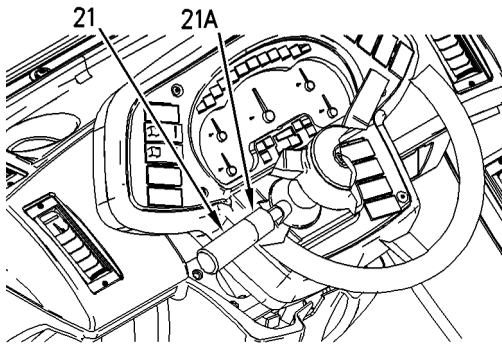


Illustration 77

g00978904

Four transmission speeds can be selected. The speeds are indicated on collar (21A). Rotate transmission control (21) until the required transmission speed is opposite the line. All four speeds can be selected for forward travel. Some machines are equipped with an automatic fifth speed. Machines that are equipped with this feature will automatically shift into fifth speed when the appropriate engine speed is reached. Fifth speed cannot be manually selected by the operator. The first three speeds can be selected for reverse travel. Select the proper speed for the application. Start moving the machine in first gear or in second gear. To upshift, move the transmission control to the next highest gear. It is not necessary to release the accelerator control. To downshift, move the transmission control to the next lowest gear. Do not skip gears when you down shift. Continue to shift through the gears in this way as the conditions are required. To prevent engine overspeed, do not downshift if the engine speed is high.

Control the speed of the machine in order to suit conditions. Make an allowance for surface conditions, weather conditions and load.


**Note:** The machine should be in first speed or second speed when you change the direction of the machine from forward to reverse or from reverse to forward.

Select the correct gear before you travel downhill. Select the necessary travel speed before you start downhill. Do not change gears while you are going downhill. When you go downhill, use the same speed that would be used to go uphill. Do not allow the engine to overspeed when you go downhill. Use the service brake to prevent engine overspeed when you go downhill. Select a lower gear before you go down the same hill again.


When you are travelling uphill, select a lower gear when the engine speed starts to fall. Drive the machine in the gear that will allow the required speed to be maintained. Do not allow the torque converter to slip and do not allow the engine to lug.

**Note:** When the torque converter is stalled due to an excessive load, down shifting will not change the gear until the service brake has been applied.

## Horn (22)


-  **Horn** - Push the horn in order to sound the horn. Use the horn in order to alert personnel. Also, use the horn in order to signal personnel.

## Directional Turn Signal Control (23)

-  **Directional Turn Signal** - Push up on the switch in order to activate the left turn signal. Pull down on the switch in order to activate the right turn signal. The mid-position is the OFF position.


## Engine Start Switch (24)

Electrical power is supplied to the systems in the cab when the engine start switch key has returned from the START position to the ON position.

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

When the key is in the OFF position the following circuits remain activated:

- Hazard warning
- Interior light
- Parking lights

 **ON** - Turn the engine start switch key clockwise to the ON position in order to activate all electrical circuits except the starting motor circuit. Before the engine will start, transmission control (21) must be in the NEUTRAL position. To start the engine, turn the engine start switch key clockwise from the ON position to the START position. Release the engine start switch after the engine starts. The engine start switch key will return to the ON position.

**Note:** If the engine fails to start, return the engine start switch key to the OFF position. Wait for twenty seconds before you attempt to start the engine again. This will allow the monitoring system to reset.

**Note:** As the machine powers up the machine goes through a number of self test and system checks. The hydraulic functions are not available for operation for four seconds until the self test is completed.

Your machine may be equipped with a security system. When a security system is installed, only the correct electronically programmed key will start the engine.

## Steering Column Tilt Control (25)

Move the lever upward in order to unlock the steering column. Pivot the steering column to the desired position. Move the lever downward in order to lock the steering column in place. Always lock the steering column before you move the machine or before you operate the machine.

## Power Receptacle (26)

**Power Receptacle** - A twelve volt power receptacle is located at the bottom of the console for the parking brake. An external twelve volt power receptacle is located on the upper, left rear of the cab. The power receptacles can be used to power automotive electrical equipment or accessories. Remove the cap before use.

**Note:** Twelve volt power supply is only available when the engine start switch is in the ON position.

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

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

Table 3

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

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



## Security Management

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

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

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

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

## Battery Disconnect Switch (If Equipped)

Open the engine enclosure on the right side of the machine. The battery disconnect switch is located on the right side of the engine compartment above the battery.

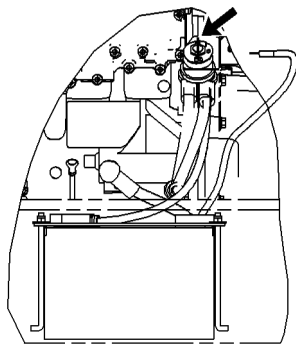


Illustration 78  
Battery disconnect switch

g00951966

**ON** - Insert the battery disconnect switch key, and turn the battery disconnect switch key clockwise in order to activate the electrical system. The switch must be ON before you start the engine.



**OFF** - Turn the battery disconnect switch key counterclockwise in order to shut off the entire electrical system.

The battery disconnect switch and the engine start switch serve different functions. When the battery disconnect switch is turned off, the entire electrical system is disabled. When only the engine start switch is turned off, the battery remains connected to the electrical system.

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

Turn the battery disconnect switch key to the OFF position and remove the battery disconnect switch key when the machine is left for a period of one month or longer. Adopt this procedure in order to prevent the following circumstances:

- A short circuit from draining the battery
- Active components from draining the battery
- Draining of the battery through vandalism

**Note:** The battery disconnect switch should never be disconnected while the machine is running.

## Boom Cylinder Lock (If Equipped)

### WARNING

A raised boom can fall if a hydraulic component is removed.

Sudden movement of the boom could cause personal injury or death.

Remove any load from the work tool, retract the boom and install the boom cylinder lock or a suitable supporting stand before working under a raised boom.

When you are working under the boom it is necessary to install a boom cylinder lock on the boom cylinder.

## Installation and Removal Procedures

### Installation

1. Park the machine on level ground. Retract and lower the boom. Move the transmission control to NEUTRAL. Engage the parking brake.
2. Raise the boom to an angle of approximately 20 degrees. Stop the engine. Remove the engine start switch key. If equipped, remove the battery disconnect switch key.

**Note:** Make sure that the front axle and the top of the main frame are clear of debris before you attempt to install the boom cylinder lock. Clean the area, if necessary.

3. Check that the cylinder lock is the correct type for your machine. Inspect the boom cylinder lock for damage. Inspect pad (4). Do not use the cylinder lock if the cylinder lock is damaged or if pad (4) is loose or missing.
4. Place the cylinder lock onto the top of the main frame above the front axle. Allow sufficient access to stand on the flat area of the frame.

Make sure that both of your hands are free. Approach the machine from the front. Use the fender bracket (if equipped) and the edge of the main frame for support. Step onto the axle. Then, step onto the top of the main frame. Use the nonslip treads that are provided.

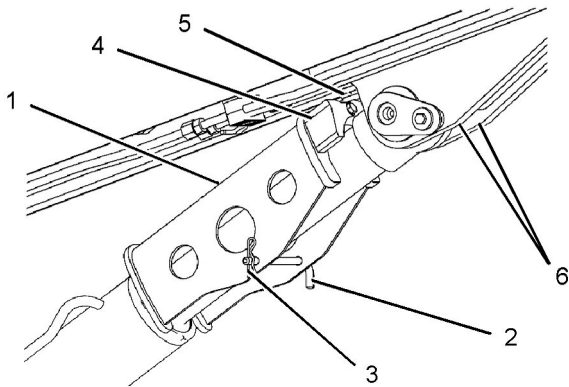


Illustration 79

g01071433

5. Install boom cylinder lock (1) onto the boom cylinder. Insert pin (2) and retaining clip (3). Align boom cylinder lock (1). Location tongue (5) must pass between boom plates (6) when the boom is lowered.

**Note:** When you descend from the machine, use the supports and use the nonslip treads, in the same manner that is indicated in the previous steps.

6. Replace the battery disconnect switch key (if equipped) and the engine start key.
7. Start the engine. Lower the boom slowly. Make sure that location tongue (5) passes between boom plates (6). Lower the boom until there is a clearance of 6 mm (0.25 inch) between the boom plates (6) and the yellow nylon pad (4).

#### NOTICE

Do not operate the boom with the boom cylinder lock installed. Operating the boom with the boom cylinder lock installed will damage the boom cylinder lock and the boom cylinder.

8. Stop the engine. Remove the engine start switch key. If equipped, remove the battery disconnect switch key. Attach a "Do Not Operate" or a similar warning tag to the joystick control.

#### Removal

**Note:** Follow the same mounting and dismounting guidelines that are detailed in the installation section.

1. Install the engine start key. If equipped, install the battery disconnect switch key. Start the engine. Slowly raise the boom until boom plates (6) are clear of location tongue (5). Stop the engine. If equipped, remove the battery disconnect switch key. Remove the engine start switch key.
2. Remove retaining clip (3) and pin (2). Remove boom cylinder lock (1) from boom cylinder and place the lock on the flat area of the main frame. Descend from the machine.

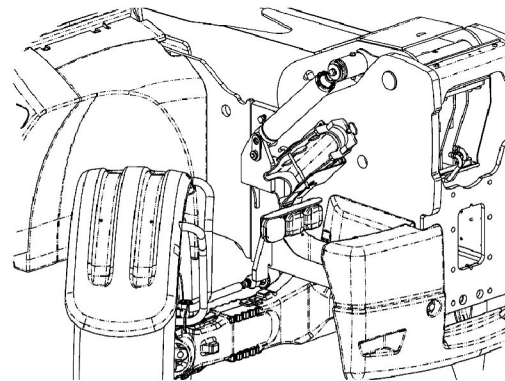


Illustration 80

Typical example of storage bracket

g01071445

3. Stow boom cylinder lock onto the storage bracket that is mounted on the machine. The bracket can be mounted on the left side of the machine or on the right side of the machine.
4. Install the engine start key. If equipped, install the battery disconnect switch key. Start the engine and fully lower the boom.

#### Rear Axle Lock (If Equipped)

##### **WARNING**

Operating the machine beyond its stability limit could result in a tip over or failure of the work tool. Check the proposed lift with the load chart. Do not attempt the lift if the longitudinal stability limit of the machine will be exceeded. Tip over or failure of the work tool could cause personnel injury or death.

##### **WARNING**

Engage the parking brake when the rear axle is in the locked axle mode. Failure to engage the parking brake could allow the machine to move and/or tip

**over. Machine movement or tip over could result in personal injury or death.**

The Rear Axle Lock (RAL) on the Telehandler is designed to improve the lateral stability of the machine when the machine is lifting heavy loads to high elevations.

The operation of the RAL is completely automatic. There is no indication to the operator when the RAL is engaged.

The RAL has three major modes of operation.

- Free Axle
- Limited Free Axle
- Locked Axle

### Free Axle

This mode is equivalent to a machine that is operating without a RAL. The rear axle can pivot freely. The machine will remain in this mode until the boom is raised above the critical angle or until the engine is switched off.

### Limited Free Axle

This mode is the equivalent to a machine that is operating in the free axle mode with the following exception. Both of the functions for the boom raise and the boom extend/retract are disabled. This mode occurs when the boom is raised above the critical angle and when the transmission is engaged. If the boom is lowered in this mode the machine will change into the free axle mode. If the transmission control is placed into neutral and the parking brake is applied the machine will change into locked axle mode.

### Locked Axle

This mode fixes the rear axle rigidly to the frame by preventing any hydraulic flow from the rear axle lock cylinder. The following operating conditions must be applied in order to place the machine into the locked axle mode:

- The transmission control must be in NEUTRAL position.
- The parking brake must be applied.
- If equipped, the frame level must be disabled.
- The boom must be raised above the critical angle.

In this mode, the operator has the full operation of the boom. It is not possible to engage the transmission in this mode until the boom is lowered below 45 degrees. Lowering the boom below 45 degrees will yield free axle mode.

**Note:** An alarm will sound if the parking brake is disengaged with the machine in locked axle mode. The alarm will sound in order to warn the operator that the machine has been placed in a potentially unsafe

condition. The alarm will cease when the parking brake is engaged.

### Limp Home Mode

A limp home mode for a failure of the boom angle sensor is provided. The limp home mode provides a procedure for returning the machine to the free axle mode if there is a failure of the boom angle sensor.

If the boom angle sensor fails the operator will be alerted with a level 2S error code on the display panel.

Before you move the machine you must ensure that the boom is below an angle of 45 degrees.

Use the following procedure in order to move the machine to a safe location.

1. Ensure that the transmission speed control is in the NEUTRAL position.
2. Engage the parking brake.
3. Lower the boom until the boom is below an angle of 45°.
4. Move the transmission speed control through the following positions:
  - NEUTRAL position
  - FIRST position
  - NEUTRAL position
  - FIRST position

**Note:** This sequence must be executed within two seconds in order to be successful.

The transmission can now be engaged.

5. The machine should now be moved to a suitable location in order to repair the boom angle sensor. Repair the boom angle sensor before returning the machine to operation.

**Note:** The double shift sequence will be required to be repeated if the transmission speed control is moved into NEUTRAL position.

## Operation Information

### WARNING

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

### WARNING

If the machine is positioned too close to electric power lines, electric current will pass through the machine. This will cause injury or death by electrocution. Keep the machine at least 8 m (25 ft) away from electric power lines. Always check for power lines before raising the boom.

### WARNING

The instability of the machine can result in injury or death. In order to ensure the stability during operation, the following conditions must be observed.

The tires must be inflated correctly and the tires must have the correct amount of ballast (if equipped).

The machine must be level.

The frame level switch must never be operated when the boom is raised.

The frame level switch must never be operated when the stabilizers are lowered.

The switches for the stabilizers must never be operated when the boom is raised.

The correct load chart must be referenced for the work tool that is installed on the machine. The specified weights and load centers must never be exceeded.

The machine must never be moved when the boom is raised above the carry position.

Use the frame leveling control in order to level the machine on uneven ground. Use the level indicator in order to verify that the frame is level.

Level the frame before you lift a load. Also, level the frame before you lower the stabilizers. Never operate the frame leveling control when you have raised the boom or after you have lowered the stabilizers.

Always use the boom in order to engage the load with the work tool. Do not move the machine in order to engage the load with the work tool. Always use the boom in order to position the load with the work tool. Do not move the machine in order to place the load with the work tool. Always use the boom in order to disengage the load from the work tool. Do not move the

machine in order to disengage the load from the work tool.

Operate the boom smoothly in order to avoid damaging or dislodging the load.

Do not move the machine while the boom is raised or while the boom is extended. If it is necessary to reposition the machine, lower and retract the boom first.

Before you lower the stabilizers or before you raise the stabilizers, the boom must be fully retracted and the boom must be lowered to the travel position.

The transmission neutralizer switch operates in conjunction with the service brake. The switch must be in the OFF position when you travel on the roadways.

Do not use the machine for lifting loads in tandem with other machines. The combined load weight and force of the other machine can exceed machine capacity. This could cause the machine to turn over.

Ensure that the correct machine load capacity chart is used for the work tool that is installed. Ensure that you use the correct machine load capacity chart for operation on tires or for operation on the stabilizers. Make sure that you understand the machine load capacity chart before you attempt to lift a load.

Be alert at all times for changing conditions which may affect the stability of the machine.

Extending the boom or lowering the boom increases the outreach of the load. This decreases the capacity and the stability of the machine. Retract the boom before you lower the boom.

Be careful when you position a load or when you engage a load. Be careful when you are using clamps or when you are using cylinders. Also, be careful when you are using a device that pierces the load. Ensure that the operation can be completed without pushing the load off the stack.

**Note:** Refer to Operation and Maintenance Manual, "Operator Controls" for the location and operation of the machine controls.

1. Make sure that no one is on the machine or near the machine before you move the machine. Keep the machine under control at all times.
2. Ensure that the rear lights are in the raised position for operating the machine under normal working conditions. Ensure that the rear lights are in the lowered position for driving the machine on public roads. Refer to Operation and Maintenance Manual, "Riding the Machine" for further information.
3. Start the machine.
4. Raise all lowered work tools in order to pass over any obstacles. Fully raise the stabilizers.

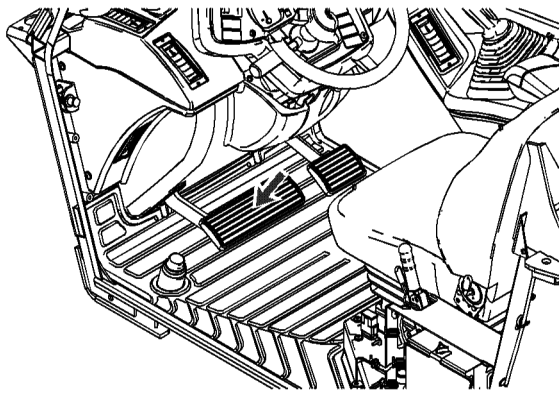


Illustration 81

g01040816

5. Push down on the service brake control in order to prevent the machine from moving.

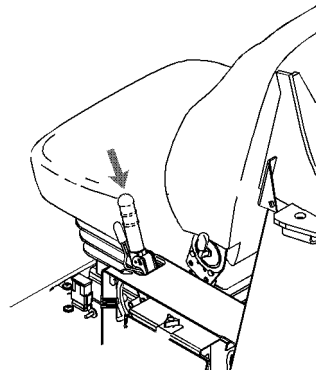


Illustration 82

g01040761

6. Disengage the parking brake. The parking brake has an interlock switch which prevents the machine from being driven through the brake. The machine will not move in forward or in reverse when the parking brake is engaged.

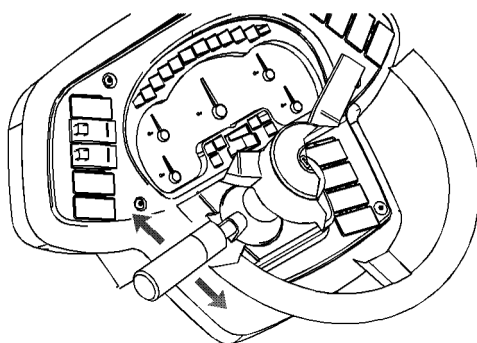
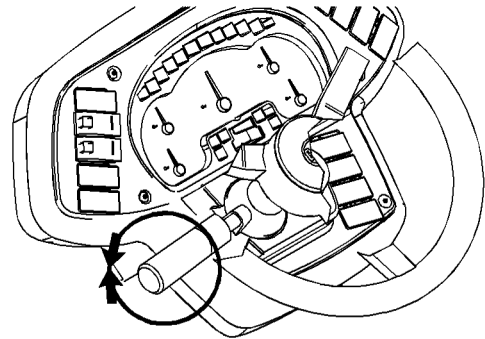


Illustration 83

g01040788

7. Move the transmission control to FORWARD position (F) or to REVERSE position (R).
8. Rotate the transmission control until the required transmission speed is selected.
9. In order to move the machine, release the service brake pedal. Push the accelerator control.

## Changing Speed and Direction

Illustration 84  
Transmission control

g01042565

Start moving the machine with the machine in first gear or in second gear. To upshift, rotate the transmission control to the next highest gear. It is not necessary to release the accelerator control. To downshift, rotate the transmission control to the next lowest gear. Do not skip gears when you downshift. Continue to shift through the gears in this way as the conditions are required. To prevent engine overspeed, do not downshift if the engine speed is high. Refer to the topic "Transmission Control" in Operation and Maintenance Manual, "Operator Controls" for additional information.

Control the speed of the machine in order to suit conditions. Make an allowance for surface conditions, weather conditions and load.

### NOTICE

Damage to the transmission could occur if the machine is allowed to coast in neutral. Damage to the transmission could also occur if a change of direction is selected at an excessive speed. Do not allow the machine to coast. Only select a transmission direction change if the machine is in first gear and moving at less than 4 km/h (2.5 mph).

**Note:** These machines are not equipped with speedometers. Before you change the direction of the machine from forward to reverse or from reverse to forward stop the machine completely.

Select the correct gear before you travel downhill. Select the necessary travel speed before you start downhill. Do not change gears while you are going downhill. When you go downhill, use the same speed that would be used to go uphill. Do not allow the engine to overspeed when you go downhill. Use the service brake to prevent engine overspeed when you go downhill. Select a lower gear before you go down the same hill again.

When you are travelling uphill, select a lower gear when the engine speed starts to fall. Drive the machine in the gear that will allow the required speed to be maintained. Do not allow the torque converter to slip and do not allow the engine to lug.

## Hydraulic Quick Coupler

Your machine may be equipped with a hydraulic quick coupler.

Illustrations in the following procedure show a carriage which is equipped with forks. The procedure is applicable to all work tools with the same types of mounting points.

### Installation Procedure

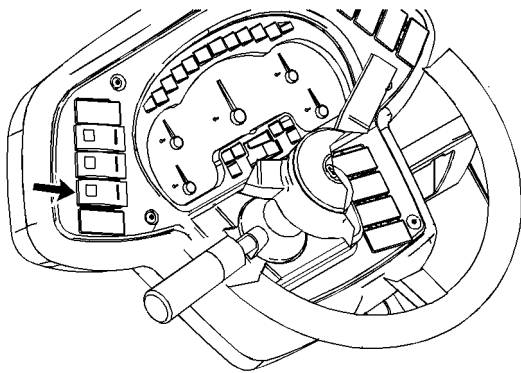


Illustration 85

g01060075

1. Move the red portion of the switch for the quick coupler downward and press the top of the switch. Hold the top of the switch until the quick coupler pins are fully disengaged. Release the switch.
2. Lower and extend the boom approximately 2 m (6.6 ft) so that the quick coupler can be seen from the cab. Position the quick coupler in line with the carriage.

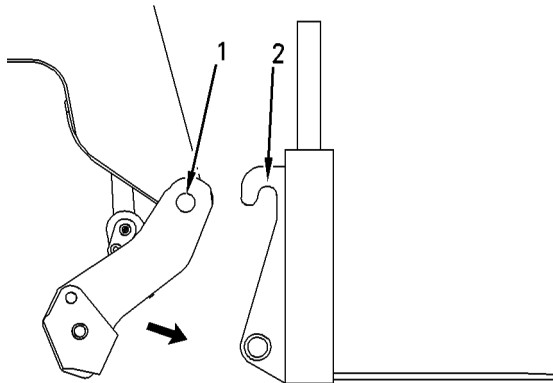


Illustration 86

g00975380

3. Tilt the quick coupler forward until the quick coupler tubes (1) are below the level of hooks (2).

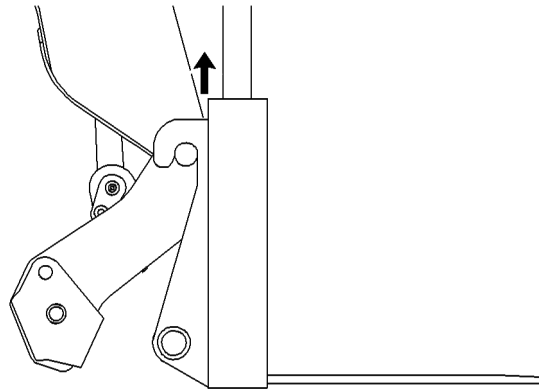


Illustration 87

g00975278

4. Extend the boom slowly until the quick coupler tubes contact the carriage. Raise the boom until the quick coupler tubes are engaged with the hooks.

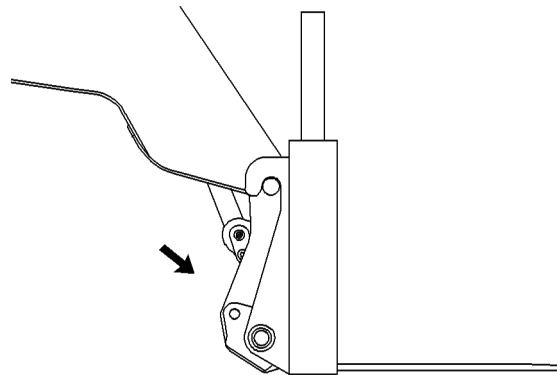


Illustration 88

g00975332

5. Tilt back the quick coupler until the lower part of the carriage is in contact with the quick coupler.
6. Press and hold the bottom of the switch for the quick coupler in order to engage the quick coupler pins. Release the switch after the pins are fully engaged.

### **WARNING**

An improperly installed work tool could become dislodged from the machine during operation. This could cause injury or death. Do not operate the machine until you have positive indication that the quick coupler pins are fully engaged.

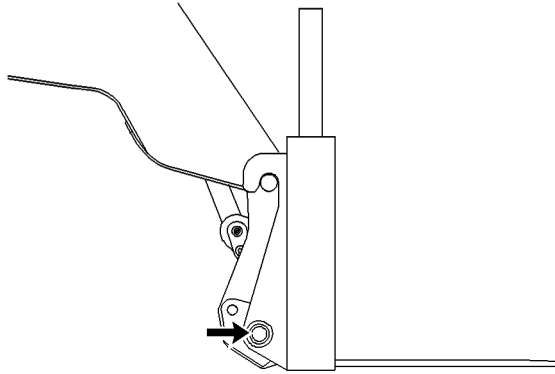


Illustration 89  
Left quick coupler pin

g00975388

7. Check the positions of the pins on both sides of the quick coupler. Both quick coupler pins must be fully engaged. Lower the boom until the carriage is pressed against the ground. Slowly back up the machine. As the machine starts to move, check for movement between the carriage and the quick coupler. Movement indicates that the pins for the quick coupler are not properly installed. Do not operate the machine unless the pins for the quick coupler are fully engaged through the quick coupler and the carriage.
8. If equipped, install the hydraulic lines for the carriage to the diverter valve.

### Removal Procedure

1. Tilt back the quick coupler. Lower and extend the boom approximately 2 m (6.6 ft) so that the quick coupler can be seen from the cab.
2. If equipped, disconnect the hydraulic lines for the attachment from the diverter valve.

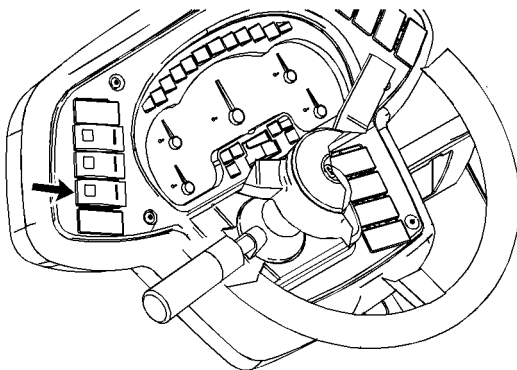


Illustration 90

g01060075

3. Move the red portion of the switch for the quick coupler downward and press the top of the switch. Hold the top of the switch until the quick coupler pins are fully disengaged. Release the switch.

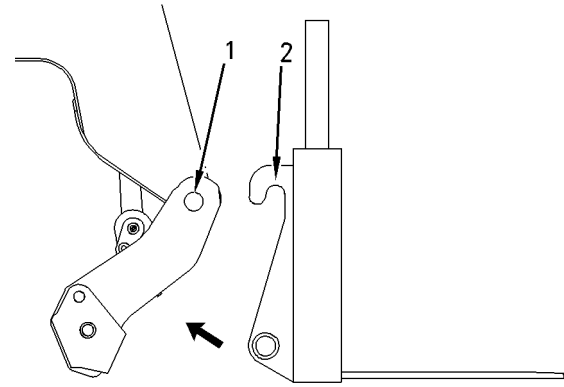


Illustration 91

g00975363

4. Lower the boom and tilt the quick coupler forward until the carriage is on the ground. If necessary, block the carriage in order to prevent the carriage from moving when the carriage is disengaged from the quick coupler. Lower the boom until tubes (1) are disengaged from hooks (2). Retract the boom until the quick coupler is clear of the carriage.

### Manual Quick Coupler

Your machine may be equipped with a manual quick coupler.

Illustrations in the following procedure show a carriage which is equipped with forks. The procedure is applicable to all work tools with the same types of mounting points.

### Installation Procedure

1. Lower and extend the boom approximately 2 m (6.6 ft.) so that the quick coupler can be seen from the cab. Position the quick coupler in line with the carriage.

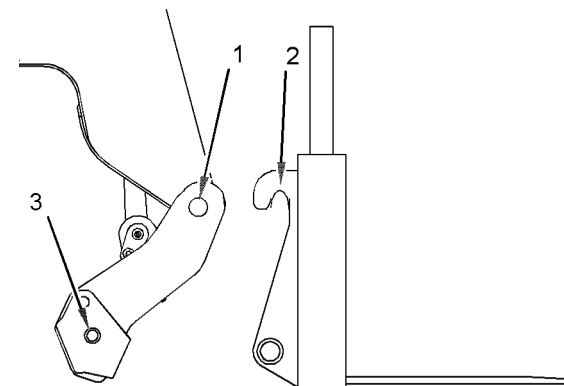


Illustration 92

g01060117

2. Remove the retaining clip from pin (3). Remove the pin.
3. Tilt the quick coupler forward until the quick coupler tubes (1) are below the level of hooks (2).

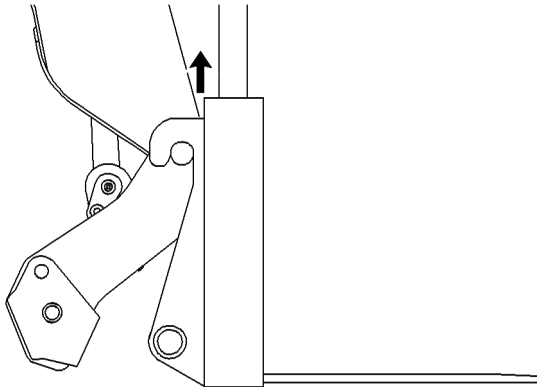


Illustration 93

g00975278

4. Extend the boom slowly until the quick coupler tubes contact the carriage. Raise the boom until the quick coupler tubes are engaged with the hooks

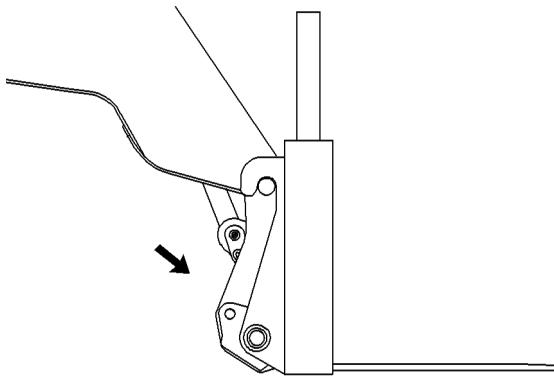


Illustration 94

g00975332

5. Tilt back the quick coupler until the lower part of the carriage is in contact with the quick coupler.
6. Install pin (3) and the retaining clip.
7. Install auxiliary hydraulic hoses or control cables to the machine (if equipped).

### Removal Procedure

1. Extend the boom approximately 2 m (6.6 ft) so that the carriage is just clear of the ground and visible from the cab. Tilt back the quick coupler. Disconnect the hydraulic lines or cables for the carriage from the boom head (if equipped).

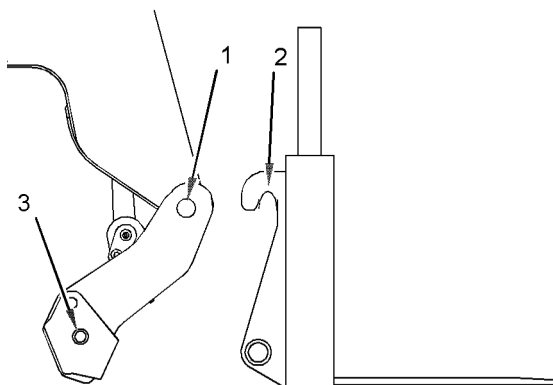


Illustration 95

g01060117

2. Remove the retaining pin and remove pin (3).
3. Lower the boom and tilt the quick coupler forward until the carriage is on the ground. If necessary, block the carriage in order to prevent the carriage from moving when the carriage is disengaged from the quick coupler. Lower the boom until tubes (1) are disengaged from hooks (2).
4. Retract the boom until the quick coupler is clear of the carriage.
5. Install the pin into the coupler.

### Use of Work Tools

#### NOTICE

When certain work tools are fitted, the work tools can contact the front tires or the front fenders. This situation can occur when the boom is retracted and the work tool is rotated fully forward. Always check for interference when first operating a new work tool.

When you use a blade to level or when you use a blade to scrape, the boom must be fully retracted. Operate with the bottom of the blade parallel to the ground.

A number of Caterpillar approved buckets are included as work tools for telehandlers. Reference the correct load chart for the work tool that is installed and never exceed the weights and load centers that are specified in the load charts. When you load a bucket the boom must be fully retracted. Extending the boom increases the outreach of the load, which will reduce the forward stability of the machine.

#### NOTICE

To avoid damage to the boom during digging and/or backgrading operations, keep the boom fully retracted.

Take material from the stockpiles in a way which avoids undercutting the pile or creating an overhang.

### Load Handling and Stacking

The illustrations that follow show a machine that is equipped with a work tool carriage. The work tool carriage is an example of a work tool that can be mounted on the quick coupler.



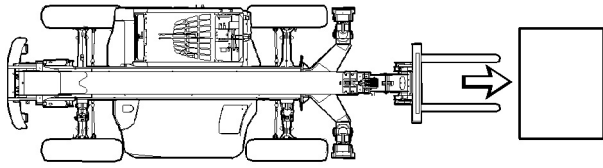


Illustration 96

g00832849

1. The machine must be positioned square to the intended load. Approach the load slowly with the boom in the travel position and get as close to the load as possible.
2. Engage the parking brake and move the transmission control to the NEUTRAL position.
3. If necessary, level the frame before you raise the boom or before you engage the load. **Do not level the frame when the boom is raised.**

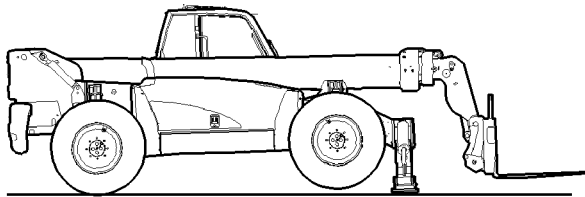


Illustration 97

g00832850

4. If you are operating with stabilizers, lower the stabilizers until the front tires are just clear of the ground and the frame is level.

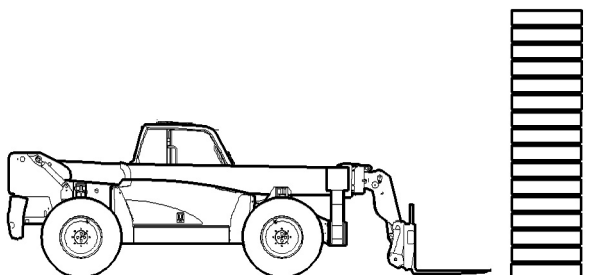


Illustration 98

g00832851

5. Tilt the quick coupler until the forks are level. The machine is equipped with an automatic system for keeping the quick coupler at the selected angle when the boom is raised or lowered.

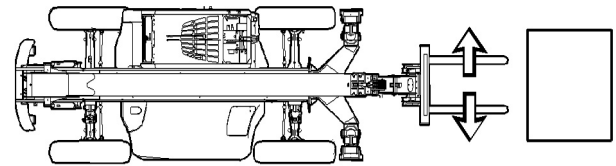


Illustration 99

g00832852

6. Ensure that the forks are spread apart as far as possible. This gives increased stability to the load.

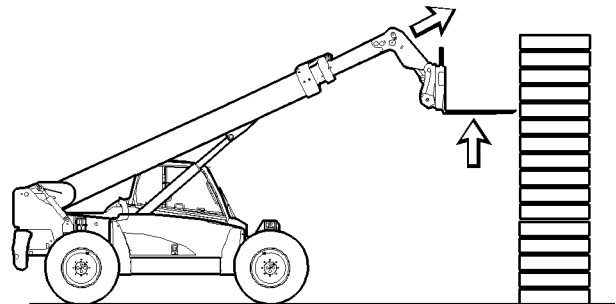


Illustration 100

g00832853

7. Raise the boom and extend the boom. The forks must be in line with the pockets of the load.
8. Use the load chart to assess the intended load. The load chart must indicate that the intended load is within the capacity of the machine. Refer to Operation and Maintenance Manual, "Load Charts".

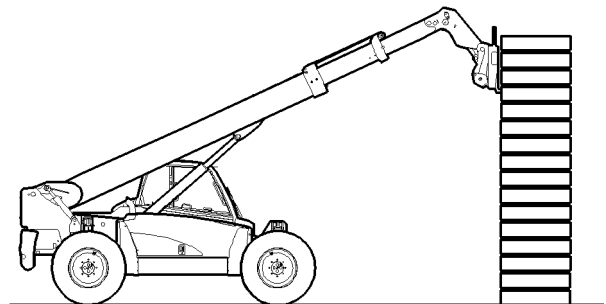


Illustration 101

g00832854

9. Extend and lower the boom. The forks must enter the pockets of the load cleanly. The forks must be fully engaged with the pockets of the load. Take care not to dislodge the load.

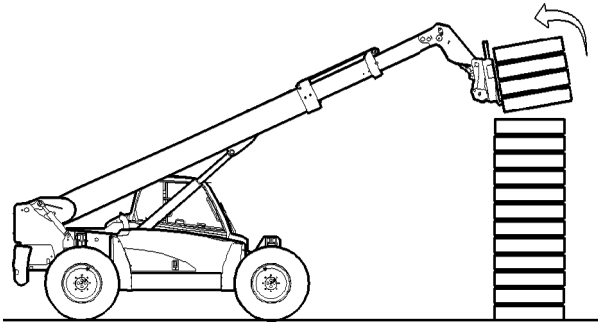


Illustration 102

g00832856

12. Retract the boom and lower the load to the travel position before the machine is moved or before the stabilizers are raised. If necessary, level the frame. Make sure that the area behind the machine is clear of personnel and obstacles before backing up.

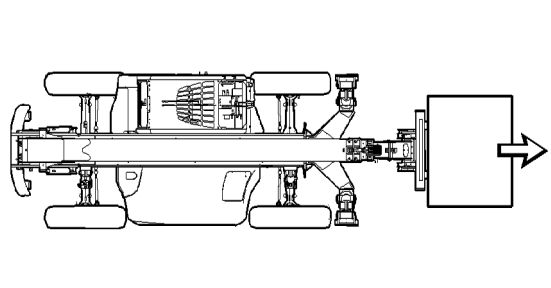


Illustration 105

g00832859

10. Raise the load carefully. When you are sure that the machine is stable, tilt the quick coupler backward in order to raise the load. If you are not sure that the machine is stable, tilt the quick coupler forward in order to lower the load. Do not proceed. Reposition the machine in order to shorten the reach before you attempt to lift the load again.

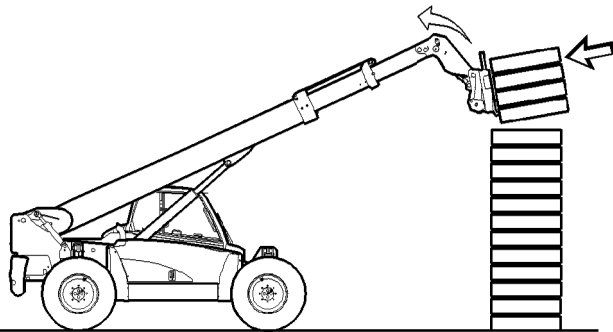


Illustration 103

g00832857

13. Approach the destination slowly. Position the machine square. Get as close to the load placement location as possible. Engage the parking brake and move the transmission control to NEUTRAL position. If necessary, level the frame. **Do not level the frame when the boom is raised.**

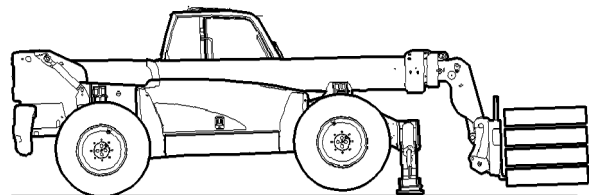


Illustration 106

g00832860

11. Use the joystick control to move the load away from the stack.

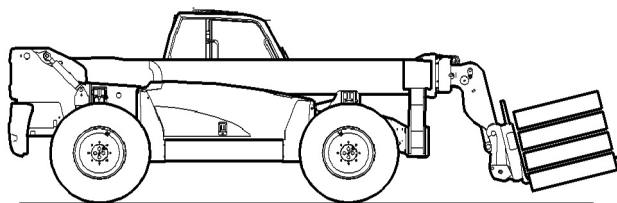


Illustration 104

g00832858

14. If you are operating with stabilizers, lower the stabilizers until the front tires are just clear of the ground.

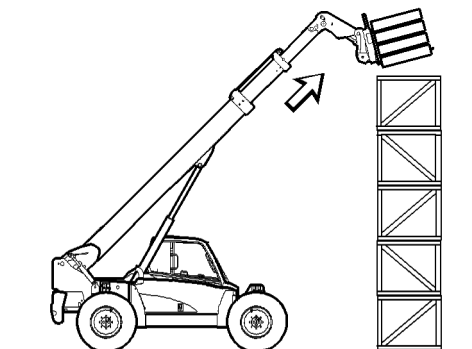


Illustration 107

g00832861

15. Raise the boom and extend the boom until the load is directly over the set down position. Do not exceed the maximum angle of the boom and do not exceed the maximum length of the boom. Use the load chart to determine the maximum angle of the boom and the maximum length of the boom.

Proceed with caution when you approach the maximum angle and/or extension indicated by the load chart. If you are not sure that the machine is stable, retract the boom. Lower the load to the travel position. Move the machine closer to the load placement location. If the machine cannot be moved closer to the load placement location, the load placement location is outside the capacity of the machine. The load cannot be placed at the intended load placement location.

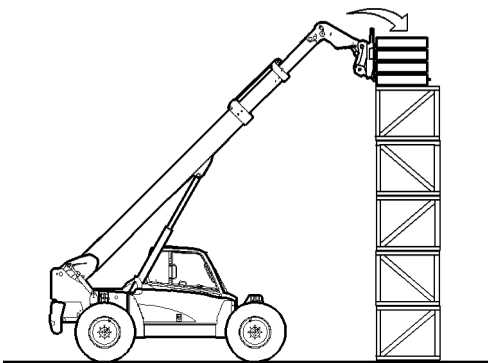


Illustration 108

g00832862

16. Tilt the quick coupler forward until the load is level. Lower and set down the load in place.

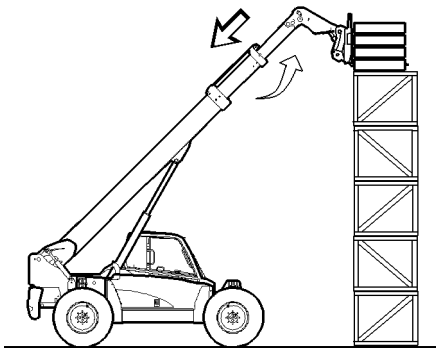


Illustration 109

g00832863

17. Ensure that the load is correctly placed and stable. Use the joystick control to raise the boom and retract the boom in a way that withdraws the forks cleanly from the load. Do not withdraw the forks by backing up the machine.

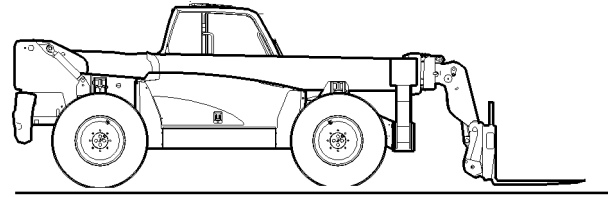


Illustration 110

g00832864

18. Retract the boom and lower the boom to the travel position before you move the machine or before you raise the stabilizers.

## Work Tools

### General Operating Guidelines

#### **WARNING**

Use of non approved work tools on Telehandler machines could result in injury or death.

Before installing a work tool on this machine, ensure that it is approved by Caterpillar and that a Caterpillar load chart covering its use is installed in the machine's cab.

#### NOTICE

When certain work tools are fitted, the work tools can contact the front tires or the front fenders. This situation can occur when the boom is retracted and the work tool is rotated fully forward. Always check for interference when first operating a new work tool.

#### NOTICE

When certain work tools are installed, the work tools can contact the stabilizers. This interference can occur when the boom is retracted and the work tool is rotated fully forward. Always check for interference when first operating a new work tool.

Travel with the work tool lowered as far as possible with adequate ground clearance. Travel with the boom fully retracted so that you have good visibility and so that the machine has good stability.

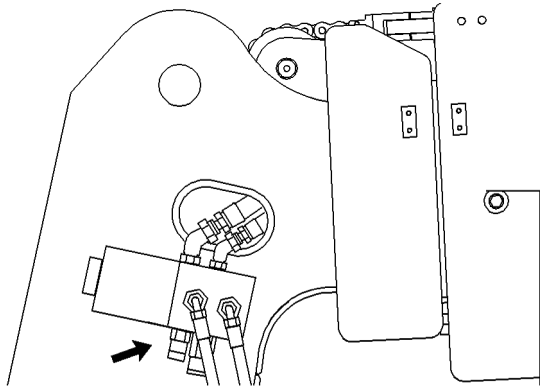
Maintain traction by avoiding excessive downward pressure on the work tool.

When the machine is operating on a slope, position the heaviest end of the machine uphill.

Make sure that the work tool that is being used is appropriate for the work that is being performed. Exceeding the machine limits will reduce the service life of the machine. Refer to Operation and Maintenance Manual, "Approved Work Tools" for additional information.

### Auxiliary Hydraulic Connections

There are many types of work tools from various manufacturers which may be installed on the machine. Caterpillar cannot anticipate every possible work tool and use which may be encountered. When you install a work tool or when you operate a work tool, follow the manufacturer's guidelines and instructions. If you are in doubt, consult your Caterpillar dealer. Your Caterpillar dealer can provide you with further information on the proper installation and use of specific work tools.



On standard machines, a single diverter valve with two quick disconnects is installed. The diverter valve allows the operator to direct hydraulic oil to the hydraulic quick coupler function or to the work tool.

**Note:** The electrical diverter valve may not be installed on certain merchandising arrangements. Consult your Caterpillar Dealer for installation of the connection points for the auxiliary hydraulic service with manual quick couplers.

**Note:** A dual diverter valve is installed as an option.

Refer to the topic "Joystick Control" in Operation and Maintenance Manual, "Operator Controls" for more detailed information on operating the boom and the work tools.

### Connecting a Work Tool

Refer to the procedures that are described in the topic "Quick Coupler" in Operation and Maintenance Manual, "Operation Information" in order to install the work tools.

When you attach work tools that require hydraulic connections, extend the boom by approximately 1 m (3 ft) after installing the work tool onto the quick coupler.

This extra space is necessary in order to connect the auxiliary hoses.

1. Position the machine. Rest the quick coupler or the work tool on the ground.
2. Engage the parking brake. Move the transmission control to the NEUTRAL position and stop the engine.
3. The hydraulic controls must be in the HOLD position. The hydraulic controls return to the HOLD position when the hydraulic controls are released.
4. Carefully inspect the hydraulic hoses or pipes on the work tool for any signs of damage. The hydraulic hoses or the pipes must be free of following defects: Cuts, abrasions, bulging, kinking, and dents. Do not use any work tool unless the hydraulic hoses and the pipes are in good condition.
5. Connect the quick disconnects on the work tool to the quick disconnects on the machine. Ensure that the quick disconnects are correctly engaged. The lock rings must be fully engaged and secure.

### Disconnecting a Work Tool

1. The work tool must be resting on the ground. If necessary, support the work tool on blocks.
2. Engage the parking brake. Move the transmission control to the NEUTRAL position and stop the engine. Move all the hydraulic controls to the HOLD position.
3. Clean the quick disconnects. Pull back on the lock rings in order to disengage the quick disconnects. Install protective caps on the quick disconnects on the machine and on the quick disconnects on the work tool.

### Carriages and Forks

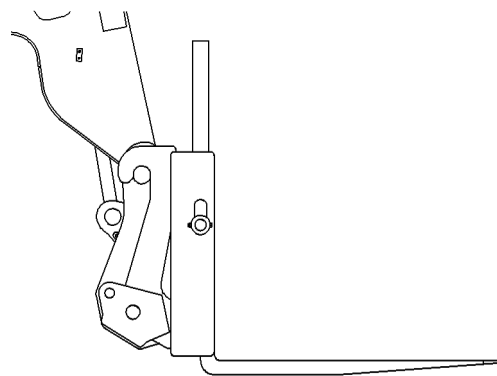


Illustration 112  
Typical carriage and forks

g00974120

All Caterpillar approved carriages that are used on these machines can be installed directly to the quick coupler.

All carriages are designed with backrests to support the load. Wide versions should be used for additional support when large loads are handled.

### Forks

#### WARNING

A crushing hazard exists when the boom is lowered or from a falling load. Stay clear of the boom when the machine is in operation. Failure to stay clear of the boom can cause injury or death.

#### WARNING

Failure to comply to the rated load can cause possible personal injury or attachment damage.

Review the rated load of a particular attachment before performing any operation. Make adjustments to the rated load as necessary.

#### WARNING

Personal injury or death can result from sudden machine movement.

Sudden movement of the machine can cause injury to persons on or near the machine.

To prevent injury or death, make sure that the area around the machine is clear of personnel and obstructions before operating the machine.

Refer to the topic "Load Handling and Stacking" in Operation and Maintenance Manual, "Operation Information".

### Correct Use of Forks

- Always position the forks into the lifting pockets before you lift a load.
- Always position the load over all of the forks so that the weight distribution is even.
- Only lift the load if the load is within the loading capacity that is shown on the load chart. The load chart is attached to the dash panel of the machine.

### Incorrect Use of Forks

Do not use the forks for any of the following operations:

- Pushing the load or dragging the load
- Excavating ground embedded objects
- Attaching chains or slings
- Lifting a load with only one fork

Forks that have been used for any of the applications that are listed above must be removed from the machine. The forks must be destroyed.

**Note:** Slings and chains must be used with a lifting hook.

## Buckets

### NOTICE

When a bucket is used for dozing a site or for clearing a site, keep the bottom face parallel to the ground. This will avoid damage to the leading edge of the bucket. Maintain traction for the machine by avoiding excessive down force on the bucket. Keep the boom extension to a minimum in order to prevent twisting of the boom.

Use a bucket that is suitable for the job.

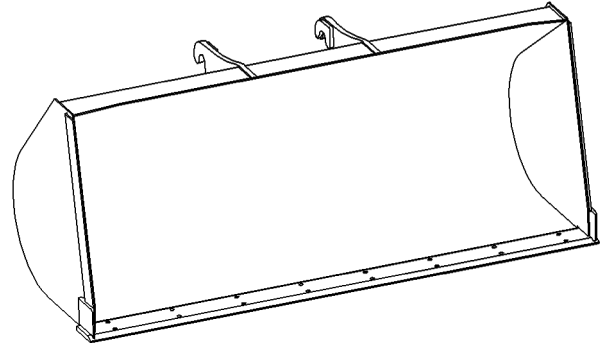


Illustration 113  
Typical bucket

g00974741

Buckets that are used in heavy applications are equipped with a cutting edge. General purpose buckets are used for digging and material handling. Typical materials would be earth, sand, cement and aggregates.

### Grapple Buckets

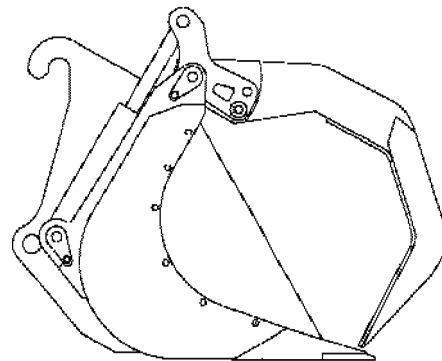


Illustration 114  
Typical grapple bucket

g00974763

Grapple buckets are equipped with a cutting edge. Grapple buckets are equipped with hydraulic cylinders that must be connected to the machine hydraulic system. The jaws of the bucket grip the load.

For the best operator visibility, travel with the bucket close to the ground.

Install the bucket that is appropriate for the intended task. Install the correct wear plate and the correct cutting edge.

### Single Thumb Wheel

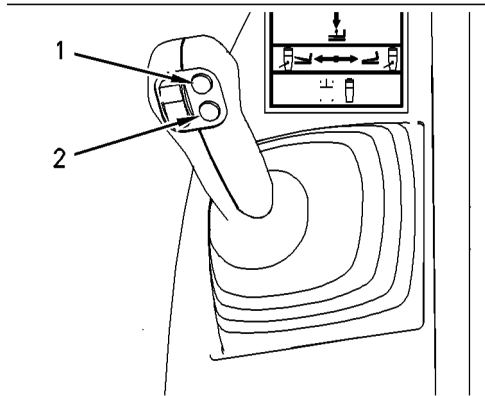


Illustration 115

g00974772

Press and hold switch (1) in order to open the grapple. Press and hold switch (2) in order to close the grapple. Refer to the topic "Joystick Control" in Operation and Maintenance Manual, "Operator Controls" for full information.

### Double Thumb Wheel

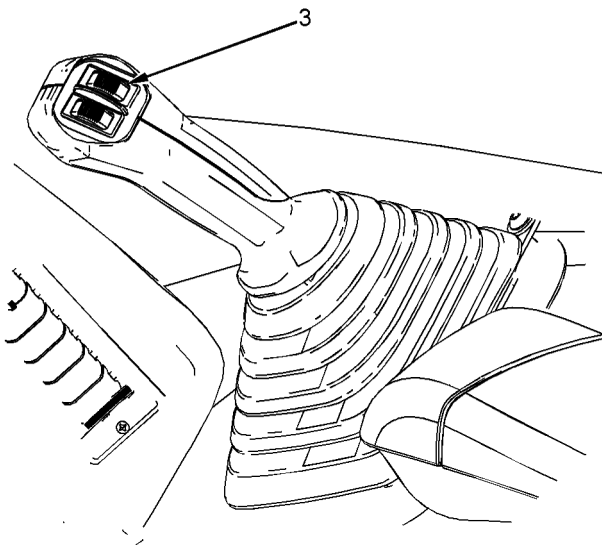


Illustration 116

g01053965

Move thumb wheel (3) forward in order to open the grapple. Move thumb wheel (3) backward in order to close the grapple. Refer to the topic "Joystick Control" in Operation and Maintenance Manual, "Operator Controls" for full information.

### Multipurpose Buckets

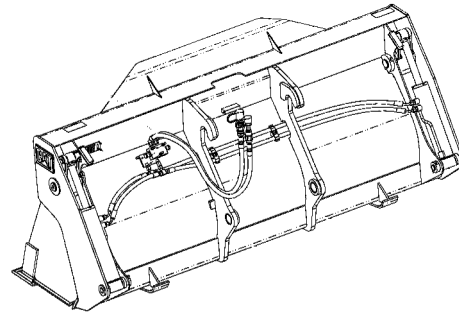


Illustration 117

Typical multipurpose bucket

g01037342

Multipurpose buckets are equipped with a cutting edge. Multipurpose buckets are equipped with hydraulic cylinders that must be connected to the machine hydraulic system. The jaws of the bucket grip the load. These buckets are intended for use when sites are being stripped.

For the best operator visibility, travel with the bucket close to the ground.

Install the bucket that is appropriate for the intended task. Install the correct wear plate.

### Single Thumb Wheel

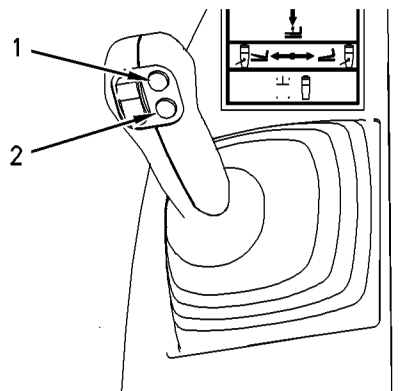


Illustration 118

g00974772

Press and hold switch (1) in order to open the grapple. Press and hold switch (2) in order to close the grapple. Refer to the topic "Joystick Control" in Operation and Maintenance Manual, "Operator Controls" for full information.

## Double Thumb Wheel

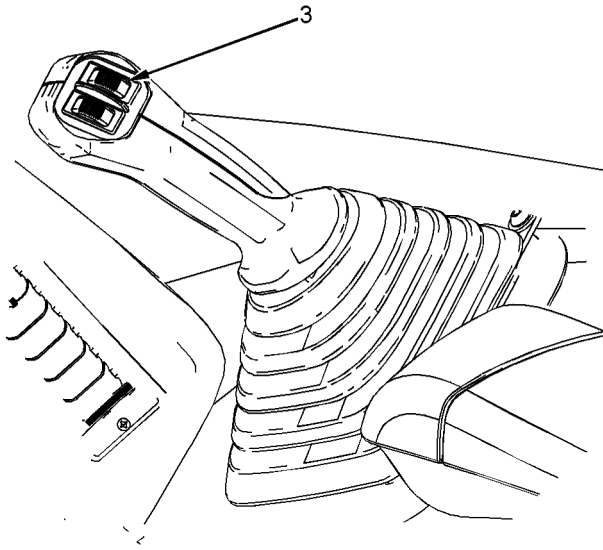


Illustration 119

g01053965

Move thumb wheel (3) forward in order to open the grapple. Move thumb wheel (3) backward in order to close the grapple. Refer to the topic "Joystick Control" in Operation and Maintenance Manual, "Operator Controls" for full information.

## Boom Extension

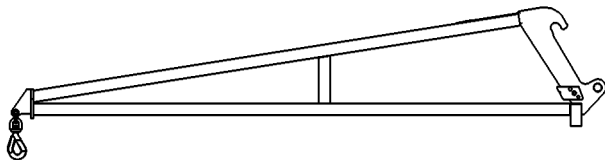


Illustration 120

g00974780

A boom extension is intended to be used in applications when additional reach or height is required in order to place light loads such as supports for roofs.

Reference the correct load chart and do not exceed the machine capacities.

Use only approved lifting equipment with a current certificate of serviceability when you attach a load to a boom extension. Short slings will prevent excessive load swing.

Before you raise the load, position the lifting point on the boom extension directly above the lifting point on the load. Failure to follow this procedure could cause the load to swing when the load is lifted. Personal

injury or damage to surrounding structures and materials could result.

Extremely cold temperatures could cause a load to be frozen to the ground. Free the load before you attempt to raise the load. Failure to comply could affect the stability of the machine when a lift is attempted.

Use tag lines to assist in the control of loads that require accurate placement.

When a load is lifted and the boom is extended and raised, the boom will deflect under the load. This has the effect of moving the load away from the machine as the load is raised. Make an allowance for this deflection.

Maneuver the load into position by operating the boom functions. Do not use the quick coupler to position the load when the boom extension is installed.

The operator must remain at the controls of the machine when a load is suspended from the boom extension.

## Lifting Hook

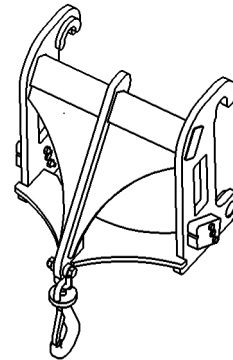


Illustration 121

g00974785

Before you raise the load, position the lifting point on the lifting hook directly above the lifting point on the load.

Failure to follow this procedure could cause the load to swing when the load is lifted. Personal injury or damage to surrounding structures and materials could result.

## Material Handling Arm

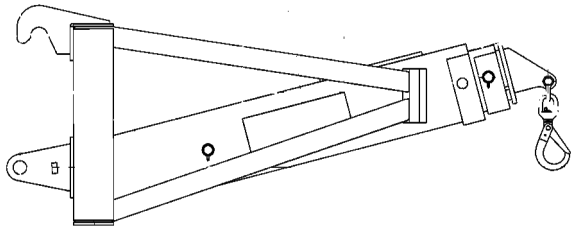


Illustration 122

g01037376

Reference the correct load chart and do not exceed the machine capacities.

Use only approved lifting equipment with a current certificate of serviceability when you attach a load to a material handling arm. Short slings will prevent excessive load swing.

Before you raise the load, position the lifting point on the material handling arm directly above the lifting point on the load. Failure to follow this procedure could cause the load to swing when the load is lifted. Personal injury or damage to surrounding structures and materials could result.

Extremely cold temperatures could cause a load to be frozen to the ground. Free the load before you attempt to raise the load. Failure to comply could affect the stability of the machine when a lift is attempted.

Use tag lines to assist in the control of loads that require accurate placement.

When a load is lifted and the boom is extended and raised, the boom will deflect under the load. This has the effect of moving the load away from the machine as the load is raised. Make an allowance for this deflection.

Maneuver the load into position by operating the boom functions. Do not use the quick coupler to position the load when the material handling arm is installed.

## Hopper

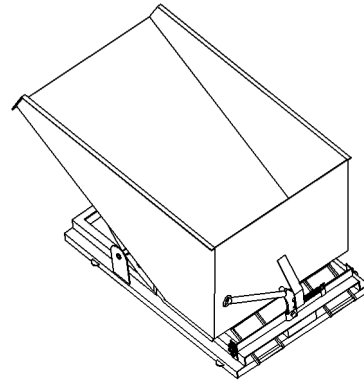


Illustration 123

g00974787

### Picking up the Hopper

Position the machine square to the hopper. Extend and lower the boom. The forks must enter the pockets of the hopper cleanly. The forks must be fully engaged with the pockets of the hopper.

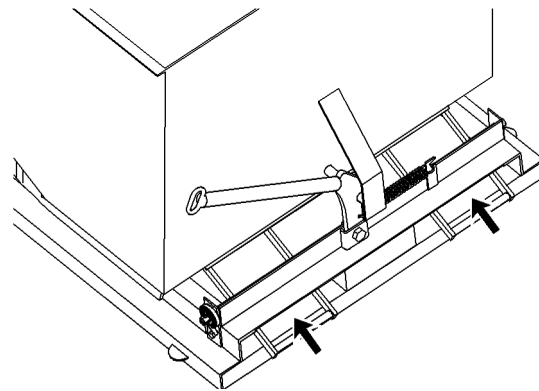


Illustration 124

g00974805

When the forks fully engage, a bar that is spring loaded will lock each fork in position. Establish that the forks are securely locked in place before you raise the hopper.

Before you raise the hopper, ensure that the latch for the trip lever is securely engaged.

Raise the hopper. Tilt the quick coupler slightly backward in order to better secure the hopper. Travel with the boom fully retracted so that you have good visibility and so that the machine has good stability.



## Discharging the Hopper

Travel the machine to the work area. Stop the machine and apply the parking brake. Lower the hopper.

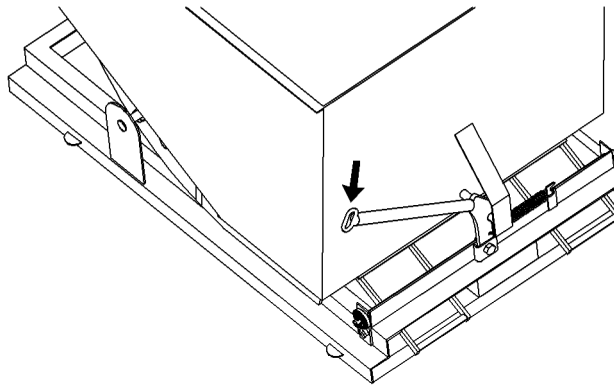


Illustration 125

g00974801

Pull down on the release lever.

The hopper will tilt forward and the load will be discharged.

To remove the hopper, lower the hopper to the ground. The bar that secures the forks in place will automatically disengage when the hopper is placed on the ground. Withdraw the forks from the pockets by retracting the boom.

## Broom

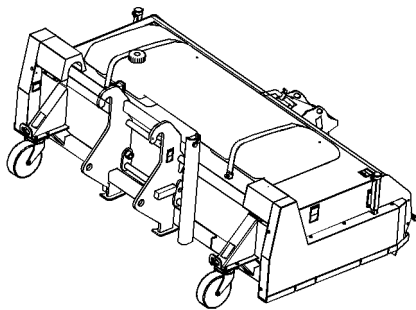


Illustration 126

g01015331

Refer to Operation and Maintenance Manual, SEBU7740, "BP24 Broom Work Tool EAK" for information on the installation of the broom and the operation of the broom.

## Monitoring System

### Alert Indicators

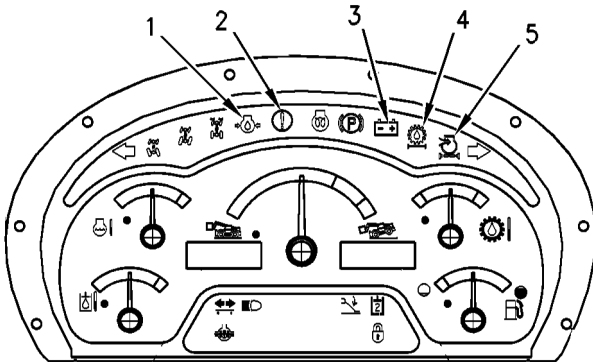


Illustration 127

g01002552



**Engine Oil Pressure (1)** - This indicator illuminates when the engine oil pressure is low.



**Action Lamp (2)** - This indicator will illuminate when a failure that is a warning category 2 or a higher warning occurs. If the lamp is illuminated, the machine needs to be serviced soon. The color of this indicator can be amber or red. An audible alarm may also sound when this indicator is illuminated.

When a warning category 2 occurs, the action lamp flashes red and there is no audible alarm. In order to prevent severe damage to components, the operator is required to change the machine operation or the operator is required to perform maintenance to the machine.

When a warning category 2S occurs, the action lamp flashes red and there is a constant audible alarm. In order to prevent severe damage to components, the operator is required to change the machine operation.

When a warning category 3 occurs, the action lamp flashes red and there is an intermittent audible alarm. In order to prevent personal injury or severe damage to components, the operator is required to perform a safe engine shutdown.

When the machine has been configured with no model designation, indicator (2) flashes amber and no audible alarm will sound. This condition will not log an error code.

When the data link is not communicating with the display unit, indicator (2) flashes amber and no audible alarm will sound. This condition will log an error code.



**Battery Condition (3)** - This indicator illuminates when the battery is not receiving a charge from the alternator.



**Combined Transmission and Hydraulic Oil Filter (4)** - This indicator illuminates when the transmission oil filter needs to be replaced.



**Engine Air Filter (5)** - This indicator illuminates when the engine air filter needs to be replaced.

### Indicators

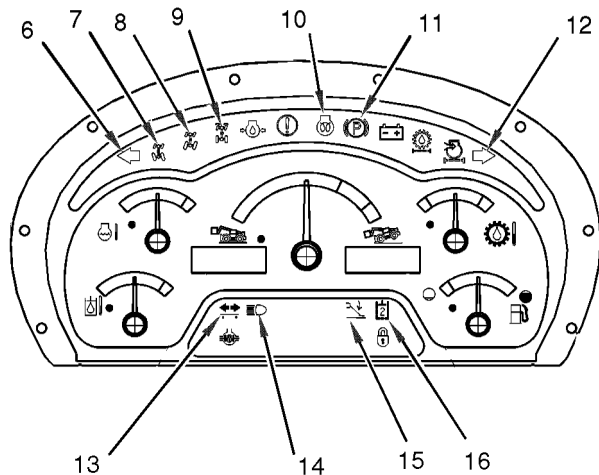


Illustration 128

g01014331



**Left Turn Signal (6)** - This indicator flashes when the left turn signal is operating.



**Circle Steer (7)** - This indicator is illuminated when circle steer mode is selected.



**Crab Steer (8)** - This indicator is illuminated when crab steer mode is selected.



**Two-Wheel Steer (9)** - This indicator is illuminated when two-wheel steer mode is selected.




**Engine Starting Aid (10)** - This indicator is illuminated when the engine starting aid is switched on.





**Parking Brake Indicator (11)** - This indicator illuminates when the parking brake is engaged.




**Right Turn Signal (12)** - This indicator flashes when the right turn signal is operating.

 **Trailer Turn Signals (13)** - This indicator flashes when a trailer turn signal is operating.

 **High Beam (14)** - This illuminates when the high beam headlights are switched on.

 **Stabilizers (15)** - This light indicates when the stabilizers are lowered.

 **Hydraulic Auxiliary 2(16)** - This indicates when the solenoids on the diverter valve have been energized in order to divert oil flow to the second auxiliary circuit.

## Gauges

These gauges are used to help the operator to monitor trends in machine operation or changes in machine operation.

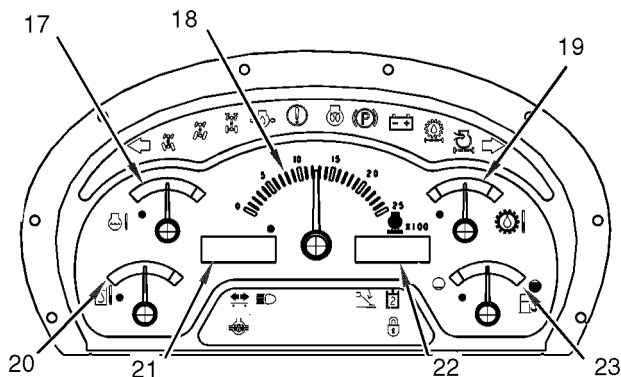


Illustration 129  
Display panel with tachometer

g01014333

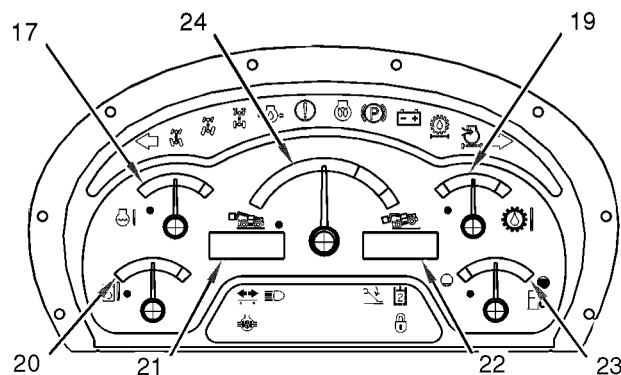





Illustration 130  
Display panel with longitudinal stability indicator


g01014335

 **Engine Coolant Temperature (17)** - This gauge indicates the temperature of the engine coolant. The green zone indicates that the engine coolant temperature is normal. The red zone indicates that the engine coolant is overheating. If the gauge indicates overheating, stop the engine. Investigate the cause. Check the coolant

level. Check that the fan drive belt is not broken or loose. Check that the radiator fins are clean.


 **Tachometer (18)** - This gauge indicates the speed of the engine in revolutions per minute, if equipped. Refer to Illustration 129.

 **Torque Converter Oil Temperature (19)** - This gauge indicates the temperature of the transmission and hydraulic system oil after the oil has passed through the torque converter. The green zone indicates that the temperature of the transmission and hydraulic system oil is normal. The red zone indicates that the torque converter temperature is overheating.

 **Hydraulic Oil Temperature (20)** - This (Hi) indicates the temperature of the transmission and hydraulic system oil in the sump. The green zone indicates that the temperature of the transmission and hydraulic system oil temperature is normal. The red zone indicates that the transmission and hydraulic system oil is overheating.

**Speedometer (21)** - This digital display indicates the current speed of the machine.

**Service Hour Meter (22)** - This digital display indicates the total operating hours of the engine. The service hour meter should be used to determine the service hour maintenance intervals.

 **Fuel Level (23)** - This gauge indicates the amount of fuel that is left in the fuel tank. When the needle on the fuel gauge reaches the red area the fuel tank should be filled.

**Longitudinal Stability Indicator (24)** - This gauge indicates the longitudinal stability of the machine, if equipped. Refer to Illustration 130. Refer to "Longitudinal Stability Indicator" for more information.

## Longitudinal Stability Indicator

### WARNING

Operating the machine beyond its stability limit could result in a tip over or failure of the work tool. Check the proposed lift with the load chart. Do not attempt the lift if the longitudinal stability limit of the machine will be exceeded. Tip over or failure of the work tool could cause personnel injury or death.

Your machine may be equipped with a longitudinal stability indicator. The longitudinal stability indicator provides audible signals and visual signals in order to indicate the limit of the forward stability of the machine, if equipped. The audible signal is shared with other system failures. Refer to Operation and Maintenance Manual for usages of the audible signal. The longitudinal stability indicator is powered by the machine electrical system which is activated

when the engine start switch key is turned to the ON position.

Ensure that a Caterpillar work tool is attached to the machine and use the correct load chart in order to verify that the intended lift operation is within the capability of the machine. Refer to Operation and Maintenance Manual, "Lifting Capacities" for the location of the load charts.

The forward stability of the machine will depend on the following factors:

- Weight of the attachment
- Weight of the load
- Angle of the boom
- Length of the boom
- The position of the stabilizers (if equipped)

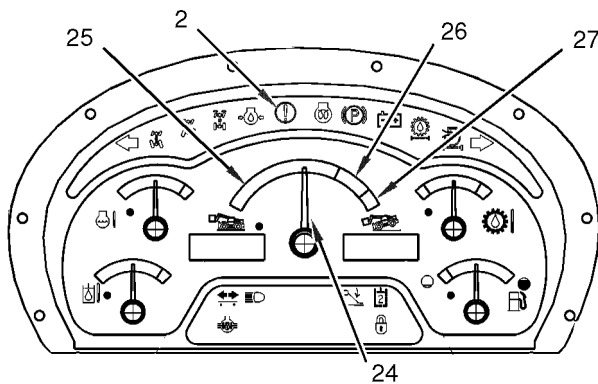


Illustration 131

g01014337

The longitudinal stability indicator has a variable gauge (24) that indicates the longitudinal stability of the machine. The indicator shows the status of the attempted lift operation in comparison to the limit of the machine stability. The variable gauge is located in the center of the display panel.

As the load on the machine increases, the indicator moves through the green zone toward the red zone of the gauge.

The scale on the gauge has three colored zones.

**Green Zone (25)** - The machine is operating within the limit of forward longitudinal stability.

**Amber zone (26)** - The limit for the forward longitudinal stability of the machine has been reached or exceeded.

**Red zone (27)** - The limit for the forward longitudinal stability of the machine has been exceeded.

When the visual indicator (24) enters the amber zone an audible alarm will sound continuously and a visible warning lamp (2) will begin to light. This audible signal indicates that the limit of longitudinal stability has been reached or exceeded. **When this condition occurs, do not proceed with the lift operation.**

Retract the boom if the boom is extended. If the boom

is retracted, return the load to the original position. If the indicator is not in the amber zone or the red zone, the alarm may be caused by another system. Check the other gauges for the indication of other problems. Change the operation of the machine.

### **WARNING**

**Extending the boom or lowering a raised boom further increases the outreach of the load. This can reduce the forward stability of the machine. Machine tip over could result. If the longitudinal stability indicator shows that the machine stability limit is being approached, do not lower or further extend the boom. Retract the boom before lowering. Machine tip over could cause personal injury or death to the operator or other personnel in the work area.**

The visual indicator (24) and the audible alarm may operate momentarily when the machine is traveling with a load on the work tool. This may occur more frequently on uneven ground or rough terrain. Turning the steering system onto the full lock may also cause unexpected operation of the visual alarm and the audible alarm.

When the ignition of the machine is turned from the OFF position to the ON position, the machine will perform the system test for the LSI. Refer to Operation and Maintenance Manual, "Longitudinal Stability Indicator System - Test" for more information. If the system passes the test for the LSI, the machine may be operated as normal.

If the LSI system should detect a problem, the machine will fail the system test. This will cause indicator (24) to hold in the red zone (27). An intermittent audible alarm will sound and the warning lamp will be illuminated. Refer to Operation and Maintenance Manual, "Longitudinal Stability Indicator System - Test" for more information if the test fails.

Another function of the system is the auto adjustment. When the machine is turned from the OFF position to the ON position, the machine will perform an automatic adjustment of the LSI. This adjustment will depend on the state of the machine upon turning the ignition to the ON position. For optimum performance of the LSI system, the machine should be parked in the following manner:

- Park the machine on level ground.
- Fully retract the boom.
- If equipped, fully raise the stabilizers.
- Fully lower the boom.
- Unload the work tool and gently rest the work tool on the ground.
- Remove the trailer from the hitch.

The LSI system will be more sensitive if the machine is not parked in this manner. The LSI will enter the amber zone and the alarm will be activated with lighter loads on the work tool.

In order to return the system to optimum performance, perform the following actions:

- Park the machine in the state that is mentioned above.
- Turn the ignition to the OFF position.
- Wait for 30 seconds.
- Start the machine and resume operation.

If any changes are made to the standard machine configuration of the Telehandler, the system may need to be recalibrated. Consult your Caterpillar dealer for recalibration of the LSI.

The following situations are conditions that require recalibration:

- The type of wheels on the rear axle are changed.
- The type of tires on the rear axle are changed.
- The tire foam fill is added to the tires.
- The rear axle is changed.
- The sensor for the LSI is changed.

The full test, which is stated in Operation and Maintenance Manual, "Maintenance Interval Schedule", must be followed.

## Backup Alarm

The backup alarm is located on the rear of the machine. The alarm sounds when the transmission direction and speed control lever is in the REVERSE position. The backup alarm is used to alert people behind the machine.

## Cab Door

Unlock the cab door.

**Note:** The key for the cab door is the same key as the engine start key.

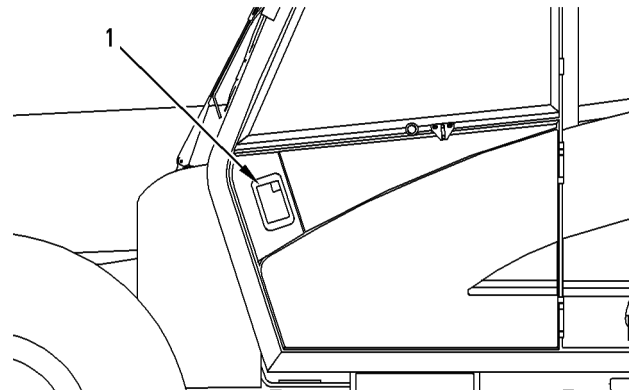


Illustration 132

g00955706

Pull out exterior door latch (1) in order to open the door from the outside.

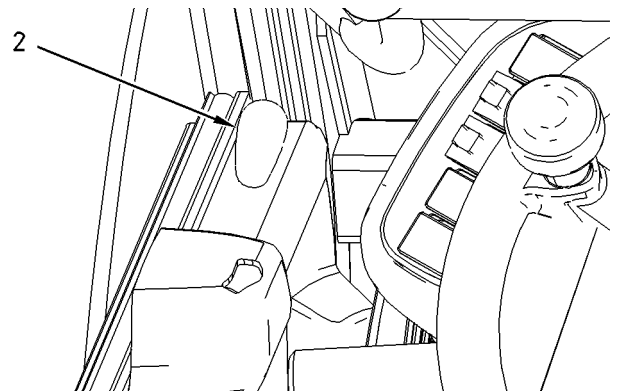


Illustration 133

g00955718

Push interior door latch (2) toward the front of the cab in order to open the door from the inside.

The door should be closed while you operate the machine.

# Engine Starting

## Engine Starting

### **WARNING**

Diesel engine exhaust contains products of combustion which may cause personal injury.

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

1. Adjust the operator seat. Refer to Operation and Maintenance Manual, "Seat" for more information.
2. Adjust the steering column. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.
3. Fasten the seat belt.

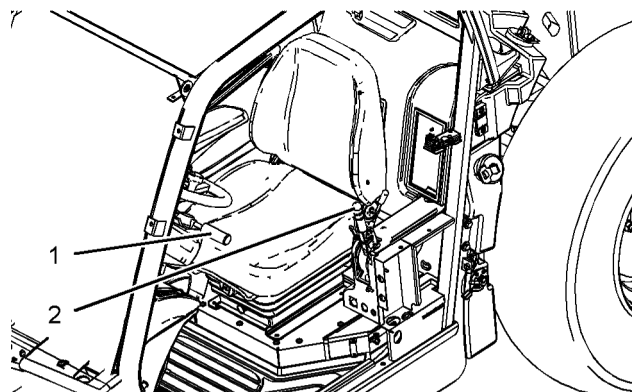


Illustration 146

g01117943

4. Move the transmission control (1) to the NEUTRAL position (N). The engine will not start unless the transmission control is in the NEUTRAL position.
5. Move the parking brake control (2) to the ENGAGED position.

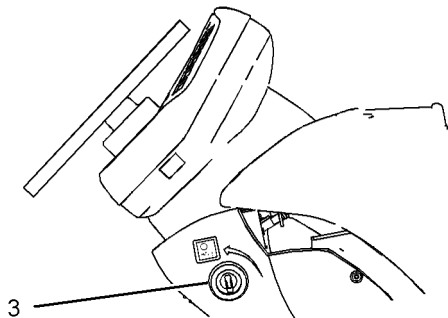


Illustration 147

g01117946

6. Turn the engine start switch key (3) to the RUN position in order to initialize the machine. The machine will run a self test that must be completed before you start the engine.

7. Before you crank the engine, depress the accelerator control (pedal) slightly.
8. Turn the engine start switch key to the START position in order to start the engine. Release the engine start switch key when the engine starts. Allow the engine to operate at low idle.

**Note:** Before you attempt to start the engine again, move the engine start switch key to the OFF position for 10 seconds. This will allow the diagnostic system to reset. Refer to the appropriate Service Manual for more detailed information about the self test.

### NOTICE

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

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

## Starting Below 0 °C (32°F)

### **WARNING**

If equipped with an air inlet heater (AIH) for cold weather starting, do not use aerosol types of starting aids such as ether. Such use could result in an explosion and personal injury.

1. Follow Step 1 to Step 7 of the Engine Starting procedure.

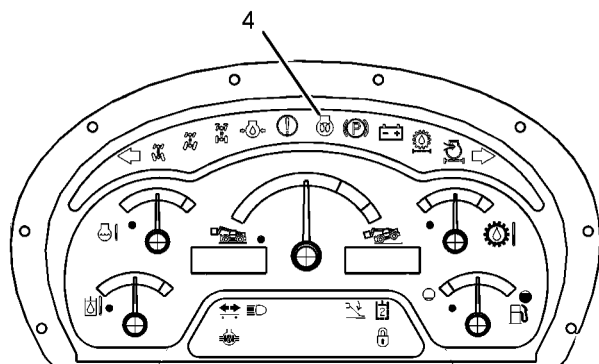


Illustration 148

g01117947

2. If the temperature is below the preset limit, indicator (4) will illuminate on the instrument panel.
3. When indicator (4) goes out, turn the engine start switch key to the START position in order to start the engine.

4. Allow the engine to warm up for several minutes. The actual time depends on the outside temperature. Use the latter part of this time to help warm up the hydraulic oil by operating the joystick control in order to raise the boom and lower the boom.

For starting below  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), the use of additional cold weather starting aids is recommended. Any of the following may be required.

- A coolant heater
- A fuel heater
- An oil heater
- An extra capacity battery

Before you operate the machine in temperatures below  $-23^{\circ}\text{C}$  ( $-10^{\circ}\text{F}$ ), consult your Caterpillar dealer.

## Engine and Machine Warm-Up

### NOTICE

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

1. Do not increase the engine speed from low idle. Do not apply load to the engine during the first ten seconds of operation.
2. Check all other gauges and indicators. All gauges and indicators should show normal operation.
3. Operate the engine at low idle for at least five minutes in order to warm the oil. More than five minutes warm up time may be required when the machine is operated in low temperature conditions. Use this warm up time to help warm the hydraulic oil by operating the joystick control in order to raise and lower the boom.

## Parking

### Stopping the Machine

#### NOTICE

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

Engage the parking brake. Do not engage the secondary brake while the machine is moving, unless the primary service brakes fail.

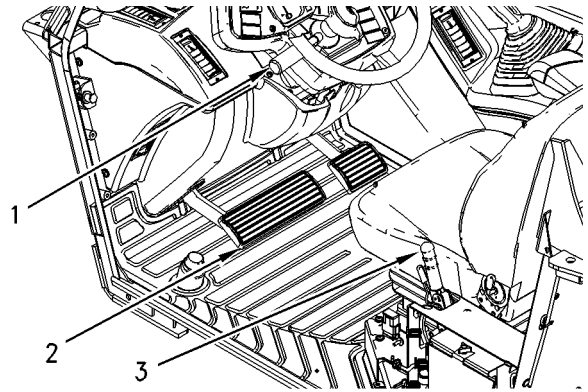


Illustration 149

g00953505

1. Apply service brake (2) in order to stop the machine. Hold down pedal (2) after the machine has stopped.
2. Move transmission control (1) to the NEUTRAL position.
3. Engage parking brake (3).
4. Release brake pedal (2). Ensure that the parking brake is holding the machine.
5. Fully retract the boom and fully lower the boom. If equipped, ensure that the work tool is resting on the ground.

## Stopping the Engine

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

1. Operate the engine for five minutes at low idle with no load. This procedure allows the temperature of the components to equalize.

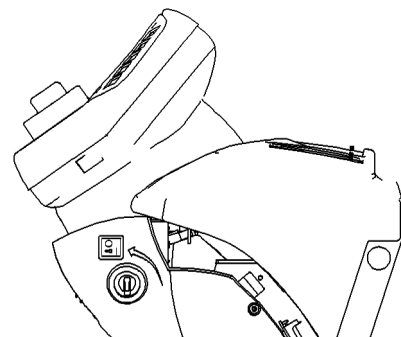


Illustration 150

g00952425

2. Turn the engine start switch key to the OFF position in order to stop the engine.

3. Remove the engine start switch key.

## Stopping the Engine if an Electrical Malfunction Occurs

Turn the engine start switch to the OFF position. If the engine does not stop, perform the following procedure.

1. Locate the fuse for the fuel pump. This fuse is located in the engine compartment, next to the circuit breakers. Remove the protective cover in order to access the fuse. Refer to Operation and Maintenance Manual, "Fuses and Relays - Replace".
2. Remove the fuse. The engine will stop.

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

## Leaving the Machine

1. Turn the engine start switch key to the ON position. Operate each hydraulic function several times in order to relieve pressure from the hydraulic system. Turn the engine start switch key to the OFF position and remove the key.
2. Close the windows and ensure that the windows are properly locked before you exit the cab.
3. Use steps and handholds whenever you dismount the machine. Face the machine and maintain a three-point contact with the steps and with the handholds. Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.
4. Lock the cab door.
5. Chock the wheels if the machine is parked on a slope.
6. Inspect the engine compartment for debris. Clean out any debris and any paper in order to avoid a fire.
7. Turn the key for the battery disconnect switch to the OFF position. When the machine is left for an extended period of one month, you should remove the key for the battery disconnect switch. Alternatively, the battery should be removed.
8. Close the engine enclosure and lock the engine enclosure.
9. Install all vandalism caps and covers before you leave the machine.

When the machine is left for an extended period of one month or longer, perform the following operations:

- Disconnect the battery and remove the battery.
- Relieve hydraulic pressure from the hydraulic system.

- Seal air intake and exhaust openings.
- Grease bright parts.
- Protect rubber components from direct sunlight.
- Fill the fuel tank.
- Ensure that the tires are correctly inflated.

## Transportation Information

### Shipping the Machine

Ensure that the combined weight of the machine and of the transport vehicle complies with local laws and regulations along the entire route.

Ensure that the intended route has adequate vertical clearances and horizontal clearances for the transport vehicle when the machine is loaded.

Remove ice, snow, or other slippery material from the transport vehicle, from the rail car, or from the loading dock before you load the machine.

Always chock the transport vehicle or the rail car wheels before you load the machine.

The boom must be fully retracted. The boom must also be lowered until the quick coupler or the work tool is resting on the transport vehicle.

#### 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.

Refer to Operation and Maintenance Manual, "Specifications" for the basic dimensions and the weights for shipping a standard machine.

### Roading the Machine

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

Inflate the tires to the correct air pressure. Use a self-attaching inflation chuck and stand behind the tire tread during the inflation. Refer to Operation and Maintenance Manual, "Tire Inflation - Check".



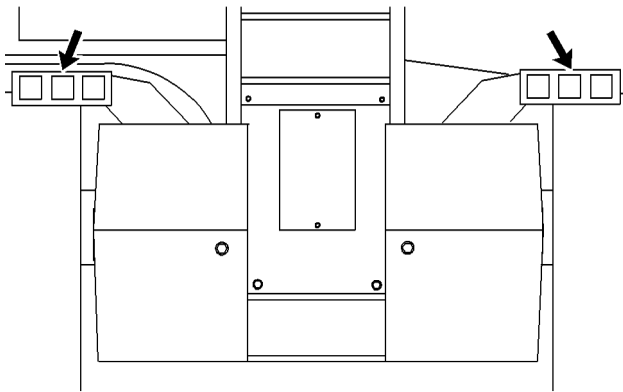


Illustration 151

g00977271

Move the rear lights to the LOWERED position for driving the machine on public roads.

Move the rear lights to the RAISED position for operation of the machine under normal working conditions.

Only operate the machine in two-wheel steer mode when you are roading a machine. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

Travel with the boom fully retracted and the boom lowered as far as possible while you are maintaining an adequate ground clearance for the coupler or for the work tool. Locking out the boom and auxiliary functions before roading the machine is a legal requirement in some countries. For information on locking out all boom and auxiliary hydraulic functions, refer to Operation and Maintenance Manual, "Operator Controls".

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

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

## Lifting and Tying Down the Machine

### WARNING

A machine may shift if improper procedures or equipment are used for lifting and tying down for transport. Ensure that proper equipment and procedures are used for lifting and tying machines down for transport. If a machine shifts it could cause personal injury or death.

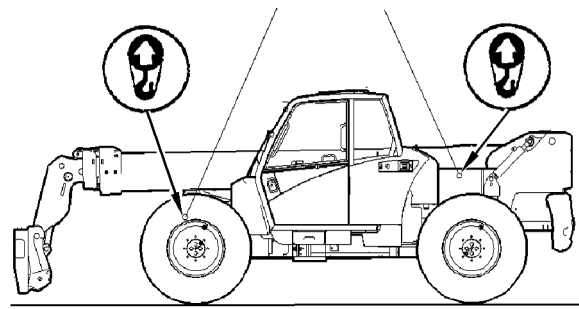


Illustration 152

g00863232

**Note:** Your machine may be equipped with front retrieval hitches. In order to gain access to the lifting points before lifting the machine, remove the two retrieval hitches and the lights that are attached to the front of the machine.

1. Use equipment which is rated for the weight of the machine that is being lifted.
2. Spreader bar widths should be sufficient in order to prevent damage to the machine.
3. Attach the equipment to the four lifting points that are provided.

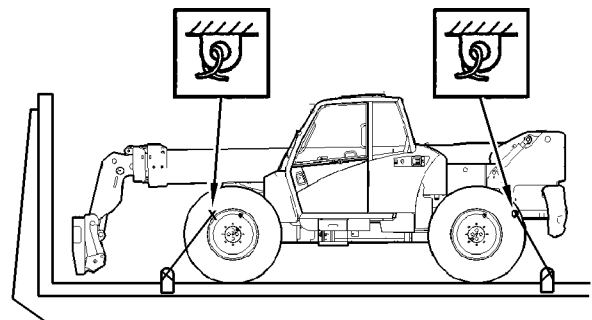


Illustration 153

g00863696

4. Install tie-downs which are rated for the weight of the machine. Install the tie-downs at the four locations that are provided.
5. Chock the front road wheels and the rear road wheels of the machine.
6. Engage the parking brake and move the transmission control to the NEUTRAL position.
7. Ensure that the boom is fully retracted. Ensure that the boom is lowered.
8. Stop the engine and remove the engine start switch key.
9. Cover the outlet of the exhaust pipe in order to prevent possible damage to the engine turbocharger.

If you are in doubt, consult your Caterpillar dealer for more information.

## Towing Information

### Towing the Machine

#### Towing a Disabled Machine

#### **WARNING**

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

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

Follow the recommendations below, to properly perform the towing procedure.

**Note:** The TH560B machine has limited off-road towing capability when the machines are equipped with a retrieval hitch. The gross weight of the trailer should not exceed 3 tons. The vertical load that is applied to the hitch should not exceed 0.5 ton. The retrieval hitch that is located on the rear of the machine and is intended to be used for retrieving the machine when the machine is disabled.

The towing instructions which follow are for moving the machine for a short distance at low speed. Move the machine at a speed of 8 km/h (5 mph) or less to a convenient location for repair. These instructions are only for emergencies. Always load the machine onto a suitable transport vehicle if long distance moving is required.

The parking brake must be engaged on the disabled machine, and the wheels must be chocked.

The boom must be fully retracted, lowered and the load must be removed before towing the machine. If hydraulic power is not available, refer to Operation and Maintenance Manual, "Equipment Lowering with Loss of Hydraulic Power" in order to retract the boom and lower the boom.

In order to prevent damage to the disabled machine, the front drive shaft and the rear drive shaft must be removed before towing. Refer to the appropriate Service Manual.

Do not use chains for towing a machine. Chain links can break with no warning. Use a wire rope with ends that have loops or rings or use a rigid tow bar. Before the machine is towed, make sure that the tow line or tow bar is in good condition. Make sure that the tow line or tow bar has enough strength for the conditions that are involved. The tow line or tow bar should be able to pull at least 150 percent of the gross weight of the towed machine. This pertains to towing a disabled machine from mud and to towing a machine on a grade.

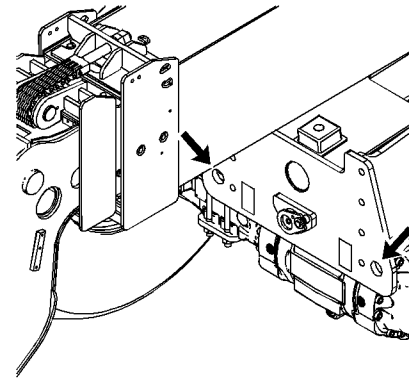


Illustration 154  
Lifting and tie-down points (front)

g01056003

For towing or retrieving the machine from the front, towing equipment should be attached to the lifting points on the frame at the front of the machine.

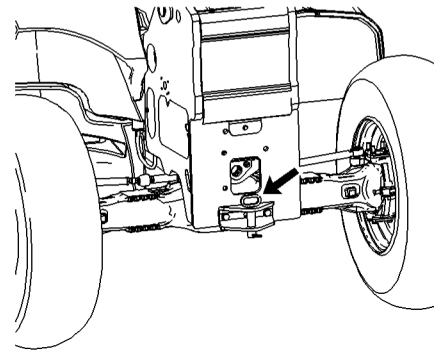


Illustration 156  
Typical retrieval hitch (rear)

g00952474

For towing or retrieving the machine from the rear, attach the tow line or tow bar to the retrieval hitch at the rear of the machine.

Normally, the towing machine should be at least the size of the disabled machine. Make sure that the towing machine has enough brake capacity, weight and power. The towing machine must be able to control both machines for the grade, distance and conditions that are involved.

A larger towing machine and a solid tow bar will be required in order to provide sufficient control and braking when a disabled machine is moved downhill.

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

Do not allow any person on the disabled machine except the operator. Only allow the operator on the disabled machine if the operator can control the steering and/or braking.

Use an observer in a safe position in order to watch the procedure. The observer can stop the procedure if the rope starts to break or the rope starts to unravel. Stop

the procedure if the towing machine moves without moving the towed machine.

Do not disengage the parking brake or remove chocks from the wheels before the tow line or tow bar has taken the weight of the disabled machine.

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

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

All situation requirements cannot be listed. Minimal towing machine capacity is required on smooth level surfaces while maximum towing machine capacity is required on grades with poor ground conditions.

If you are in doubt, consult your Caterpillar dealer for advice before you attempt to tow a disabled machine.

### Towing with the Machine

**Note:** The TH560B machine has limited off-highway towing capability.

#### WARNING

If the combined weight of the machine, the towed attachment and the attachment cargo exceed the brake capacity available from both the machine and the towed attachment, a loss of control may occur. The operator must verify that the combined weight does not exceed the combined braking capacity. Loss of control could cause injury or death.

**Note:** The maximum permissible weight of the attachment and freight may need to be reduced if the attachment will be towed on ground which is not level. The speed of the machine may also need to be reduced if the attachment will be towed on ground which is not level.

#### WARNING

Towed attachments which exceed the weights which are shown above must be equipped with a suitable type of brake system. The brake system must be of sufficient capacity in order to supplement the brake capacity of the machine.

Ensure that the braking specification for the towed attachment meets the local regulations for your intended application. Ensure that this has been confirmed by the supplier for the towed attachment.

For towed attachments that are equipped with a brake system of sufficient capacity, refer to Table 4.

Table 4

Type of Hitch		TH560B
Retrieval Hitch <sup>(1)</sup>	Maximum weight of attachment and freight	3000 kg (6600 lb)
	Maximum vertical weight component on the hitch interface	500 kg (1100 lb)

(1) Only for off-highway use

**Note:** When you operate the machine with a towed attachment, check the engine temperature and the transmission temperature more frequently. Check the temperatures more frequently when you operate the machine on a grade. If either temperature rises above the normal operating range for the machine, operate the machine in a lower gear.

### Retrieval Hitch

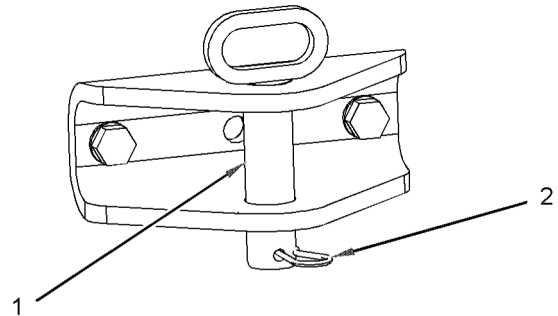


Illustration 157

g01068287

In order to connect the attachment for towing, remove pin (1). Align the machine and the tow eye of the attachment. Reverse the machine with assistance in order to ensure an easy connection.

Secure pin (1) with spring pin (2).

**Note:** The retrieval hitch is only suitable for off-highway use.

## Engine Starting (Alternate Methods)

### Engine Starting with Jump Start Cables

#### **WARNING**

Never "hotwire" or short across the starter terminals! Hotwiring or shorting across the starter terminals could bypass the engine neutral start system, damage the electrical system, and result in unexpected machine motion or behavior. This could cause personal injury or death.

#### **WARNING**

Failure to properly service the batteries may cause personal injury.

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

Do not smoke when checking battery electrolyte levels.

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

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

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

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

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

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

#### NOTICE

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

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

This machine has a 12 volt starting system. Use only the same voltage for jump starting. Use of a welder or higher voltage damages the electrical system.

Refer to Special Instruction, Battery Test Procedure, SEHS7633, available from your Caterpillar dealer, for complete testing and charging information.

If your battery is dead, you may need to charge the battery at a low rate of charge. When auxiliary start receptacles are not available, use the following procedure:

1. Engage the parking brake on the stalled machine. Place the transmission into neutral. Lower the equipment to the ground. Move all of the controls to the HOLD position.
2. Turn the engine start switch on the stalled machine to the OFF position. Turn off all of the accessories.
3. Turn the battery disconnect switch on the stalled machine to the ON position (if equipped).
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. Engage the parking brake of the machine that is being used as an electrical source.
6. 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.
7. Ensure that battery caps on both machines are tight. Ensure that the battery caps are correctly placed. Ensure that batteries in the stalled machine are not frozen. Make sure that the batteries have enough electrolyte. Use a face shield and protective clothing in order to perform this task.
8. The positive ends of the jump start cable are red. Connect one positive end of the jump start cable to the positive cable terminal of the discharged battery. Some machines have battery sets.

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

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

9. Connect the other positive end of the jump start cable to the positive cable terminal of the electrical source.
10. Connect one negative end of the jump start cable to the negative cable terminal of the electrical source.

11. Finally, connect the other negative end of the jump start cable to the frame of the stalled machine. Do not connect the jump start cable to the battery post. Do not allow the jump start cables to contact the following components: the fuel lines, the hydraulic lines, and any moving parts.
12. Start the engine of the machine that is being used as an electrical source or energize the charging system on the auxiliary power source.
13. Wait at least two minutes before you attempt to start the stalled machine. This will allow the batteries in the stalled machine to partially charge.
14. Attempt to start the stalled engine. Refer to Operation and Maintenance Manual, "Engine Starting" for the correct starting procedure.
15. Immediately after you start the stalled engine, disconnect the jump start cables in reverse order.

## Equipment Lowering with Loss of Hydraulic Power

### WARNING

Lowering the boom with the engine stopped can cause personal injury or death.

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

### WARNING

Personal injury can result from not following the specified procedure.

To avoid personal injury, follow the procedure as specified.

### WARNING

Lowering a raised boom increases the outreach of the load. This can reduce the forward stability of the machine resulting in machine tip over. This can cause injury or death to the operator or other personnel in the work area. Always retract the boom, if possible, before lowering it.

The cylinder for retracting the boom, and the cylinder for lowering the boom are equipped with load control valves. The load control valves lock oil in the cylinders if hydraulic power is lost. The locked oil in the cylinders prevents the boom from moving.

In most situations, the boom can be retracted and the boom can be lowered from ground level if hydraulic power is lost.

If the angle of the boom is too low you may not be able to retract the boom.

If the boom cannot be retracted, it might be possible to lower the load to ground level without retracting the boom first. Assess the weight of the load and consult the appropriate load chart in order to determine that the load can be lowered in this way without causing the machine to tip forward. Do not attempt to lower the boom unless you are satisfied with the stability of the machine. You must be sure that the boom can be lowered without hitting an obstacle.

Due to the size of the hydraulic tank, it is possible to return 12 L (3.17 US gal) of oil to the tank more than the tank capacity. This volume of oil must be removed by the following procedure before lowering the boom or retracting the boom from full stroke.

## Procedure for Draining Hydraulic Tank

### WARNING

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

### NOTICE

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

Refer to Special Publication, NENG2500, "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.

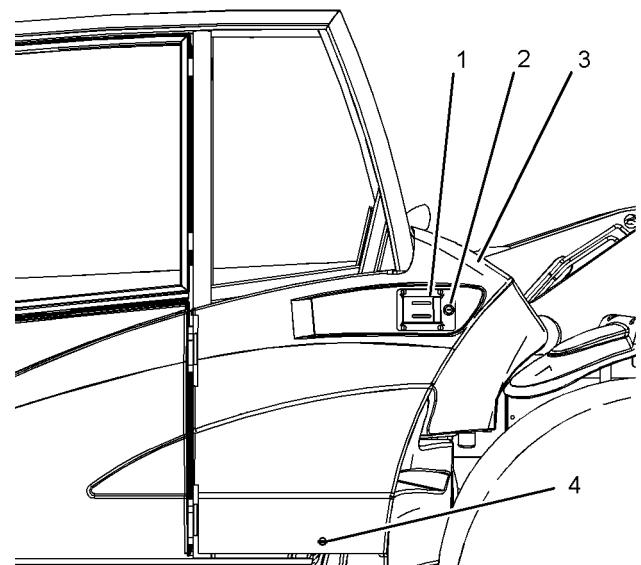


Illustration 134  
Protection cover

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1. In order to open protection cover (3), unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

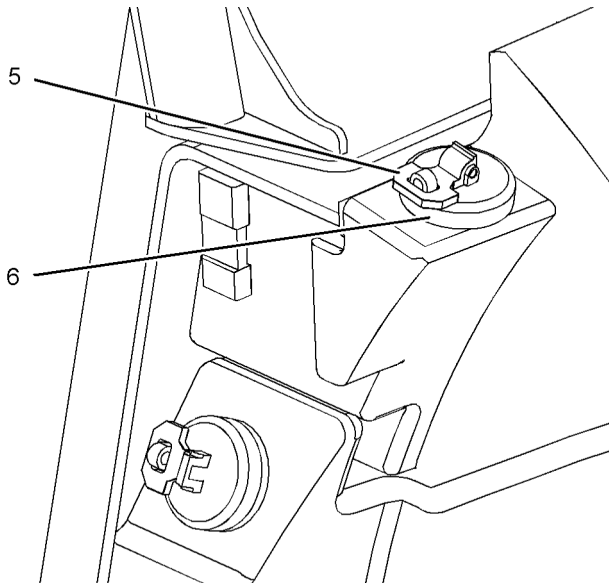


Illustration 135  
Hydraulic tank filler cap

g01205579

2. Lift latch (5), and turn the latch counterclockwise in order to relieve the pressure in the hydraulic system. Remove hydraulic tank filler cap (6).

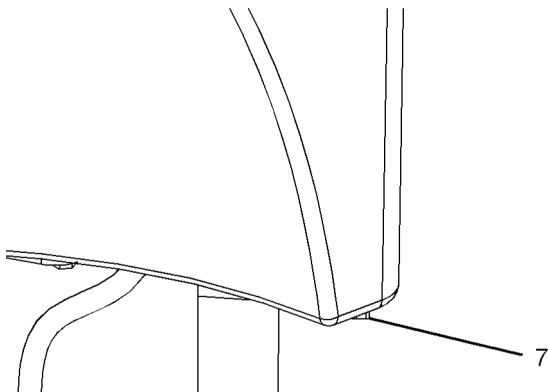


Illustration 136

g01205675

3. Remove drain plug (7) from the bottom of the hydraulic tank and drain 12 L (3.17 US gal) of oil into a suitable container. Clean the drain plug. Install the drain plug back into the hydraulic tank. Install the hydraulic tank filler cap. If the boom does not need to be retracted, proceed to "Procedure for Lowering the Boom".

### Procedure for Retracting the Boom

**Note:** If the angle of the boom is below approximately 55 degrees, the boom may not retract. If the boom is below 55 degrees and there is only a light load on the work tool, it may not be necessary to perform "Procedure for Retracting the Boom"

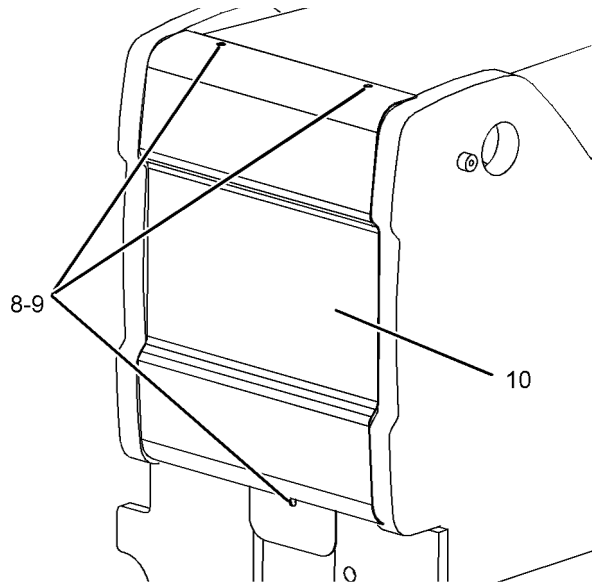


Illustration 141

g01205716

1. Locate the rear cover on the back of the boom. Remove three bolts (8) and three hard washers (9) that hold rear cover (10) in place. Remove the rear cover.

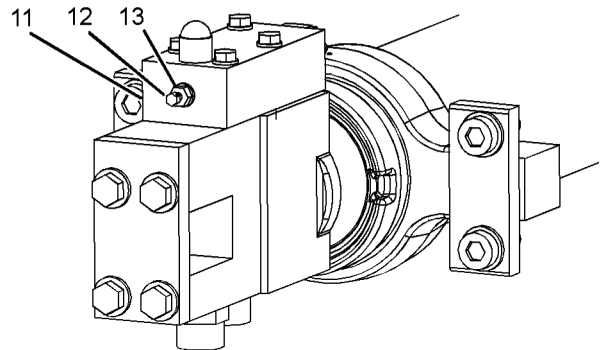


Illustration 142

g01205723

2. Locate load control valve (11). Slightly loosen locknut (13). Remove adjustment screw (12) without rotating locknut (13) on the screw. Measure the distance from the head of adjustment screw (12) to the top of locknut (13). Record this measurement. This measurement will be required later when adjustment screw (12) is reset. Spin locknut (13) to the head of adjustment screw (12). Turn adjustment screw (12) by hand into load control valve (11) in order to contact the ball. Attach a wrench to adjustment screw (12) and turn the screw clockwise until the screw becomes tight.

**Note:** Do not use excessive force when a wrench is used in order to turn adjustment screw (12).

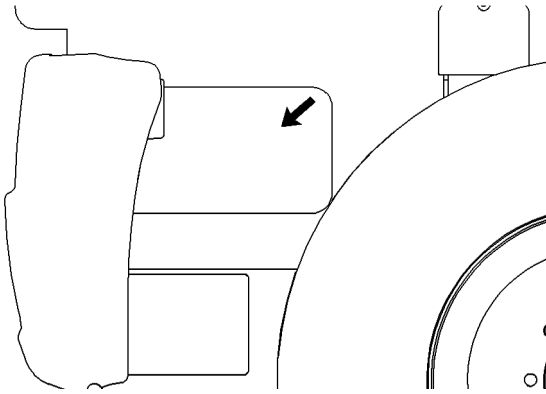


Illustration 143

g00964632

3. Locate the rear access cover on the right side of the chassis. Remove the two washers and two bolts that secure the access cover to the chassis. Remove the access cover in order to gain access to the control valve.

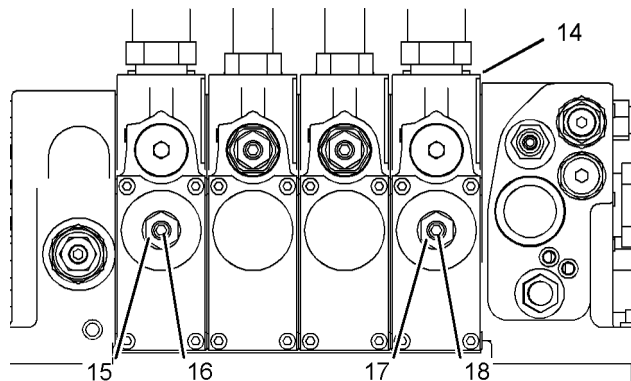


Illustration 144

g01205727

4. Locate control valve (14).
5. Measure the distance from the head of adjustment screw (18) to the top of locknut (17). Completely remove locknut (17). Turn the screw clockwise by hand until the screw is tight. Use an allen wrench to turn the adjustment screw clockwise in order to retract the boom. Allow the boom to fully retract.

**Note:** If necessary, turn adjustment screw (18) counterclockwise in order to stop the boom from retracting.

6. When the boom has fully retracted, turn adjustment screw (18) in a counterclockwise direction until the adjustment screw is returned to the original position.
7. Tighten locknut (17). If the boom needs to be lowered, proceed to "Procedure for Lowering the Boom".

**Note:** Do not start the engine until you have reset adjustment screws (12) and (18).

8. Start the engine. Raise and lower the boom. Extend and retract the boom approximately 300 mm (12 inch).
9. Position the boom to the fully retracted position. Position the boom to the fully lowered position.
10. Remove the hydraulic tank filler cap. Add the 12 L (3.17 US gal) of oil that was removed from the hydraulic tank in Step 3 of "Procedure for Draining Hydraulic Tank".
11. Check the oil level in the hydraulic tank. If necessary, top up the hydraulic oil to the required level. Install the hydraulic tank filler cap. Clean up any oil that may have been spilled. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)" for further information.
12. Install the access cover on the chassis. Install the rear cover for the boom.

### Procedure for Lowering the Boom

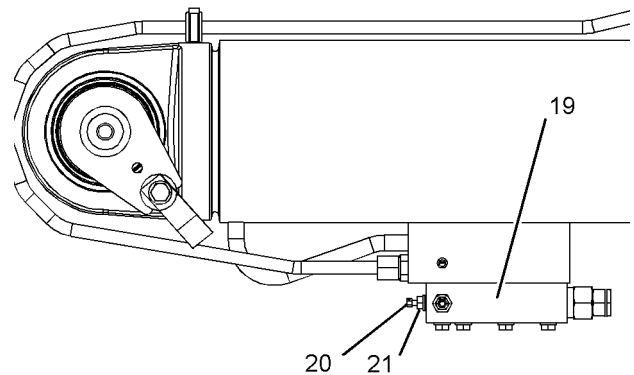


Illustration 145

g01205730

1. Locate load control valve (19) for lowering the boom. The load control valve is mounted to the underside of the cylinder, and toward the rear of the cylinder. The valve can be accessed from the underside of the machine.
2. Slightly loosen locknut (21). Remove adjustment screw (20) without rotating locknut (21) on the screw. Measure the distance from the head of adjustment screw (20) to the top of locknut (21). Record this measurement. This measurement will be required later when adjustment screw (20) is reset. Spin locknut (21) to the head of adjustment screw (20). Turn adjustment screw (20) by hand into load control valve (19) in order to contact the ball. Attach a wrench to adjustment screw (20) and turn the screw clockwise until the screw becomes tight.

**Note:** Do not use excessive force when a wrench is used to turn adjustment screw (20).

3. Locate control valve (14). Refer to Illustration 144.

4. Measure the distance from the head of adjustment screw (16) to the top of locknut (15). Completely remove locknut (15). Turn the screw clockwise by hand until the screw is tight. Use an allen wrench to turn the adjustment screw clockwise in order to lower the boom. Allow the boom to fully lower.

**Note:** If necessary, turn adjustment screw (16) counterclockwise in order to stop the boom from lowering.

5. When the boom has fully lowered, turn adjustment screw (16) in a counterclockwise direction until the adjustment screw is returned to the original position.
6. Tighten locknut (15).

**Note:** Do not start the engine until you have reset adjustment screw (16) and adjustment screw (20).

7. Start the engine. Raise and lower the boom. Extend and retract the boom approximately 300 mm (12 inch).
8. Position the boom to the fully retracted position. Position the boom to the fully lowered position.
9. Remove the hydraulic tank filler cap. Add the 12 L (3.17 US gal) of oil that was removed from the hydraulic tank in Step 3 of "Procedure for Draining Hydraulic Tank".
10. Check the oil level in the hydraulic tank. If necessary, top up the hydraulic oil to the required level. Install the hydraulic tank filler cap. Clean up any oil that may have been spilled. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)" for further information.
11. Install the access cover on the chassis.

## Resetting the Load Control System

### Resetting the Load Control Valves

1. Reset adjustment screw (12) to the measurement that was recorded in Step 2 of "Procedure for Retracting the Boom". Refer to Illustration 142.
2. Reset adjustment screw (20) to the measurement that was recorded in Step 2 of "Procedure for Lowering the Boom". Refer to Illustration 145.
3. Secure adjustment screw (12) with locknut (13). Also, secure adjustment screw (20) with locknut (21).
4. Repair the machine before you return the machine to service.

## Purging Air from the System

Air may have entered the hydraulic system. Ensure that the air is purged from the hydraulic system before the machine is returned to service.

**Note:** Purging air from the system should be performed on an unloaded boom.

1. Fully raise the boom and fully lower the boom.
2. Repeat this procedure three times in order to purge the air from the hydraulic system.
3. Fully extend the boom and fully retract the boom. The boom operation should be smooth.
4. If necessary, repeat this procedure in order to purge the air from the hydraulic system.

## Verifying the Correct Setting of the Load Control Valves

1. Install a work tool onto the quick coupler. Raise the boom until the work tool is clear of the ground. Extend the boom by approximately 300 mm (12 inch).
2. Look at the boom extension reference scale and the boom angle reference scale and note the readings. Refer to the load chart and use these two values in order to determine the maximum weight that can be lifted with the boom in this position.
3. Pick up the maximum load that was determined in Step 2. Refer to the procedure for load handling and stacking in Operation and Maintenance Manual, "Operation Information".
4. Extend the boom approximately 300 mm (12 inch) and fully raise the boom.
5. Stop the engine.
6. On control valve (14), turn locknut (15) and locknut for one turn in a counterclockwise direction. Turn adjustment screw (16) and adjustment screw in a counterclockwise direction for four full turns. Refer to Illustration 144.
7. Check the position of the boom after 10 minutes. The cylinder for the boom retract and the cylinder for the boom raise should not have drifted. If either cylinder has drifted, consult your Caterpillar dealer. Do not operate the machine until any necessary repairs are completed or until any necessary adjustments are completed.
8. Turn adjustment screw (16) and adjustment screw (18) in a clockwise direction. Tighten the screws.
9. Tighten locknut (15) and locknut (17).



## Maintenance Section

### Maintenance Access

#### Access Doors and Covers

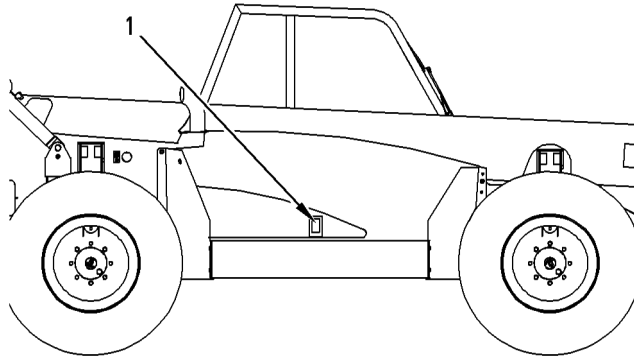


Illustration 158

g00954656

Access door (1) is located on the right side of the machine. Open the access door in order to access the following components:

- Batteries
- Belt
- Circuit breakers
- Coolant tank and pressure cap
- Water temperature regulator
- Engine air filters
- Engine mounts
- Engine oil dipstick
- Engine oil filler cap
- Engine oil filter
- Engine crankcase drain line
- Fuel injectors
- Fuel system priming pump
- Primary fuel filter/water separator element
- Radiator
- Turbocharger

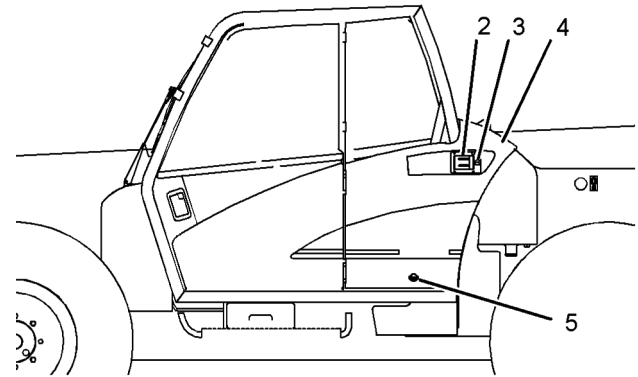


Illustration 159

g01206261

In order to open protection cover (4) on the left side of the machine, unlock lock (3) and turn lock (5) counterclockwise. Then, pull latch (2) outward. Open the protection cover in order to access the following components:

- Primary cab air filter
- Fuses and relays
- Fuel tank and filler cap
- Hydraulic oil tank and filler cap
- Sight gauge for the hydraulic oil

## Tire Inflation Information

### Tire Inflation with Air

#### **WARNING**

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire.

Proper inflation equipment, and training in using the equipment, are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

Before inflating tire, install on the machine or put tire in restraining device.

#### NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa (20 psi) over the recommended tire pressure.

Refer to Operation and Maintenance Manual, "Tire Pressure" for operating pressures.

## Tire Pressure

### **WARNING**

Personal injury can result from improper tire inflation.

A tire blowout or rim failure can result from improper or misused equipment.

Use a self-inflating chuck and stand behind the tread when inflating a tire.

Proper inflating equipment, and training in using the equipment, are necessary to avoid overinflating.

Before inflating tire, put the tire in a restraining device.

The tire inflation pressures that are shown in the following table are cold inflation pressures.

Tire inflation pressures for each application may vary. These tire inflation pressures should be obtained from your tire supplier.

Stand behind the tire tread and use an inflation chuck on the air line with a Caterpillar 4S-6524 Pressure Gauge, or 1P-0545 Pressure Gauge. If these pressure gauges are not available use an equivalent tool to check the tire pressure.

Table 6

EAME Standards			
Tire Size	Ply Rating	Tire Pressure	Compatible with Foam
14-24 16PR TG2	16	375 kPa (55 psi)	No
14-24 SGG-2A 16PR	16	525 kPa (76 psi)	No
14-24 16PR CATERPILLAR	16	550 kPa (80 psi)	No

Refer to the topics in the following list for more information on tire inflation:

- Operation and Maintenance Manual, "Tire Inflation with Air"
- Operation and Maintenance Manual, "Tire Inflation Pressure Adjustment"

## Tire Inflation Pressure Adjustment

The tire pressure in a warm shop area 18° to 21 °C (65° to 70°F) will significantly change when you move the machine into freezing temperatures. If you inflate the tire to the correct pressure in a warm shop, the tire will be underinflated in freezing temperatures. Low pressure shortens the life of a tire.

## Tire Damage

For pneumatic tires, when any cut, rip or tear is discovered that exposes sidewall or tread area cords in the tire, measures be taken to remove the product from service immediately. Arrangements must be made for replacement of the tire or tire assembly.

For polyurethane foam filled tires, when any of the following are discovered, measures must be taken to remove the product from service immediately. Arrangements must be made for replacement of the tire or tire assembly.

- A smooth even cut through the cord piles which exceeds 7.5 cm (3 in) in total length.
- Any tears or rips (ragged edges) in the cord piles which exceeds 2.5 cm (1 in) in any direction.
- Any punctures which exceed 2.5 cm (1 in) in diameter.

If a tire is damaged but within the above noted criteria, the tire must be inspected daily to ensure the damage has not propagated beyond the allowable criteria.

## Tire Replacement

It is recommended that a replacement tire be the same size, ply and brand as originally installed. Refer to the appropriate parts manual for ordering information. If not using an approved replacement tire, the replacement tires must have the following characteristics:

- Equal or greater ply/load rating and size of original.
- Tire tread contact width equal or greater than original.
- Wheel diameter, width and offset dimensions equal to the original.
- Approved for the application by the tire manufacturer (including inflation pressure and maximum tire load).

### Wheel Replacement

The rims installed have been designed for stability requirements which consist of track width, tire pressure and load capacity. Size changes such as rim width, center piece location, larger or smaller diameter, etc., without written factory recommendations, may result in unsafe condition regarding stability.

## Wheel and Tire Installation

Torque lug nuts before first use and after each wheel removal.

**Note:** If machine is equipped with directional tire assemblies, the wheel and tire assemblies must be installed with the directional tread pattern “arrows” facing in the direction of forward travel.

1. Start all nuts by hand to prevent cross threading. DO NOT use a lubricant on threads or nuts.
2. Tighten lug nuts in an alternating pattern. Torque to 400-520 Nm (295-384 lb-ft).

### WARNING

**TIP OVER HAZARD.** Lug nuts must be installed and maintained at the proper torque to prevent loose wheels, broken studs and possible separation of wheel from axle. Failure to comply could result in death or serious injury.

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# Lubricant Viscosities and Refill Capacities

## Lubricant Viscosities

The proper oil viscosity grade is determined by the minimum outside ambient temperature. This is 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 in order to select the oil viscosity grade 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 when you start the machine.

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. Consult your dealer if additional information is needed. Refer to the appropriate Service Manual for further information.

Table 7

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Classification	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase <sup>(1)(2)</sup>	Cat DEO Multigrade Cat DEO SYN Cat Arctic DEO SYN <sup>(3)</sup> Cat ECF-1 <sup>(4)</sup> API CG-4 Multigrade <sup>(5)</sup>	SAE 0W-20	-40	10	-40	50
		SAE 0W-30	-40	30	-40	86
		SAE 0W-40	-40	40	-40	104
		SAE 5W-30	-30	30	-22	86
		SAE 5W-40	-30	50	-22	122
		SAE 10W-30	-18	40	0	104
		SAE 10W-40	-18	50	0	122
		SAE 15W-40	-9.5	50	15	122
Hydraulic System, Service Brake System, Transmission, Differentials and Final Drives <sup>(6)</sup>	Cat TDTO Cat TDTO-TMS Cat Arctic TDTO SYN commercial TO-4	SAE 0W-20	-40	40	-40	104
		SAE 0W-30	-40	40	-40	104
		SAE 5W-30	-30	40	-22	104
		SAE 5W-40	-30	40	-22	104
		SAE 10W	-20	40	-4	104
		SAE 30	10	50	50	122
		SAE 10W-30	-20	40	-4	104
		SAE 15W-40	-15	50	5	122
		Cat TDTO-TMS <sup>(7)</sup>	-20	50	-4	122

(1) Supplemental heat is recommended for cold-soaked starts below the minimum ambient temperature. Supplemental heat may be required for cold-soaked starts that are above the minimum temperature that is stated, depending on the parasitic load and other factors. Cold-soaked starts occur when the engine has not been operated for a period of time, allowing the oil to become more viscous due to cooler ambient temperatures.

(2) API CF oils are not recommended for Caterpillar 3500 Series and smaller Direct Injection (DI) diesel engines. API CF-4 oils are not recommended for Caterpillar machine diesel engines.

(3) Cat Arctic DEO SYN is an SAE 0W-30 viscosity grade oil.

(4) API CI-4, API CI-4 PLUS, and API CH-4 oils are acceptable if the requirements of Caterpillar's ECF-1 (Engine Crankcase Fluid specification -1) are met. API CI-4, API CI-4 PLUS, and API CH-4 oils that have not met the requirements of Caterpillar's ECF-1 specification may cause reduced engine life.

(5) API CG-4 oils are acceptable for use in all Caterpillar machine diesel engines. When API CG-4 oils are used, the oil change interval should not exceed 250 hours. API CG-4 oils that also meet API CI-4, API CI-4 PLUS, or API CH-4 must also meet the requirements of the Caterpillar ECF-1 specification.

(6) Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the amount of 197-0017 Friction Modifier (Axle and Brake) that needs to be added to the center section of the front axle on your machine. CT Cat TDTO-TMS (Transmission Multi-Season) (synthetic blend that exceeds the TO-4M multigrade specification requirements).

## Recommended Grease

### Cat MPG (Multipurpose Grease)

Cat MPG is a National Lubricating Grease Institute (NLGI) grade 2 grease. This grease is made with petroleum base oil and a lithium complex thickener. Cat MPG is formulated for use in applications that have a low severity to a medium severity in moderate temperatures.

Cat MPG meets the NLGI certification of "GC-LB". (This certification relates to extended service intervals in automotive chassis points and in wheel bearings with disc brakes in automobiles, vans and light trucks.)

**Note:** If the application calls for an MPG and a Cat MPG is not available, consult the grease data sheets.

Use a substitute that meets or exceeds the performance characteristics of Cat MPG.

## Capacities (Refill)

Table 8

APPROXIMATE REFILL CAPACITIES			
Compartment or System	Liter	US gal	Imp gal
Cooling System (Total Capacity without Heater) 12 kW gold cooler	22.5	5.9	5.0
Cooling System (Total Capacity with Heater) 12 kW gold cooler	23.5	6.2	5.2
Cooling System (Total Capacity without Heater) 20 kW black cooler	23.5	6.2	5.2
Cooling System (Total Capacity with Heater) 20 kW black cooler	24.5	6.5	5.4
Fuel Tank (Tank Capacity)	110	29	24.2
Total Engine (Oil Capacity) 74.5 kW (99 hp) engine	Max level 8.4 Min level 7.1	Max level 2.2 Min level 1.9	Max level 1.8 Min level 1.6
Total Engine (Oil Capacity) 92 kW (123 hp) or 93.1 kW (125 hp) engine	Max level 8.5 Min level 6.8	Max level 2.2 Min level 1.8	Max level 1.9 Min level 1.5
Front Axle Differential <sup>(1)</sup>	15	4	3.3
Rear Axle Differential	13.5	3.6	3
Final Drive Hubs (Each Hub)	1.7	.44	0.37
Hydraulic System (Including the Hydraulic Oil Tank and the Transmission)	105.3	27.8	23.2
Washer Fluid Bottle	5	1.3	1.1

(1) Quantities exclude 0.4 L (0.11 US gal) of 197-001 7 Friction Modifier (Axle and Brake).

## Grease Points Identification

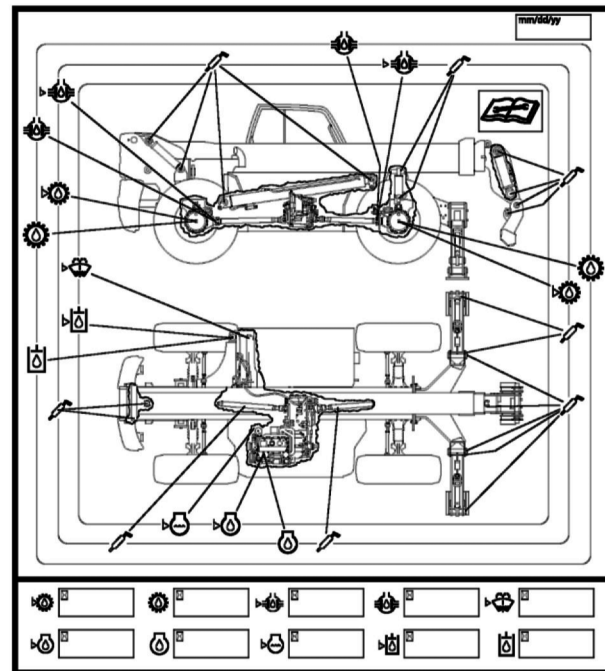


Illustration 160  
Typical example

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On machines that are equipped with the Open Roll Over Protective Structure (OROPS), the identification film is located in the engine compartment to the back plate of the enclosure group. On machines that are equipped with the Enclosed Roll Over Protective Structure (EROPS), the identification film is located on the inside of the lower door.

The identification film shows the lubrication points on the machine that need to be serviced and the maintenance intervals between each of the checks.

**Note:** Refer to Operation and Maintenance Manual, "Maintenance Interval Schedule" for the recommended intervals.

## SOS Information

SOS Services is a highly recommended process for Caterpillar 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, SOS Services can help determine the cause of an existing product problem.

Refer to the appropriate Service Manual for detailed information concerning SOS Services.

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

Consult your Caterpillar dealer for complete information and assistance in establishing an SOS program for your equipment.

## Maintenance Support

### Welding on Machines and Engines with Electronic Controls

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 ECM 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 from the debris which is created from welding. Protect any wiring harnesses from the splatter which is created from welding.
5. Use standard welding procedures in order to weld the materials together.

## Maintenance Interval Schedule

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, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. 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.

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

### When Required

Axle Breathers - Clean/Replace .....	101
Battery- Recycle .....	101
Battery or Battery Cable - Inspect/Replace .....	101
Boom Telescoping Cylinder Air-Purge .....	105
Boom and Frame - Inspect.....	108
Cab Air Filter-Clean/Replace.....	110
Circuit Breakers - Test .....	111
Cooling System Pressure Cap - Clean/Replace .....	115
Engine Air Filter Primary Element - Clean/Replace .....	119
Engine Air Filter Secondary Element - Replace.....	121
Fuel System - Prime .....	126
Fuel Tank Cap-Clean .....	129
Fuses and Relays - Replace .....	130
Oil Filter- Inspect .....	155
Parking Brake -Adjust .....	155
Radiator Core - Clean.....	135
Window Washer Reservoir- Fill .....	142
Window Wiper- Inspect/Replace .....	143

### Every 10 Service Hours or Daily

Backup Alarm - Test .....	101
Braking System - Test.....	109
Cooling System Coolant Level - Check .....	113
Engine Oil Level - Check.....	122
Fuel System Water Separator - Drain.....	127

Fuel Tank Water and Sediment - Drain .....	127	Pulley for Boom Retraction Chain - Lubricate.....	135
Indicators and Gauges - Test .....	133	Stabilizer and Cylinder Bearings - Lubricate .....	137
Seat Belt - Inspect .....	137	<b>Every 1000 Service Hours or 1 Year</b>	
Tire Inflation - Check.....	138	Belt- Inspect/Replace .....	101
Transmission and Hydraulic System Oil Level - Check .....	141	Boom Wear Pad Clearance - Inspect/Adjust .....	106
Wheel Nut Torque - Check.....	142	Cooling System Coolant - Change.....	112
Windows - Clean.....	143	Differential Oil - Change .....	116
Work Tool - Inspect/Replace .....	143	Final Drive Oil - Change .....	124
<b>Every 100 Service Hours or Monthly</b>		Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) - Inspect .....	136
Longitudinal Stability Indicator-Test.....	154	Transmission and Hydraulic System Oil - Change .....	138
<b>Every 250 Service Hours</b>		Transmission and Hydraulic System Oil Filter - Replace .....	139
Cooling System Coolant Sample (Level 1) - Obtain .....	113	Work Tool - Inspect/Replace .....	143
Engine Oil Sample - Obtain .....	122	<b>Every 2000 Service Hours or 2 Years</b>	
<b>Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)</b>		Engine Valve Lash - Check .....	124
Cooling System Coolant Sample (Level 2) - Obtain .....	114	Refrigerant Dryer- Replace.....	136
<b>Every 500 Service Hours</b>		Transmission and Hydraulic System Tank Breather- Clean .....	141
Differential Oil Sample - Obtain .....	118	Turbocharger - Inspect .....	142
Final Drive Oil Sample - Obtain .....	125	<b>Every Year</b>	
Transmission and Hydraulic System Oil Sample - Obtain .....	141	Cooling System Coolant Sample (Level 2) - Obtain .....	114
<b>Every 500 Service Hours or 6 Months</b>		<b>Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture</b>	
Boom Chain Tension - Check/Adjust .....	103	Seat Belt- Replace .....	137
Boom Cylinder Pin - Lubricate .....	105	<b>Every 3000 Service Hours or 3 Years</b>	
Boom Head Section - Lubricate .....	105	Boom Chain - Inspect/Lubricate .....	103
Boom Pivot Shaft - Lubricate .....	105	Cooling System Water Temperature Regulator - Replace .....	115
Compensating Cylinder Bearing - Lubricate .....	111	Engine Mounts - Inspect.....	121
Differential Oil Level - Check.....	117		
Drive Shaft Spline - Lubricate .....	118		
Drive Shaft Universal Joint Bolts - Check.....	119		
Engine Air Filter Primary Element - Clean/Replace .....	119		
Engine Air Filter Primary Element - Replace .....	121		
Engine Air Filter Secondary Element - Replace .....	121		
Engine Oil and Filter-Change .....	122		
Final Drive Oil Level - Check.....	125		
Fork Leveling Cylinder Pin - Lubricate .....	126		
Frame Leveling Cylinder Pin - Lubricate .....	126		
Fuel System Water Separator Element - Replace.....	127		
Longitudinal Stability Indicator-Calibrate .....	133		
Pulley for Boom Extension Chain - Lubricate .....	135		



## Axle Breathers - Clean/Replace

1. Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.

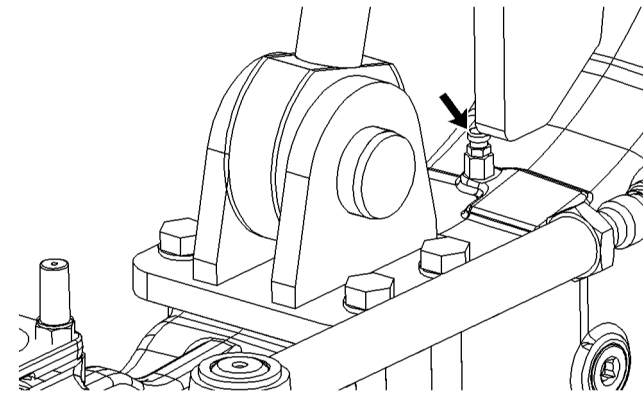


Illustration 161  
Axle Breather

g00979103

2. Locate the axle breathers on the right side of the front and rear axles. Clean the area around the breathers. Remove the breathers from the front and rear axles.
3. Wash the breathers in clean nonflammable solvent. Wipe the breathers dry and check the breathers for damage.
4. Replace the breathers if the breathers are damaged. Install the clean breathers back into the axles.

## Backup Alarm - Test

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

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

Apply the service brake. Move the transmission control lever to the REVERSE position.

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

The backup alarm has one sound level. The sound level is not adjustable.

## Battery - Recycle

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

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

## Battery or Battery Cable - Inspect/Replace

1. Turn the engine start switch key to the OFF position. Turn all switches to the OFF position.
2. The battery disconnect switch (if equipped) is located in the engine compartment above the battery. Turn the key for the battery disconnect switch to the OFF position. Remove the key. Refer to Operation and Maintenance Manual, "Battery Disconnect Switch" for further information.
3. Disconnect the negative battery cable at the battery disconnect switch.

**Note:** Some machines are equipped with two batteries. Do not allow the disconnected battery cable to contact the battery disconnect switch or the machine.

4. Disconnect the negative battery cable from the battery.
5. Disconnect the positive cable at the battery end.
6. Inspect the battery terminals for corrosion. Inspect the battery cables for wear or damage.
7. If necessary, make repairs. If necessary, replace the battery cables, the battery or the battery disconnect switch.
8. Connect the positive cable at the battery end.
9. Connect the negative battery cable at the battery.
10. Connect the negative battery cable at the battery disconnect switch.
11. Install the key for the battery disconnect switch. Turn the battery disconnect switch to the ON position.

## Belt - Inspect/Replace

### Inspect

**Note:** If a new belt is installed, check the film on the belt tensioner (2) after 30 minutes of operation. A belt is considered to be used after 30 minutes of operation.

1. Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Open the engine enclosure.

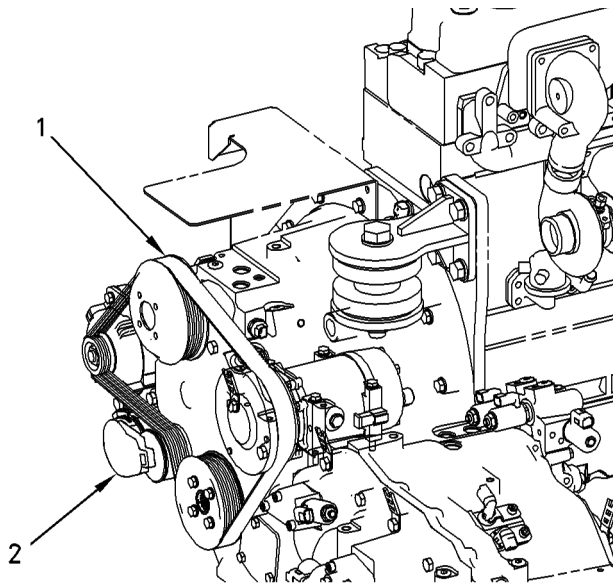


Illustration 162

g00953133

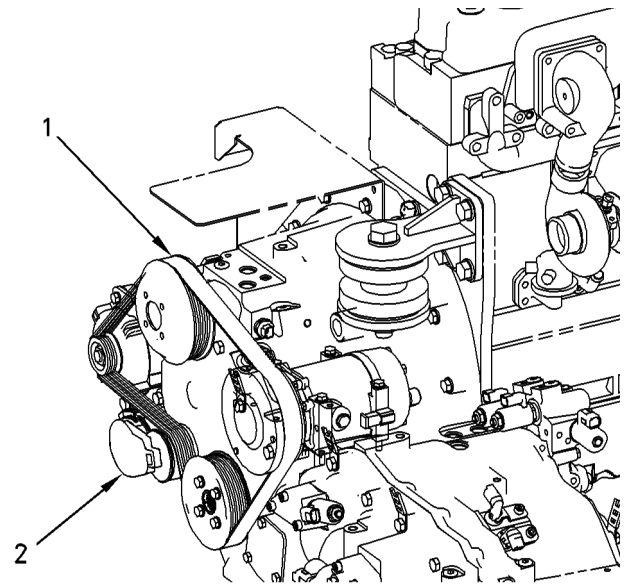


Illustration 163

g00953133

3. Inspect the condition of belt (1).
4. Replace the belt if any of the following conditions exist:
  - excessive cracking
  - excessive wear
  - excessive damage
5. Inspect the free arm stop of the belt tensioner (2). The free arm stop must be aligned with the black line which is on the decal of belt tensioner (2). If the free arm stop is in the red area, replace the belt.
6. Close the engine enclosure.

## Replace

1. Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Open the engine enclosure.
3. Turn the battery disconnect switch to the OFF position.
4. Remove the retaining bolts for the fan guard. Slide the guard out of the engine enclosure

5. Release the tension on the belt (1). Insert a 12.7 mm (0.50 inch) ratchet into the square hole in the belt tensioner (2) and pry the belt tensioner in a clockwise direction.
6. Remove the belt from the pulleys. Feed the belt over the fan.
7. Install the new belt around the pulleys. Pry the belt tensioner in a clockwise direction. Install the belt around the belt tensioner. Release the belt tensioner in order to put tension on the belt. The routing of the belt is shown in Illustration 163.
8. Install the fan guard and tighten the retaining bolts to a torque of  $15 \pm 3$  Nm ( $11.1 \pm 2.2$  lb ft).
9. Turn the battery disconnect switch to the ON position.
10. Close the engine enclosure.

## Boom Chain - Inspect/ Lubricate

**Note:** The information that follows will only relate to machines that have a three-section boom.

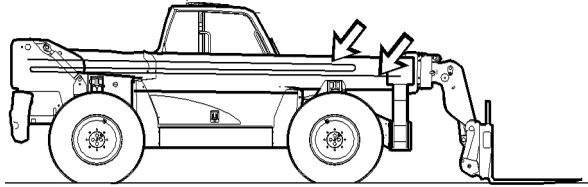


Illustration 164

g00856575

The boom extension chain and boom retraction chain must be removed from the boom for inspection. After removal, measure the chains for wear. Chains which are serviceable must be lubricated before reinstalling the chains. For the correct procedure, refer to the Hydraulic System Systems Operation, Testing and Adjusting, "Boom Chain - Clean/Inspect/Lubricate" or refer to your Caterpillar dealer for details.

## Boom Chain Tension -Check/ Adjust

**You must read the warnings and instructions which are contained in the safety section of this manual. Before you perform any operation or maintenance procedures ensure you understand the warnings and instructions.**

### Check Condition

1. Park the machine on level ground. Fully retract the boom and lower the boom.
2. Remove the cover from the rear of the chassis.
3. A limited inspection of the chains can be made through the rear of the boom. The boom extension chain can be inspected by fully extending the boom and looking on top of the intermediate section. If the chains are corroded, the chains must be removed from the boom for cleaning and a full inspection. If the chains require lubricant, the chains must be removed from the boom
4. for cleaning and a full inspection. Refer to the Hydraulic System Systems Operation, Testing and Adjusting, "Boom Chain - Clean/Inspect/Lubricate" or consult your Caterpillar dealer.
5. Install the cover on the rear of the boom.

## Check and Adjust the Chain Tension

1. Slacken the extension chain and the retraction chain slightly. Raise the boom to the maximum angle and retract the boom. This ensures that all sections of the boom are fully retracted. If the retraction chain requires adjustment and the boom is retracted in a lowered position, all the sections will not fully retract.

### WARNING

**The boom can fall if a control is moved or if a hydraulic component fails. This can cause personal injury or death. Support the boom with stands. Do not rely on the cylinder to hold the boom up.**

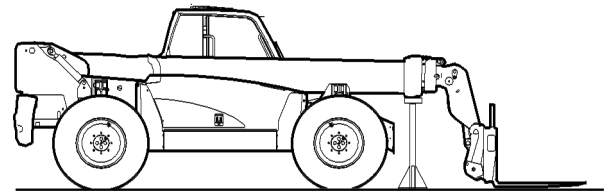


Illustration 165

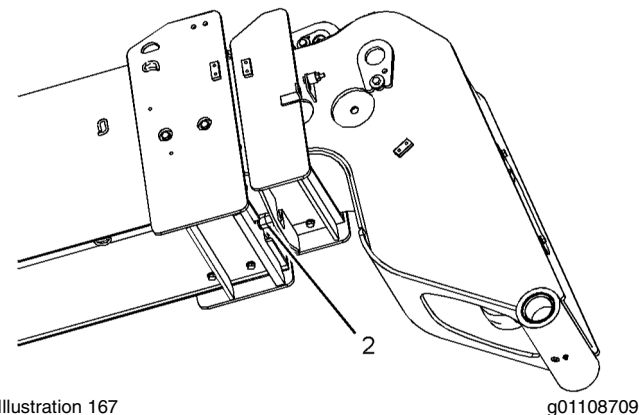
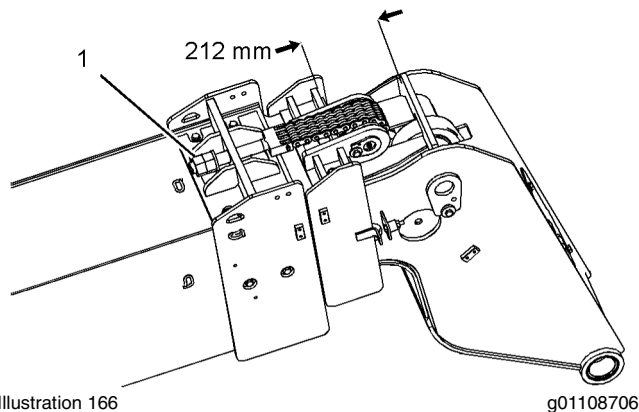
g00836123

2. Lower the boom to the horizontal position and install a suitable stand under the first section in order to prevent the boom from falling unexpectedly. To properly support the boom, use the following tools:

Table 9

Required Tools		
Part Number	Description	Quantity
8S-7641	Tube	1
4C-6486	Stand	1
8S-7615	Pin	1
8S-7625	Collar	1
8S-8048	Saddle	1

3. Lower the boom to a position just above the stand and stop the engine.



4. Set the minimum distance to 212 mm (8.3 inch) between boom section 2 and boom section 3. The maximum allowable distance is 222 mm (8.7 inch). Tighten extension chain (1) in order to move section 3 outward. Tighten retraction chain (2) in order to move section 3 inward. If the distance is significantly more than 212 mm (8.3 inch), slacken both chains and refer to Step 1.
5. After setting the distance to the required tolerance, tighten the extension chain to 25 N-m (18 lb ft).
6. Tighten the retraction chain to 22 N-m (16 lb ft).
7. Tighten the extension chain to  $130 \pm 5$  N-m ( $96 \pm 4$  lb ft).
8. Tighten the retraction chain to  $85 \pm 5$  N-m ( $63 \pm 4$  lb ft).
9. Extend the boom and retract the boom several times. Check the torque for the extension chain. Check the torque for the retraction chain.
10. Install the locknut for the extension chain. Torque the locknut for the extension chain to  $130 \pm 5$  N-m ( $96 \pm 4$  lb ft).
11. Install the locknut for the retraction chain. Torque the locknut for the retraction chain to  $85 \pm 5$  N-m ( $63 \pm 4$  lb ft).
12. Check the shackles on both chains. If necessary, adjust the shackles in order to set the shackles horizontally.
13. Remove the stand and lower the boom.

## Measure the Chain for Wear

Nominal pitch of the link equals 25.4 mm (1 inch).

Nominal height of the plate equals 24.1 mm (0.95 inch).

1. Fully retract the boom. Position the boom horizontally.
2. Extend the boom by 2 m (6 ft 7 inch) or extend the boom to the section of chain that most frequently passes over the boom extension chain pulley.

**Do not retract the boom sections before you begin to measure the chains.**

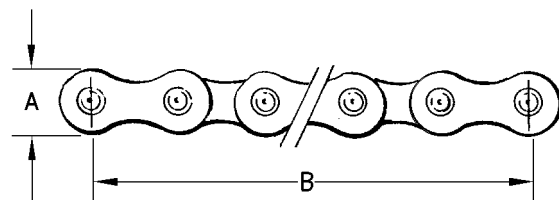


Illustration 168

g00747739

3. Use a caliper in order to measure the height of inner plate (A) and the height of outer plate (A) over 15 pitches of the selected worn section of chain. If any inner plates or any outer plates show a reduction in height of more than 5% wear, all chains must be replaced. Also, if the measurement is less than 22.89 mm (0.901 inch), all chains must be replaced.
4. Use a 6V- 0028 Wear Gauge As (CHAIN) in order to measure the chain between the 16 pin centers of the selected worn section (B). The nominal length of 16 pin centers is 381 mm (15 inch). If the measurement shows an elongation of more than 2%, all chains must be replaced. Also, if the measurement is greater than 388.6 mm (15.30 inch), all chains must be replaced.

## Boom Cylinder Pin - Lubricate

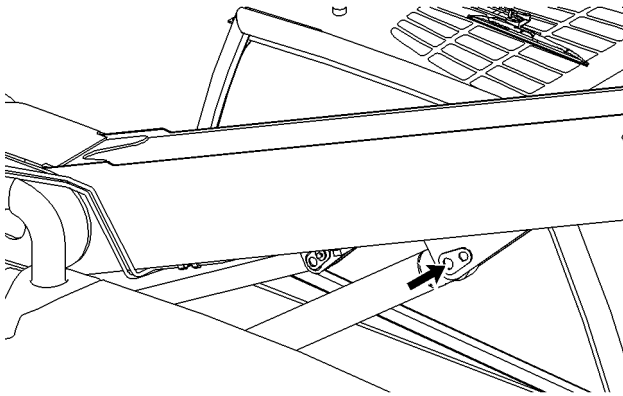


Illustration 169

g00951662

There is a boom raise cylinder under the boom. Lubricate the boom cylinder pin through the fitting at the rod end of the cylinder.

## Boom Head Section - Lubricate

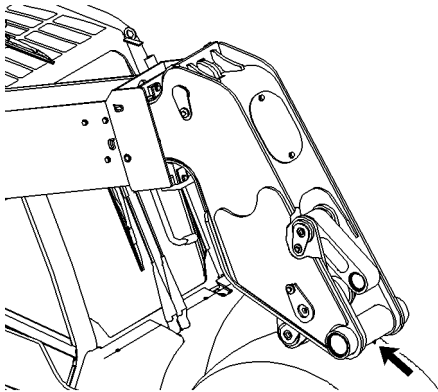
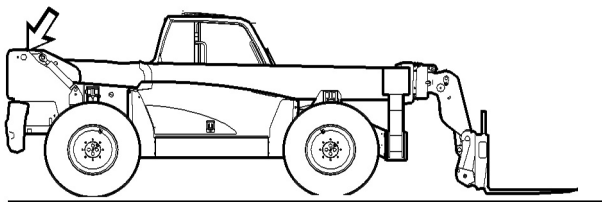


Illustration 170

g00950665

Lubricate the boom head through the lubrication fitting.

## Boom Pivot Shaft - Lubricate

Illustration 171  
Location of the pivot shaft for the boom

g00856576

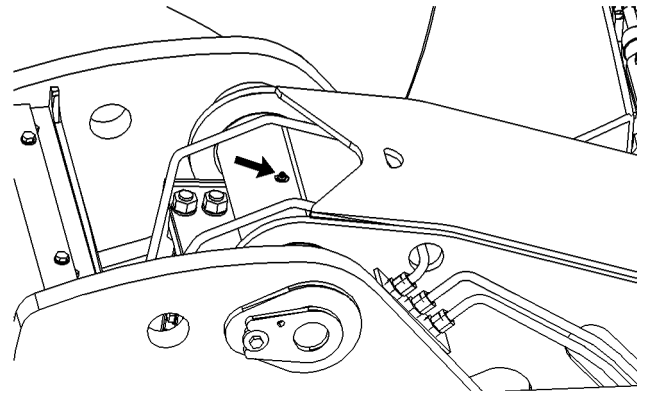


Illustration 172

g00950677

Lubricate the pivot shaft for the boom through the lubrication fitting. The lubrication fitting is located on top of the pivot shaft for the boom

## Boom Telescoping Cylinder Air-Purge

It may be necessary to purge air from the boom extend cylinder after the hydraulic oil has been changed. It may also be necessary to purge air from the boom extend cylinder after any disassembly of hydraulic system components.

Normally, the hydraulic system will purge air from the boom extend cylinder but air can be trapped. Air in boom extend cylinder can cause erratic boom motion.

1. If necessary, warm the hydraulic oil by raising the boom and lowering the boom.

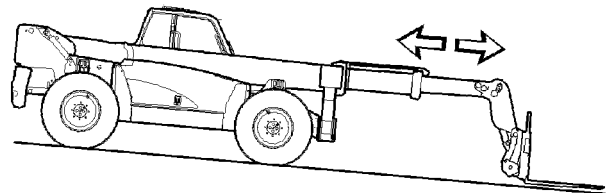


Illustration 173

g00837537

2. Retract and lower the boom. Position the machine on a down slope. Engage the parking brake.
3. Fully extend the boom and retract the boom six times. This will purge air from the cylinders.
4. Move the machine back to level ground and check the operation of the boom motion.

## Boom Wear Pad Clearance - Inspect/Adjust

The clearance between the wear pads and the boom section should be checked at more frequent intervals when the machine is operated in severe conditions.

**Note:** Sand or grit particles can cause accelerated wear to the wear pads.

1. Park the machine in a clear area on level ground and chock the wheels.

### **WARNING**

The boom can fall if a control is moved or if a hydraulic component fails. This can cause personal injury or death. Support the boom with stands. Do not rely on the cylinder to hold the boom up.

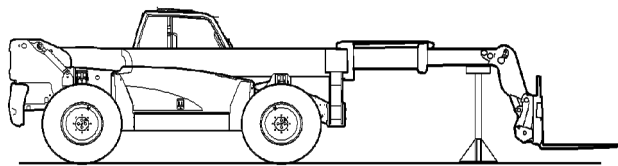


Illustration 174

g00857793

2. Raise the boom to the horizontal position and fully extend the boom. Install a suitable stand under the first section in order to prevent the boom from falling unexpectedly. **Do not support the second and third sections.** To properly support the boom, use the following tools:

Table 10

Required Tools		
Part Number	Description	Quantity
8S-7641	Tube	1
4C-6486	Stand	1
8S-7615	Pin	1
8S-7625	Collar	1
8S-8048	Saddle	1

3. Stop the engine.

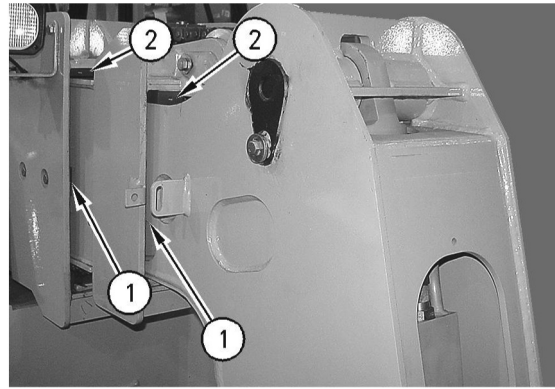


Illustration 175

g00857783

4. Measure clearances (1) between the wear pads and the side of the boom sections at each side.
5. Measure clearances (2) between the wear pads and the top of the boom sections.

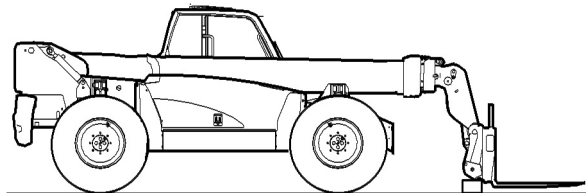


Illustration 176

g00857785

6. Raise the boom and remove the stand. Fully retract the boom and support the boom in the horizontal position. In order to support the boom, install the stand under the third section or install cribbing under the quick coupler.

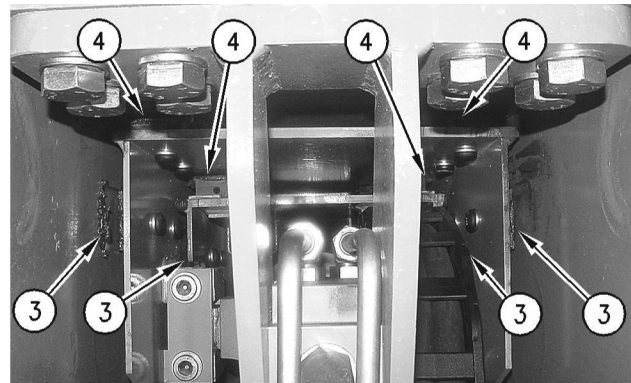


Illustration 177

g00857804

7. Remove the cover from the rear of the chassis and measure clearances (3) between the rear wear pads and the side of the boom sections at each side.

8. Measure clearances (4) between the rear wear pads and the top of the boom sections.
9. The clearance at each location must not exceed 3 mm (0.12 inch). If the clearances are excessive, adjustments must be made.

## Adjustment

**Note:** The bolts that secure different wear pads are not identical lengths. Do not mix the bolts. Clean all used bolts. Before installation, apply thread lock compound to bolts that secure wear pads.

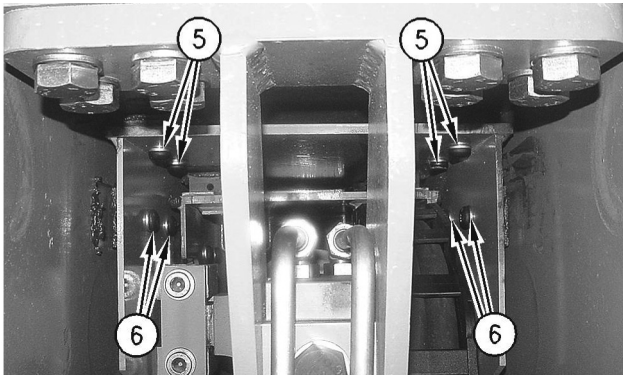


Illustration 178

g00858058

1. Loosen bolts (5) that secure the rear top wear pads. Install sufficient shims in order to reduce the clearance to 0.75 mm (0.030 inch). Tighten the bolts to a torque of  $75 \pm 5$  N-m ( $55 \pm 4$  lb ft).
2. Remove bolts (6) that secure the rear side wear pads. Install sufficient shims in order to reduce the clearance to 0.75 mm (0.030 inch) at each side. Install sufficient shims in order to produce an equal clearance between the boom sections at each side. It may be necessary to install more shims at one side than the other side. Tighten the bolts to a torque of  $75 \pm 5$  Nm ( $55 \pm 4$  lb ft).

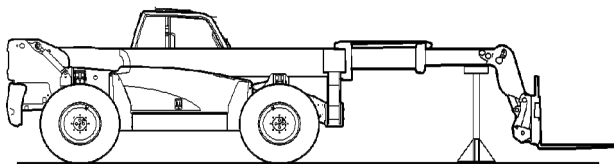


Illustration 179

g00857793

3. Raise the boom sufficiently above the stand. Fully extend the boom and lower the boom to the horizontal position. Support the boom under the third section.

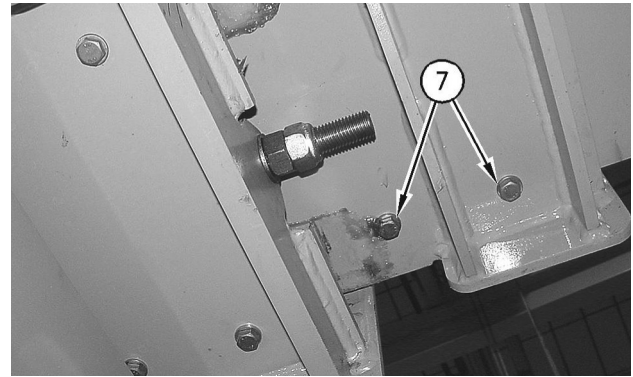


Illustration 180

g00865469

4. Remove bolts (7) that secure the bottom wear pads. Install sufficient shims in order to reduce the clearance to 0.75 mm (0.030 inch). Tighten the bolts to a torque of  $75 \pm 5$  Nm ( $55 \pm 4$  lb ft).

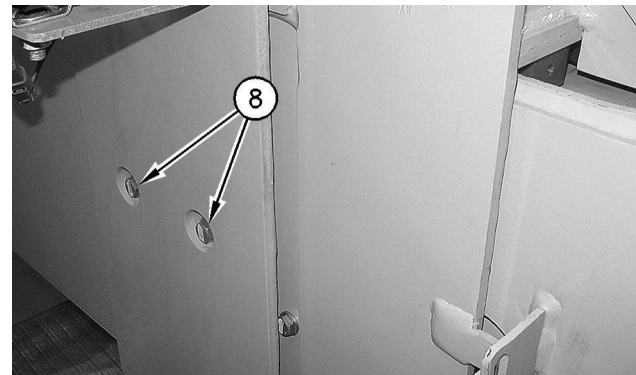


Illustration 181

g00865472

5. Remove bolts (8) that secure the side wear pads. Install sufficient shims in order to reduce the clearance to 0.75 mm (0.030 inch) at each side. Install sufficient shims in order to produce an equal clearance between the wear pads and the boom sections at each side. It may be necessary to install more shims at one side than the other side. Tighten the bolts to a torque of  $75 \pm 5$  Nm ( $55 \pm 4$  lb ft).
6. Fully extend and retract the boom at angles of 0 degrees, 45 degrees and 70 degrees. The boom operation must be smooth. If the boom operation is not smooth, operate the boom with a load of 500 kg (1100 lb) on the attachment. Fully extend the boom and retract the boom at an angle of 45 degrees. Repeat ten times.

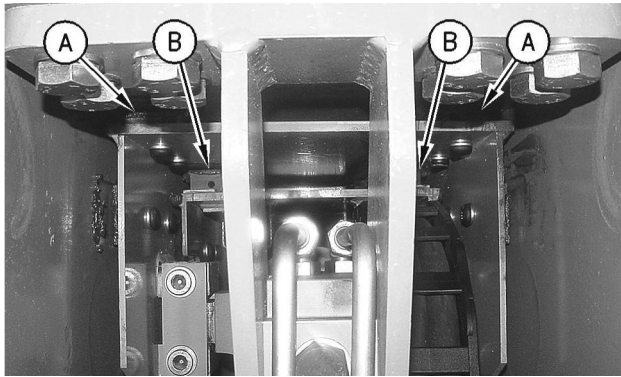


Illustration 182 g00858059

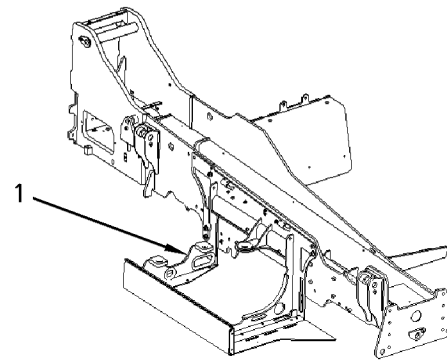


Illustration 183  
Main frame and support cradle

g00861901

7. Extend the boom and lower the work tool to the ground. Lower the boom to the ground and fully extend the boom. Check the temperature of the top surfaces of number 1 boom section and number 2 boom section. Check the temperature of the wear pads at opposite locations at positions (A) and at positions (B). Both sides of each section should feel the same temperature. If necessary, increase the thickness of the shims under the rear wear pad which is in contact with the cool side

of the boom section. Alternatively, decrease the thickness of the shims under the front wear pad which is in contact with the hot side of the boom section.

8. Install the cover on the rear of the boom.

## Boom and Frame - Inspect

In order to help minimize unexpected, costly repairs and downtime, inspections need to be carried out on a regular basis. The interval between the inspections depends on factors. These factors are the age of the machine, the severity of the application, loading, routine servicing which has been carried out on the machine and the operating conditions.

More frequent inspections will be required of older machines and machines that are used in particularly severe applications.

If the machine has been involved in any kind of accident the machine must be taken out of service immediately. The machine must be inspected again.

To perform a proper inspection, the machine must be thoroughly cleaned. It is impossible to inspect the machine properly if the machine is dirty.

Early detection and repair of faults will ensure continued operation of the machine. Also, early detection and repair will improve the availability of the machine. Repair of faults will also reduce the risk of accidents.

The machine should only be repaired by a qualified Caterpillar dealer. However, if you decide to carry out your own repairs, consult your Caterpillar dealer for the recommended repair techniques.

Retract the boom and raise the boom away from the main frame and support cradle (1). Support the boom with a suitable stand. To properly support the boom, use the following tools:

Table 11

Required Tools		
Part Number	Description	Quantity
8S-7641	Tube	1
4C-6486	Stand	1
8S-7615	Pin	1
8S-7625	Collar	1
8S-8048	Saddle	1

Inspect the complete main frame and the support cradle. Inspect the main frame and the support cradle particularly in welded structures.

Pay particular attention to the mounting points for the following parts:

- Boom
- Cab
- Axles
- Engine
- Transmission
- Towing attachment (if equipped)
- Mountings on the frame
- Stabilizers (if equipped)
- Tie down lugs



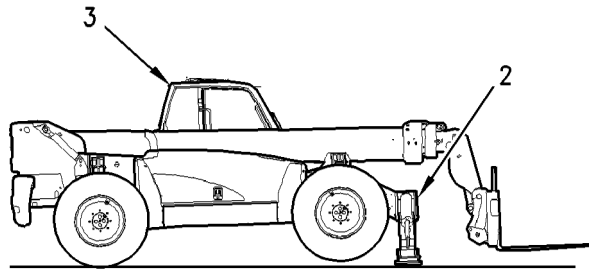


Illustration 184  
Stabilizer and rollover protection structure

g00836172

Lower stabilizers (2) until the stabilizer pads are touching the ground. Inspect each stabilizer fully. Inspect the beams, stabilizer pads, mounting hardware, cylinders and the pivot pins.

If equipped, inspect Rollover Protection Structure (ROPS) (3) or inspect Falling Objects Protection Structure (FOPS) (3). Inspect the ROPS or the FOPS carefully. Do not attempt to straighten the structure. Do not attempt to repair the structure by welding. Consult your Caterpillar dealer if damage is found to the ROPS or to the FOPS.

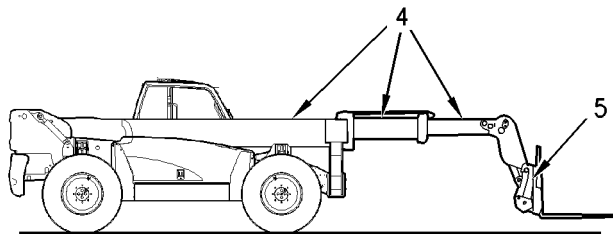


Illustration 185  
Boom and quick coupler

g00836174

Inspect all sections of boom (4). Inspect the boom after the boom is extended fully and the work tool is on the ground.

Completely inspect quick coupler (5). Also, inspect the work tool.

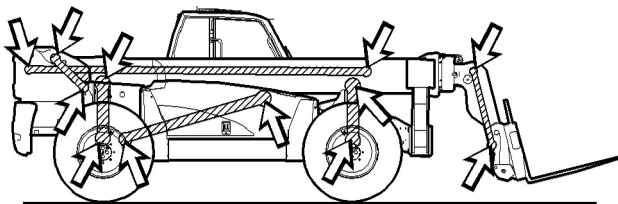


Illustration 1860  
Pivot pins and anchor points

g00836176

Inspect all pivot pins and inspect all anchor points for wear.

## Braking System - Test

### Service Brake

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

Check the brakes on a dry, level surface.

Fasten the seat belt before you check the brakes.

The following procedure is used in order to determine if the service brake is functional. This procedure is not intended to measure the maximum brake performance. The brake holding torque that is required to sustain an engine torque at a specific engine rpm varies depending on the machine configuration. The variations are the differences in the engine setting, in the power train efficiency, and in the brake holding ability, etc.

### Test Procedure

1. Remove the work tool and park the machine in the travel position.
2. Start the engine and disengage the parking brake. Place the transmission in FIRST GEAR FORWARD.
3. Apply the service brake and fully depress the accelerator pedal in order to increase the engine speed.
4. The machine should remain stationary during this test.
5. Switch off the engine and engage the parking brake

### WARNING

**If the machine moved while testing the service brakes, contact your Caterpillar dealer.**

**Have the dealer inspect, and if necessary repair the service brakes before returning the machine to operation. Failure to have the service brakes inspected and repaired can cause injury or death.**

**Reference:** See the appropriate Service Manual for more information.

### Parking Brake

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

Check the brakes on a dry, level surface.

Fasten the seat belt before you check the brakes.

The following procedure is used in order to determine if the parking brake is functional. This procedure is not intended to measure the maximum brake performance. The brake holding torque that is required to sustain an engine torque at a specific engine rpm

varies depending on the machine configuration. The variations are the differences in the engine setting, in the power train efficiency, and in the brake holding ability, etc.

### Test Procedure

1. Start the engine.
2. Engage the parking brake.
3. If the machine is equipped with a standard transmission, move the transmission control lever in the following pattern:
  - SECOND
  - NEUTRAL
  - SECOND

This is done in order to override the transmission neutralizer for this test.

**Note:** The indicator light for the parking brake should come on.

4. If the machine is equipped with a power shift transmission, move the transmission control lever in the following pattern:
  - SECOND GEAR FORWARD
  - NEUTRAL
  - SECOND GEAR FORWARD

This is done in order to override the transmission neutralizer for this test.

**Note:** The indicator light for the parking brake should come on.

5. Gradually increase the engine speed to high idle. The machine should not move.

### WARNING

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

6. Reduce the engine speed. Move the transmission control lever to NEUTRAL. If the machine moved during the test, perform the maintenance procedure Operation and Maintenance Manual, "Parking Brake - Adjust".

## Cab Air Filter - Clean/Replace

There are two cab air filters.

### Primary Cab Air Filter

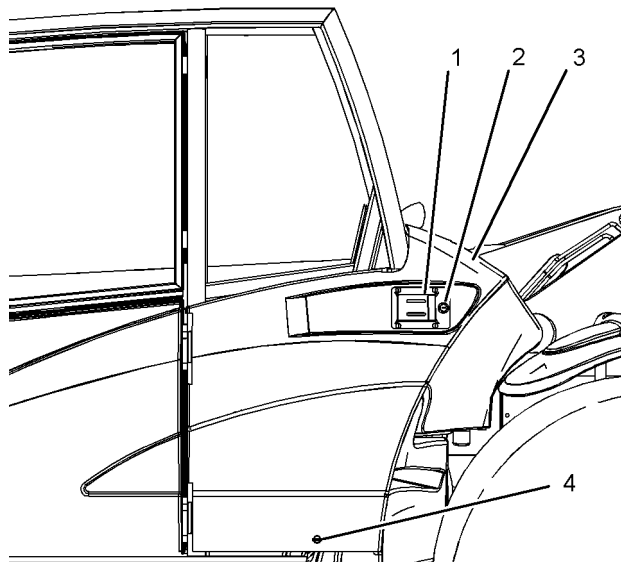


Illustration 187

g01202853

1. The primary cab air filter is located behind protection cover (3) on the left side of the cab. In order to open the protection cover, unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

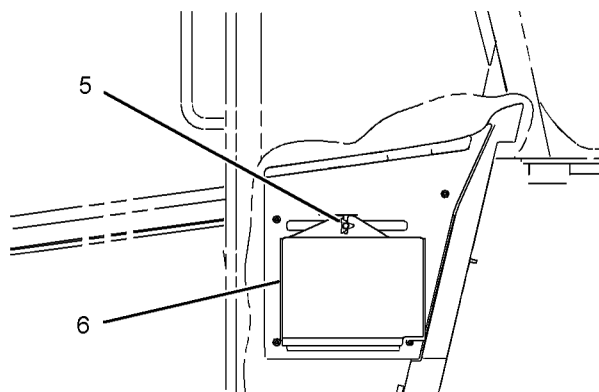


Illustration 188

g01205873

2. Open filter cover (6) by removing retaining screw (5).
3. Remove the filter from behind filter cover (6).
4. If the air filter is not damaged, clean the air filter with pressurized air. The maximum air pressure for cleaning is 205 kPa (30 psi).

Direct pressurized air along the pleats from no closer than 160 mm (6 inch) from the air filter.

If the air filter is damaged, replace the air filter.

## Secondary Cab Air Filter

The secondary cab air filter is located inside the cab. The filter is on the rear wall of the cab behind the seat.

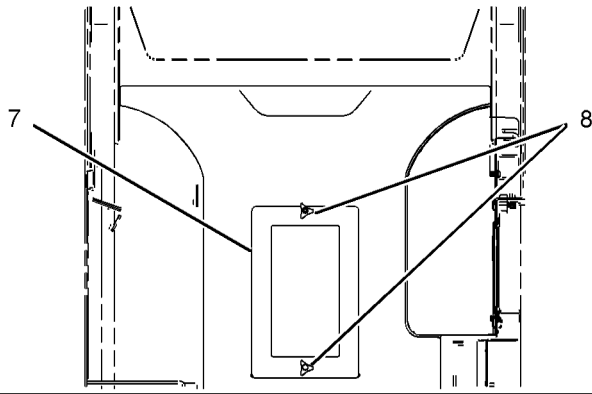


Illustration 189

g01205876

1. Open filter cover (7) by removing retaining screws (8).
2. Remove the filter from the filter housing.
3. If the air filter is not damaged, clean the air filter with pressurized air. The maximum air pressure for cleaning is 205 kPa (30 psi).

Direct pressurized air along the pleats from no closer than 160 mm (6 inch) from the air filter.

If the air filter is damaged, replace the air filter.

## Circuit Breakers - Test

The circuit breakers are located under the engine hood on the front right side of the engine compartment.

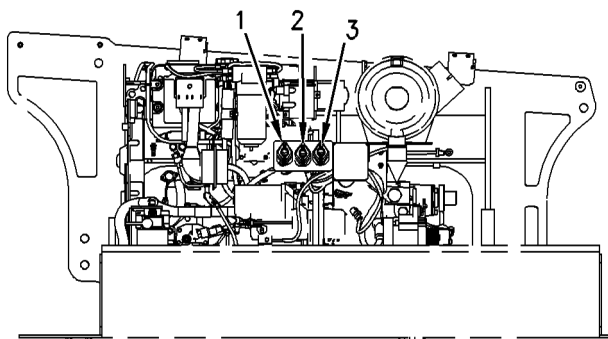
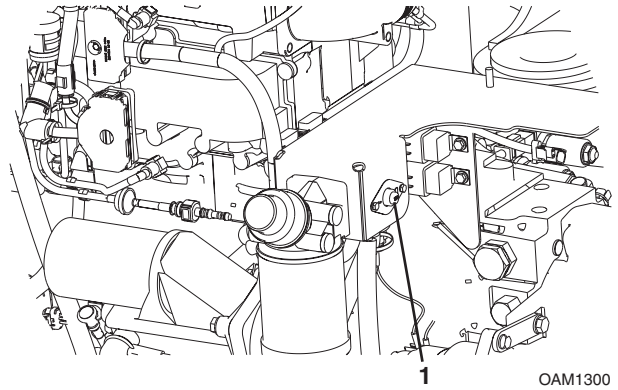


Illustration 190  
Tier II

g00993080



OAM1300

Tier III



**Main Circuit Breaker (1)** - The main circuit breaker is 120 amp.



**Alternator Circuit Breaker (2) (Tier II only)** - The alternator circuit breaker is 105 or 135 amp.



**Key Start Breaker (3) (Tier II only)** - The key start breaker is 60 amp.



Reset the circuit breaker if the breaker trips. Push in the button in order to reset the circuit. If the button does not remain depressed or the circuit breaker trips soon after being reset, check the appropriate electrical circuit. Repair the electrical circuit, if necessary.

## Compensating Cylinder Bearing - Lubricate

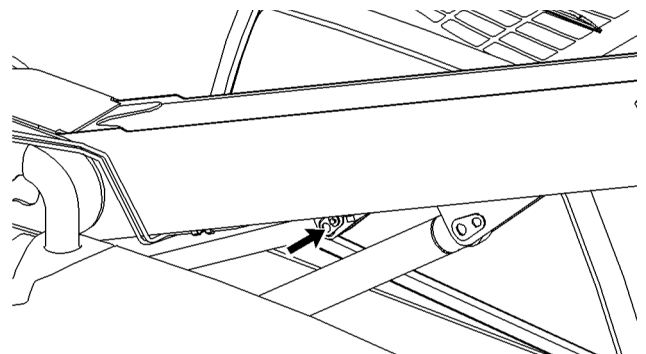


Illustration 191

g00950704

There is a compensating cylinder under the boom. Lubricate the compensating cylinder pin through the fitting at the head end of the cylinder.

## Cooling System Coolant - Change

### WARNING

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

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

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

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

### 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.

If the coolant in the machine is changed to another type of coolant, consult your Caterpillar dealer.

1. Allow the engine to cool.

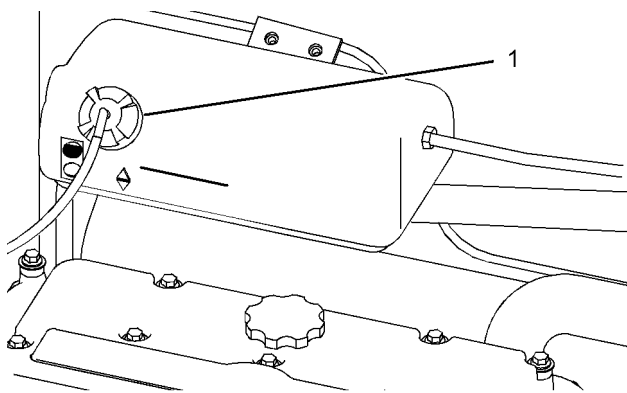


Illustration 192

g01081067

2. Loosen pressure cap (1) from the coolant tank slowly in order to release pressure. Remove the pressure cap.

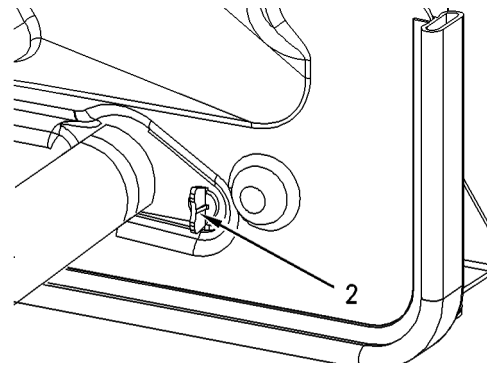


Illustration 193

g00984483

3. Loosen drain valve (2) that is located at the bottom right corner of the radiator. Drain the coolant into a suitable container.

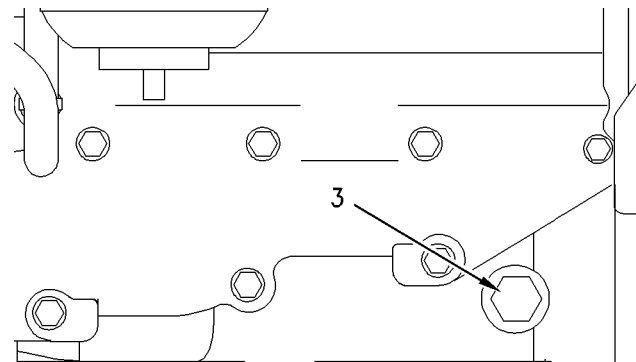


Illustration 194

g00993488

4. Remove coolant drain plug (3) that is located in the engine block above the starter. Drain the coolant into a suitable container.

**Note:** Check the threads of the drain plug for damage. Check the sealant on the drain plug for damage. The drain plug can be reused if threads are not damaged and the sealant is not damaged.

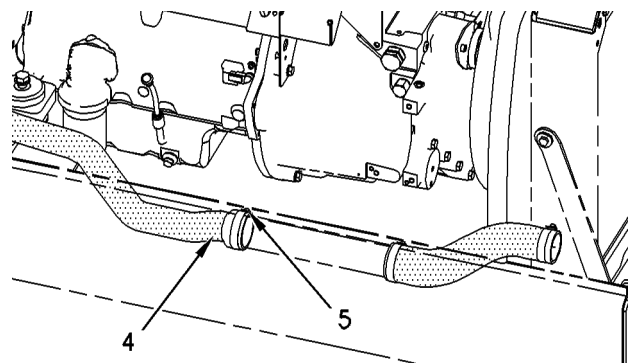


Illustration 195

g00993528

5. Loosen hose clamp (5) that is located on the hydraulic oil cooler. Remove hose (4). Allow the coolant to drain into a suitable container.

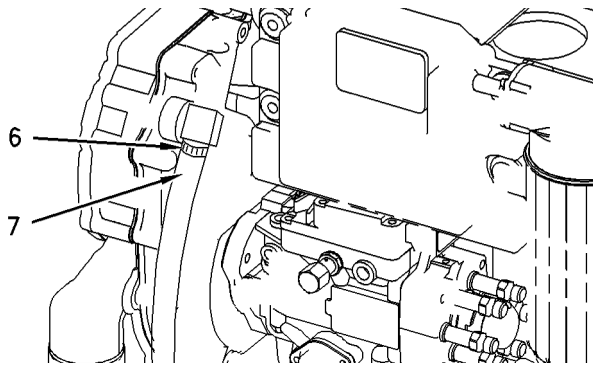


Illustration 196

g00993544

6. If the machine is equipped with a cab heater, turn the heater control that is located inside the cab to the HOT position. Loosen hose clamp (6). Remove hose (7). Allow the coolant to drain into a suitable container.
7. Flush the cooling system with clean water until the draining water is transparent.
8. Close drain valve (2).
9. Reinstall coolant drain plug (3) in the engine block above the starter. Tighten the plug.
10. Reinstall hoses (4) and (7). Tighten clamps (5) and (6).

#### NOTICE

**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. Add the coolant into the coolant tank. Refer to Operation and Maintenance Manual, "Capacities (Refill)"
12. Start the engine. Operate the engine without the pressure cap for the coolant tank until the coolant temperature regulator opens and the coolant level stabilizes.
13. Maintain the coolant level up to the FULL mark on the coolant tank.
14. Inspect the gasket of the pressure cap. If the gasket is damaged, replace the cap.
15. Install the pressure cap on the coolant tank.
16. Stop the engine.

## Cooling System Coolant Level - Check

### WARNING

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

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

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

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

Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.

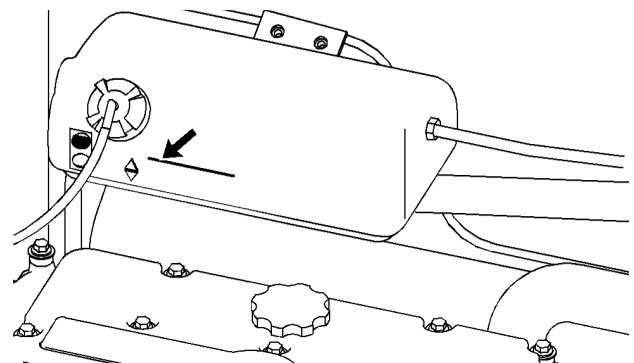


Illustration 197

g01057534

The coolant tank for the cooling system is located in the engine compartment.

Check the coolant level while the engine is cold. The coolant level should be maintained to the "FULL" line on the coolant tank.

## Cooling System Coolant Sample (Level 1) - Obtain

### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

**Note: Level 1 results may indicate a need for Level 2 Analysis.**

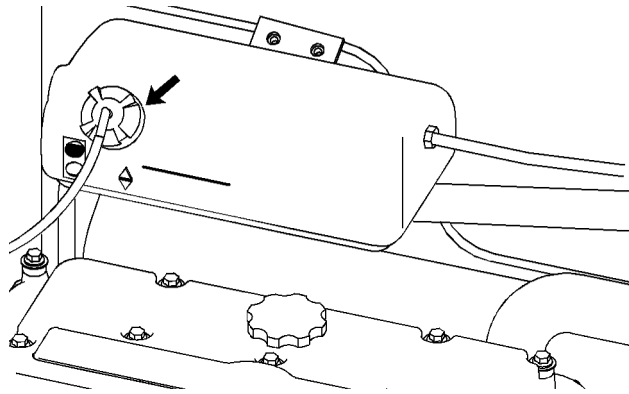


Illustration 198

g01081068

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

Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of SOS 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.
- 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 the appropriate Service Manual or consult your Caterpillar dealer.

## Cooling System Coolant Sample (Level 2) - Obtain

### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

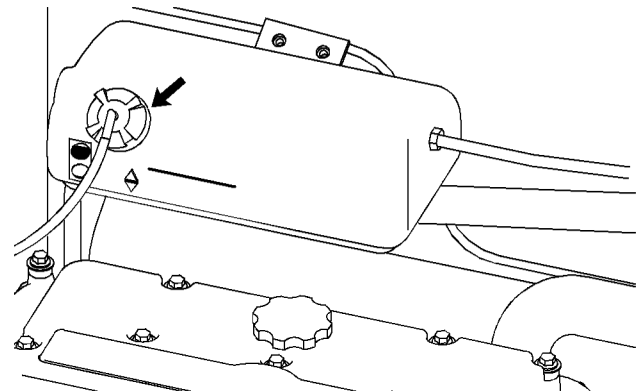


Illustration 199

g01081068

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

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Refer to Operation and Maintenance Manual, "Cooling System Coolant Sample (Level 1) - Obtain" for the guidelines for proper sampling of the coolant.

Submit the sample for Level 2 analysis.

For additional information about coolant analysis, see the appropriate Service Manual or consult your Caterpillar dealer.

## Cooling System Pressure Cap - Clean/Replace

### WARNING

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

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

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

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

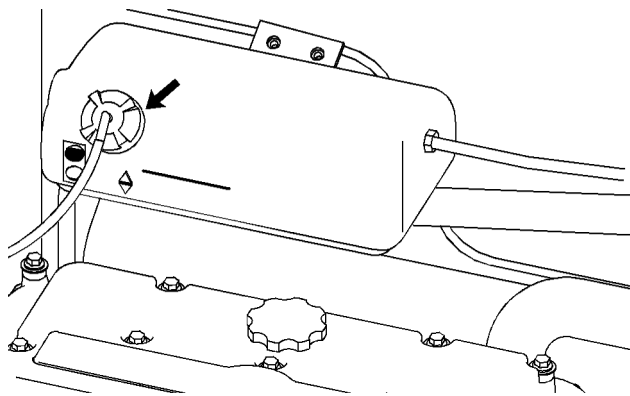


Illustration 200

g01081068

The cooling system pressure cap is located on the coolant tank inside the engine compartment.

1. Remove the cap slowly in order to relieve the pressure.
2. Inspect the cap and the gasket for damage, for foreign material, and for deposits.
3. Clean the cap with a clean cloth or replace the cap if it is necessary.

**Note:** Always check the pressure rating of the old cap before you replace the cap. Replace the old cap with a new cap of the same pressure rating.

4. Reinstall the cap.

## Cooling System Water Temperature Regulator Replace

### WARNING

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

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

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

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

### 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.

### NOTICE

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

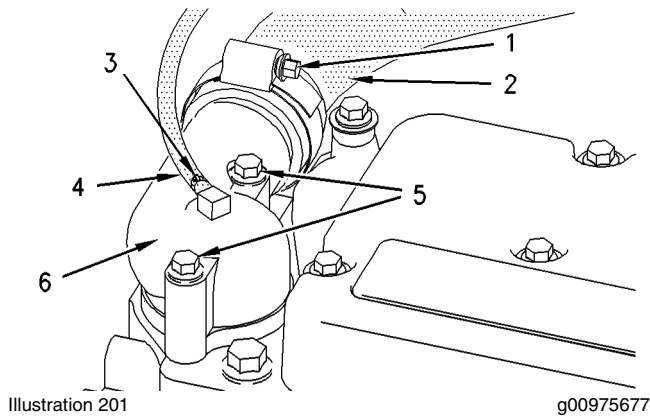
### NOTICE

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

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

Replace the water temperature regulator on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system. The water temperature regulator should also be replaced after the cooling system has been cleaned.

Replace the water temperature regulator while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the water temperature regulator housing.



1. Loosen hose clamp (1).
2. Remove hose (2) from the housing.
3. Loosen hose clamp (3).
4. Remove hose (4) from the fitting.
5. Remove bolts and washers (5).
6. Remove water temperature regulator housing (6). Remove the water temperature regulator and the gasket.

#### NOTICE

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

7. Install a new water temperature regulator and a new gasket.
8. Install water temperature regulator housing (6).
9. Install washers and bolts (5). Tighten the bolts.
10. Install hose (4). Tighten hose clamp (3).
11. Install hose (2). Tighten hose clamp (1).
12. Refill the cooling system. Refer to Operation and Maintenance Manual, "Capacities (Refill)" and the appropriate Service Manual.

## Differential Oil - Change

#### 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.

Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.

## Rear Axle Differential

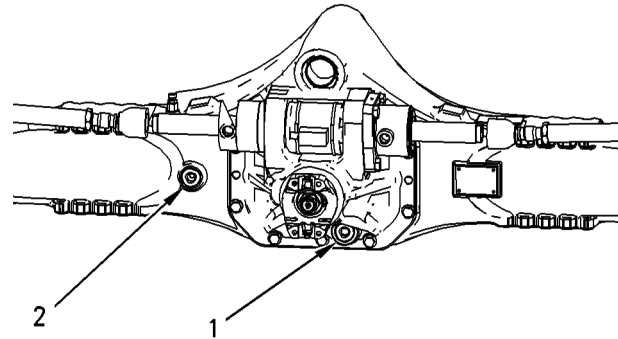


Illustration 202 g00952999

1. Clean the area around the plugs. Remove the following plugs for the rear differential:

- Drain plug (1)
- Combined level plug and filler plug (2)

Allow the oil to drain into a suitable container.

2. Clean drain plug (1) and reinstall drain plug (1).
3. Add new oil to the differential housing through filler hole (2) until the oil is level with the threads for plug (2). Refer to Operator and Maintenance Manual, "Lubricant Viscosities" for the correct grade of oil. Refer to Operation and Maintenance Manual, "Capacities (Refill)" and the appropriate Service Manual for more detailed lubricant information.
4. Clean combined level plug and filler plug (2). Reinstall combined level plug and filler plug (2).

## Front Axle Differential

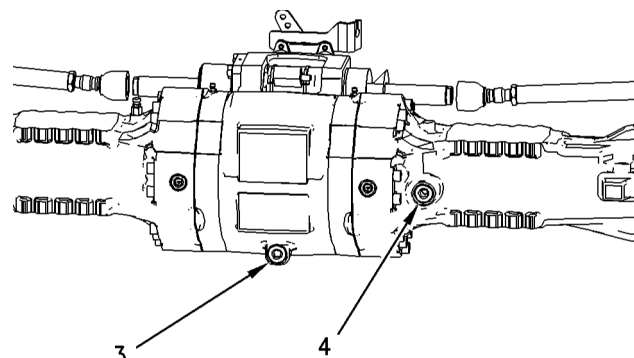


Illustration 203 g00953178

1. Clean the area around the plugs. Remove the following plugs for the front differential:

- Drain plug (3)



- Combined level plug and filler plug (4)

Allow the oil to drain into a suitable container.

2. Clean drain plug (3) and reinstall drain plug (3).
3. Add new 197-0017 Axle and Brake Oil Additive to the differential housing through hole (4). Refer to Operation and Maintenance Manual, "Capacities (Refill)" for more detailed information.
4. Add new oil to the differential housing through filler hole (4) until the oil is level with the threads for plug (4). When you are filling the front axle with oil you should allow time for the oil to drain through the differential into the other side of the axle. Ensure that the correct quantity of oil is added to the axle in order to fill the differential and the axle housing. Damage to the differential will result if this procedure is not observed. Refer to Operator and Maintenance Manual, "Lubricant Viscosities" for the correct grade of oil.

Refer to Operation and Maintenance Manual, "Capacities (Refill)" and the appropriate Service Manual for more detailed lubricant information.

5. Clean combined level plug and filler plug (4).  
Reinstall combined level plug and filler plug (4).

## Differential Oil Level - Check

### 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.

Park the machine on level ground. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.

## Rear Axle Differential

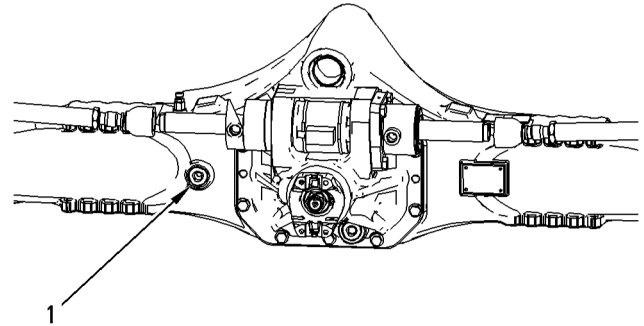


Illustration 204

g00953223

1. Clean the area around combined level and filler plug (1) for the rear differential. Remove combined level and filler plug (1) and check that the oil is level with the hole for combined level and filler plug (1).
2. If necessary, add oil through the same hole.
3. Clean combined level and filler plug (1) and install combined level and filler plug (1).

## Front Axle Differential

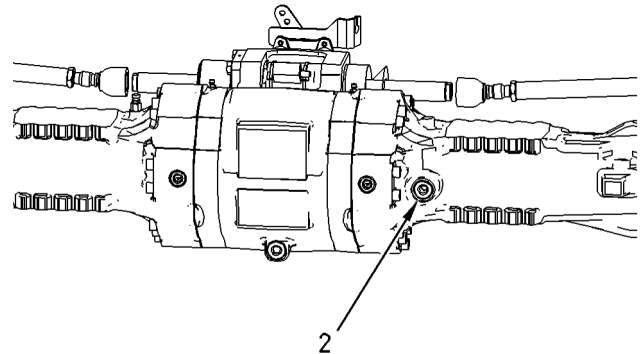


Illustration 205

g00953225

1. Clean the area around combined level and filler plug (2) for the front differential. Remove combined level and filler plug (2) and check that the oil is level with the hole.
2. If necessary, add oil through the same hole.
3. Clean combined level and filler plug (2) and install combined level and filler plug (2).

## Differential Oil Sample - Obtain

### **WARNING**

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

#### NOTICE

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

Refer to Special Publication, NENG2500, "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.

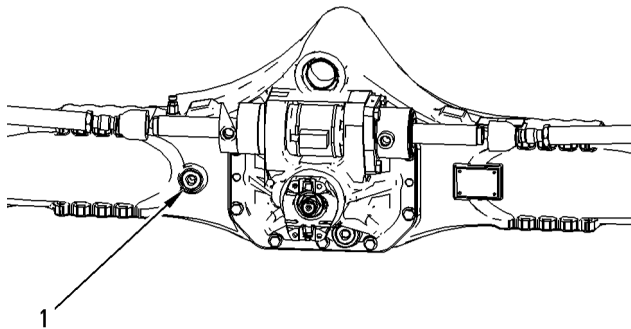


Illustration 206  
Rear axle differential

g00953223

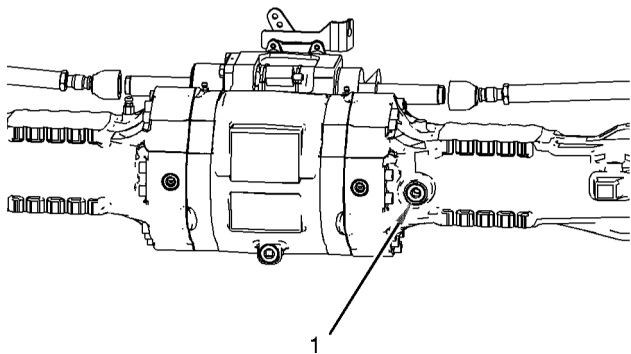


Illustration 207  
Front axle differential

g01054761

Fully retract the boom and fully lower the boom. Move the transmission control to the **NEUTRAL** position and ensure that the parking brake is engaged. Shut off the engine.

Obtain an oil sample from each axle. Keep the oil samples separate from each other.

Clean the area around combined level and filler plug (1) for the differential. Remove combined level and filler plug (1). Use a sampling gun in the filler hole in order to obtain an oil sample. Inspect combined level and filler

plug (1) for damage. Install combined level and filler plug (1).

Analysis of oil from each axle will provide an accurate representation of oil condition within each system.

Use SOS Oil Analysis in order to monitor the condition of your oil.

For additional information, refer to the appropriate Service Manual.

## Drive Shaft Spline - Lubricate

#### NOTICE

Apply lubricant to the fittings with a hand operated grease gun only. Use of pressure operated lubricating equipment damages the seals.

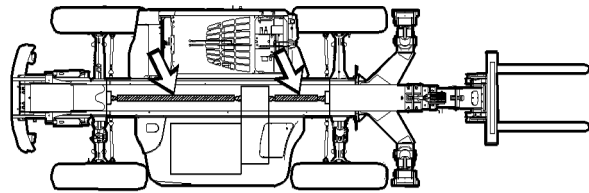


Illustration 208  
Location of the Drive Shafts

g00837541

The following drive shafts must be lubricated:

- The front drive shaft
- The rear drive shaft

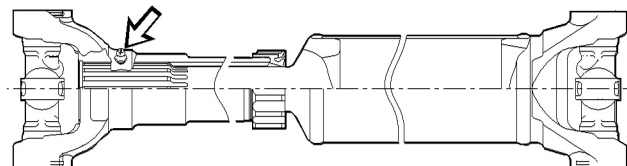


Illustration 209  
Typical Lubrication Point

g00864761

There is a grease nipple on the slider of each drive shaft.

Lubricate the drive shaft splines through the grease nipples.

## Drive Shaft Universal Joint Bolts - Check

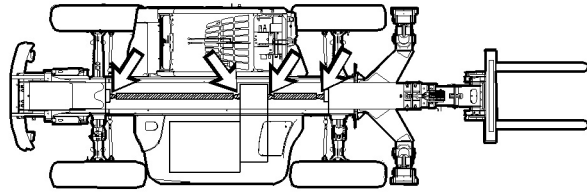


Illustration 210  
Locations of the Universal Joints

g00856592

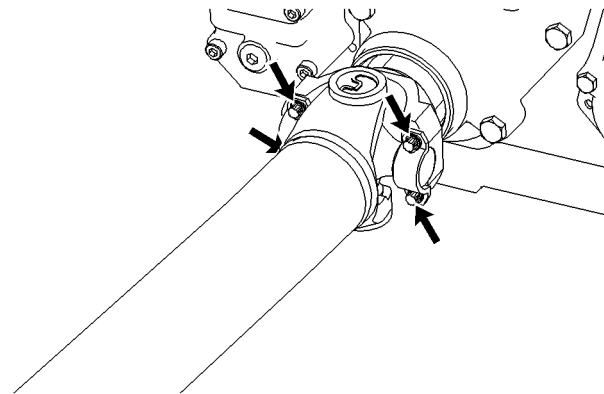


Illustration 211

g00950658

## Engine Air Filter Primary Element - Clean/Replace

**Note:** The primary air filter element can be used up to three times if the element is properly cleaned and inspected. Replace the primary air filter element if the element has been in service for 500 hours or six months. This replacement should be performed regardless of the number of cleanings.

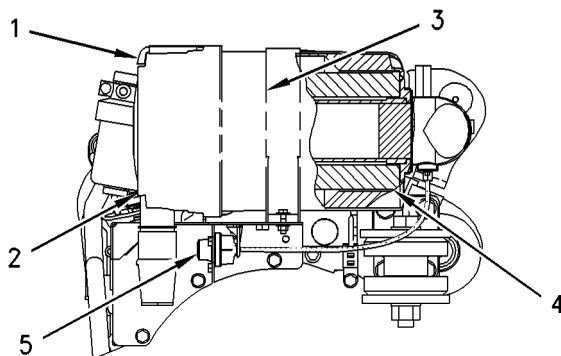


Illustration 212

g00950906

1. Open the engine enclosure.
2. Slide out retaining clip (1).
3. Release cover (2) from air filter housing (3) by rotating counterclockwise. Remove the cover from the housing.
4. Remove primary element (4) from filter housing (3). To avoid dislodging any dust, take care to avoid touching the element against the sides of the housing. Inspect the primary element. If the pleats or the seals are damaged, discard the primary element. Replace a damaged primary element with a clean primary element.
5. If the primary element is not damaged, you may clean the primary element. Refer to Operation and Maintenance Manual, "Cleaning Primary Air Filter Elements".
6. When you clean the inside of the pleats, direct the air along the pleats. Inspect the primary element after you clean the primary element.
7. Clean the inside of the filter housing and clean the cover. Pay particular attention to the sealing surface of the outlet tube, which fits inside the primary element.
8. Install a clean primary element.
9. Install the cover.
10. Reset the engine air filter service indicator by pressing button (5).

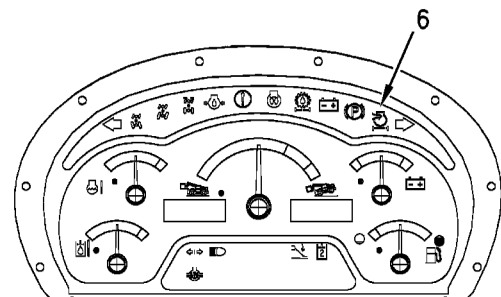


Illustration 213

g00847436

11. Start the engine. If the engine air filter service indicator (6) illuminates on the dash panel, install a new primary element. Refer to the "Alert Indicators" section of Operation and Maintenance Manual, "Monitoring System" for further information. Also, if the exhaust smoke is black, install a new primary element. Replace the engine air filter secondary element when you replace the primary filter element. Refer to the Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".
12. Close the engine enclosure.

## Cleaning Primary Air Filter Elements

### NOTICE

Caterpillar recommends certified air filter cleaning services available at participating Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

### NOTICE

Do not clean the air filter elements by bumping or tapping. This could damage the seals. Do not use elements with damaged pleats, gaskets, or seals. Damaged elements will allow dirt to pass through. Engine damage could result.

Visually inspect the primary air filter element before cleaning. Inspect the air filter element for damage to the seal, the gaskets, and the outer cover. Discard any damaged air filter elements.

There are two common methods that are used to clean primary air filter elements:

- Pressurized air
- Vacuum cleaning

### Pressurized Air

Pressurized air can be used to clean primary air filter elements that have not been cleaned more than two times. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

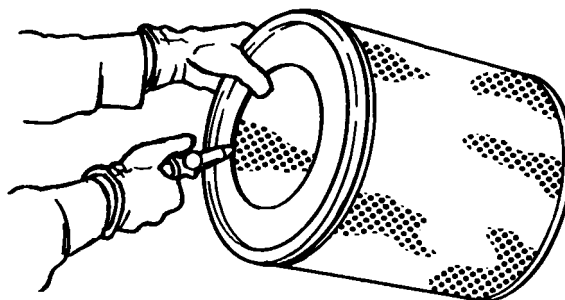


Illustration 214

g00281692

**Note:** When the primary air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Aim the hose so that the air flows inside the element along the length of the filter in order to help prevent damage to the paper pleats. Do not aim the stream of air directly at the primary air filter element. Dirt could be forced further into the pleats.

### Vacuum Cleaning

Vacuum cleaning is another method for cleaning primary air filter elements which require daily cleaning because of a dry, dusty environment. Cleaning with pressurized air is recommended prior to vacuum cleaning. Vacuum cleaning will not remove deposits of carbon and oil.

## Inspecting the Primary Air Filter Elements

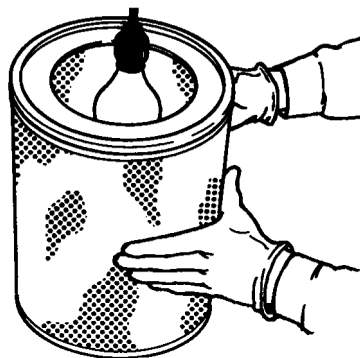


Illustration 215

g00281693

Inspect the clean, dry primary air filter element. Use a 60 watt blue light in a dark room or in a similar facility. Place the blue light in the primary air filter element. Rotate the primary air filter element. Inspect the primary air filter element for tears and/or holes. Inspect the primary air filter element for light that may show through the filter material. If it is necessary in order to confirm the result, compare the primary air filter element to a

new primary air filter element that has the same part number.

Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets or seals. Discard damaged primary air filter elements.

### Storing Primary Air Filter Elements

If a primary air filter element that passes inspection will not be used, the primary air filter element can be stored for future use.

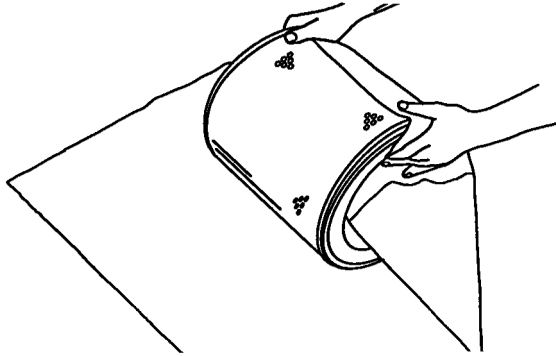


Illustration 216

g00281694

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An airflow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the primary air filter element into a box for storage. For identification, mark the outside of the box and mark the primary air filter element. Include the following information:

- Date of cleaning
- Number of cleanings

Store the box in a dry location.

## Engine Air Filter Primary Element - Replace

### NOTICE

The filter should be kept in service no longer than six months or 500 service hours.

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

Write the date on the element, when the element is replaced.

## Engine Air Filter Secondary Element - Replace

### NOTICE

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

The secondary filter element should be replaced at the time the primary element is serviced for the third time.

1. Open the engine enclosure.

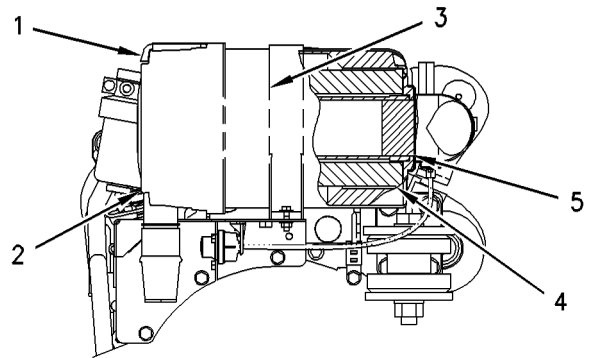


Illustration 217

g01001933

2. Slide out retaining clip (1).
3. Release cover (2) from air filter housing (3) by rotating counterclockwise. Remove the cover from the housing.
4. Remove primary element (4) from filter housing (3). To avoid dislodging any dust, take care to avoid touching the element against the sides of the housing.
5. Remove secondary filter element (5).
6. Cover the air inlet opening. Clean the inside of the air cleaner housing.
7. Uncover the air inlet opening. Install a new secondary element.
8. Install the primary element and the air filter cover.
9. Close the engine enclosure.

## Engine Mounts - Inspect

Check the engine mounts for deterioration. Check the bolts on the engine mounts for the proper torque. The correct torque on the bolts will prevent excessive engine vibration that is caused from improper mounting.

## Engine Oil Level - Check

### **WARNING**

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

#### NOTICE

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

Park the machine on level ground.

Check the crankcase oil level with the machine level. If the machine has just been stopped, wait for a minimum of one minute. The minute will allow oil to drain back into the crankcase.

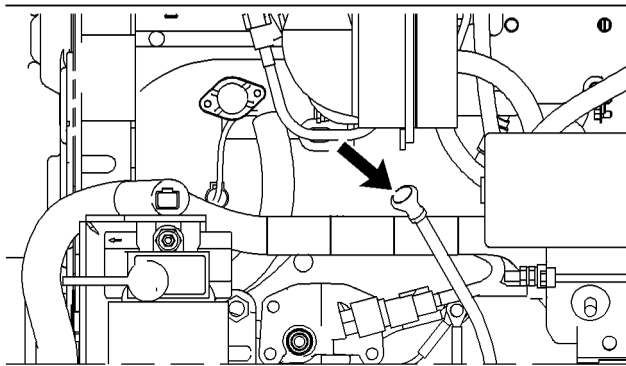


Illustration 218

g00951796

1. Open the engine enclosure. The oil level dipstick is located on the front of the engine.
2. Maintain the oil level between the "ADD" mark and the "FULL" mark on the dipstick.

Note: When you operate the machine on severe slopes, the oil level in the engine crankcase must be at the "FULL" mark on the dipstick.

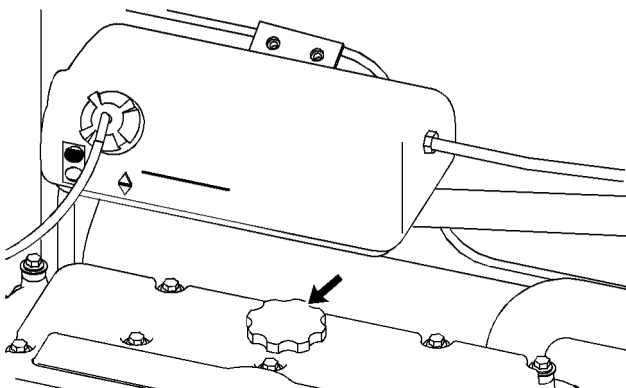


Illustration 219

g01081071

3. Clean the oil filler cap. Remove the oil filler cap. If necessary, add oil.

4. Install the oil filler cap.
5. Close the engine enclosure.

## Engine Oil Sample - Obtain

Park the machine on level ground. Fully retract and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged.

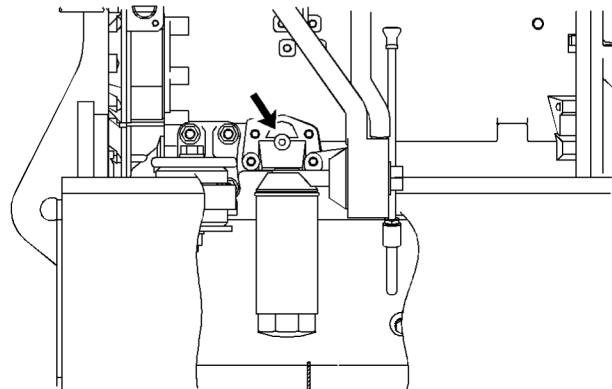


Illustration 220

g01057330

The oil sampling valve for the engine oil is located on the engine oil filter base.

Refer to the appropriate Service Manual for more information about obtaining a sample of the engine oil.

Use SOS Oil Analysis in order to monitor the condition of your engine.

## Engine Oil and Filter - Change

### **WARNING**

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

#### NOTICE

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

Refer to Special Publication, NENG2500, "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: Change the engine oil and the filter after every 500 hours. This is the normal interval provided that the following conditions are met:

- Only genuine Caterpillar filters must be used.

- Only Caterpillar Multigrade Diesel Engine Oil (DEO) to specification CG-4 or an equivalent must be used. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and the appropriate Service Manual for more detailed lubricant information.
  - Working conditions must be clean and applications must be light. Obtain an SOS oil sample at the first 250 hours in order to determine if the oil change interval can be decreased.
  - The sulfur content of the fuel must be between 0.05% to 0.5%. If a higher percentage of sulfur is present in the fuel, the engine oil and the filter will need to be changed more often. 0.5% to 1.0% of sulfur content will require the engine oil and the filter to be changed after every 250 hours. 1.0% to 1.5% of sulfur content will require the engine oil and the filter to be changed after every 125 hours.
1. Before you drain the engine oil, park the machine on a level surface and engage the parking brake. The engine oil should be warm before you drain the oil. Stop the engine.
  2. Open the engine access door.

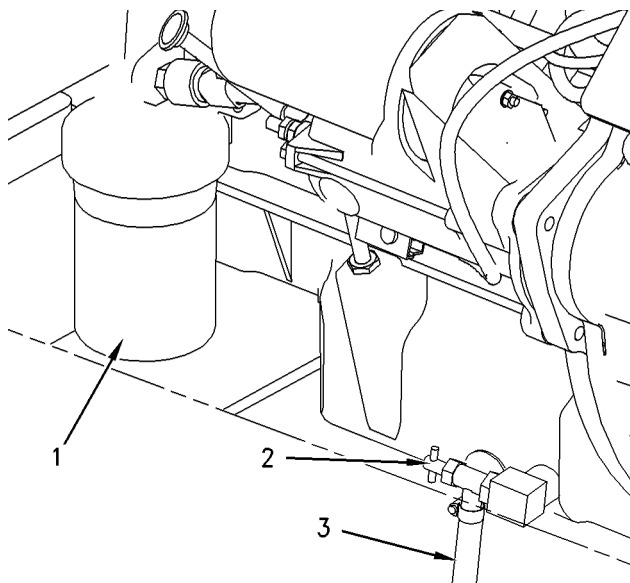


Illustration 221

g00975860

3. Position the end of hose (3) into a suitable container. Turn shutoff valve (2) counterclockwise in order to drain the engine oil from the crankcase. Turn the shutoff valve clockwise in order to close the shutoff valve. Allow the oil to drain from the hose.
4. Remove old engine oil filter (1) with a filter wrench.
5. Clean the filter housing base. Ensure that all of the old seal is removed.
6. Apply a thin film of clean engine oil to the seal of the new engine oil filter.
7. Install new engine oil filter (1) hand tight until the seal of engine oil filter (1) 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 engine oil filter (1) that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten engine oil filter (1), use the rotation index marks as a guide.

8. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of 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.

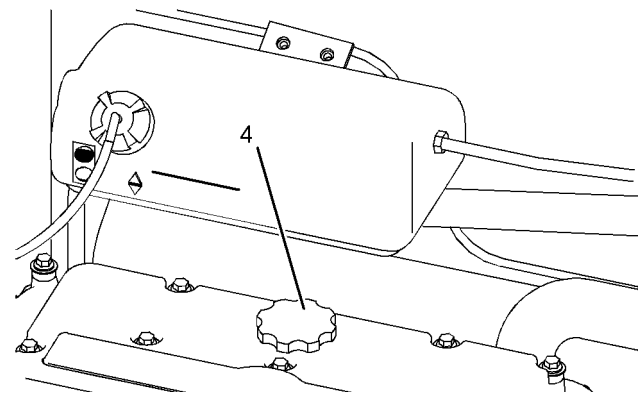


Illustration 222

g01081070

9. Remove filler cap (4) and fill the crankcase with new oil.

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for more information on the type of oil that is required. Refer to Operation and Maintenance Manual, "Capacities (Refill)" for more information on the quantity of oil that is required.

10. Check that the parking brake is engaged and that the transmission is in NEUTRAL and then start the engine. Operate the engine for five minutes at low idle. Inspect the engine for leaks and make any repairs that are necessary.
11. Stop the engine. Wait for two minutes after you stop the engine. Stopping the engine allows oil to drain back to the crankcase. Check the oil level. If necessary, add oil. Maintain the oil level between the "ADD" mark and the "FULL" mark on the dipstick. Install the filler cap.
12. Close the engine access door.

## Engine Valve Lash - Check

Maintenance is recommended by Caterpillar for engine valve lash adjustments. The maintenance for the engine valve lash is part of the lubrication and preventive maintenance schedule in order to provide maximum engine life.

**Note:** The engine valve lash should be checked at every 2000 hours or 2 years.

### NOTICE

Only qualified service personnel should perform this maintenance. Refer to the Service Manual or your Caterpillar Dealer for the complete engine valve lash adjustment procedure.

### WARNING

Be sure the engine cannot be started while this maintenance is being performed. To prevent possible injury, do not use the starting motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring/adjusting engine valve lash clearance.

### NOTICE

Operation of Caterpillar Engines with improper engine valve lash adjustments will reduce the engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

Measure the engine valve lash with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the valves to cool to engine cylinder head and block temperature.

## Final Drive Oil - Change

### 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.

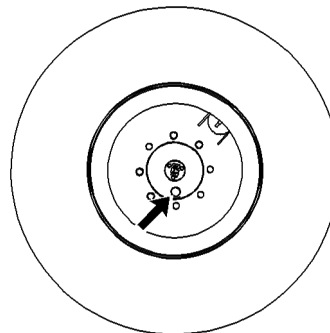


Illustration 223  
Position of the plug draining the oil

g00952214

1. Park the machine on level ground. Position the drain plug in the position that is shown in Illustration 223.
2. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
3. Clean the area around the drain plug. Remove the drain plug and drain the oil into a suitable container.

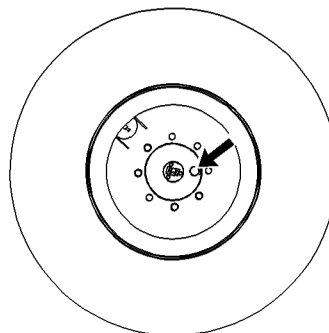


Illustration 224  
Position of the plug for filling the oil

g00952220

4. Move the machine until the plug hole is at the horizontal center line of the wheel. The correct position is shown in Illustration 224.
5. Add oil to the final drive through the plug hole. Oil should be dripping out of the plug hole when the final drive is full of oil. Refer to Operation and Maintenance Manual, "Capacities (Refill)" and Operation and Maintenance Manual, "Lubricant Viscosities" for more information.

Refer to the appropriate Service Manual for more detailed lubricant information.

6. Clean the drain plug and reinstall the drain plug.
7. Repeat the steps that are explained above for each of the three remaining final drives.



## Final Drive Oil Level - Check

### 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.

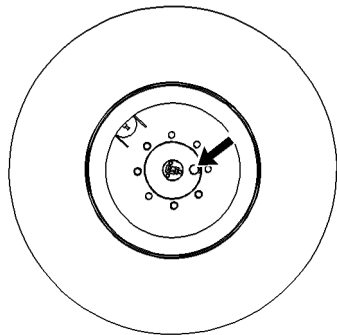


Illustration 225

g00952220

1. To check the oil level on the final drive, position the machine on level ground. Position the plug for the final drive on the horizontal center line of the wheel.
2. Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
3. Clean the area around the plug. Remove the plug.
4. Check that the oil is level with the plug hole. If necessary, add oil through the plug hole.
5. Clean the plug and reinstall the plug.
6. Repeat Step 1 through Step 5 for each of the three remaining final drives.

## Final Drive Oil Sample - Obtain



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

### NOTICE

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

Refer to Special Publication, NENG2500, "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.

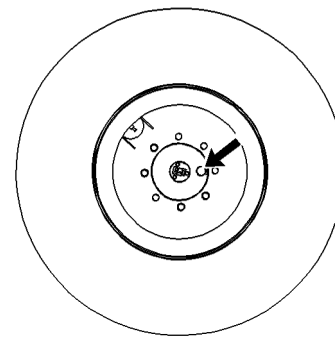


Illustration 226

g00952220

Fully retract the boom and fully lower the boom. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.

Obtain a sample of oil from each final drive. Keep the oil samples separate from each other.

Select a final drive in order to obtain a sample of oil. Park the machine on level ground and position the plug for the final drive on the horizontal center line of the wheel.

Clean the area around the plug and remove the plug. Use a sampling gun in the plug hole in order to obtain an oil sample from the final drive. Inspect the plug for damage. Install the plug.

Repeat this procedure for the remaining final drives. Analysis of oil from the corresponding final drive will provide an accurate representation of oil condition within each system.

Use SOS Oil Analysis in order to monitor the condition of your oil.

For additional information, refer to the appropriate Service Manual.

## Fork Leveling Cylinder Pin - Lubricate

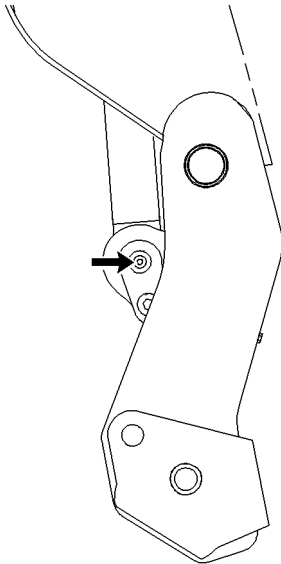


Illustration 227

g00977344

Lubricate the pin for the fork leveling cylinder through the fitting.

## Frame Leveling Cylinder Pin - Lubricate

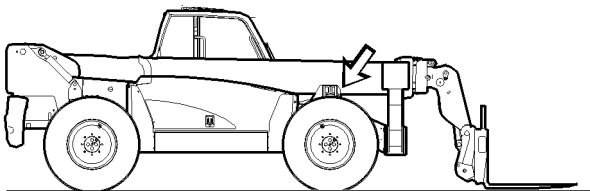


Illustration 228  
Location of the frame leveling cylinder.

g00856617

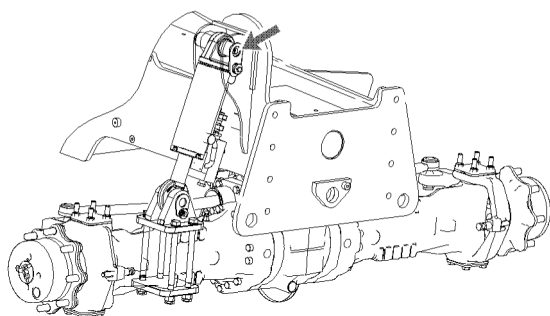


Illustration 229

g01013692

The frame leveling cylinder is located at the front right of the machine.

Lubricate the frame leveling cylinder pin through the fitting on the top mounting point.

## Fuel System - Prime

### Tier II

1. Turn the engine start switch to the ON position. Leave the switch in the ON position for 3 minutes.

### NOTICE

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

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

2. Start the engine. Allow the engine to operate at low idle until the engine runs smoothly.

**Note:** If additional priming is necessary, refer to the appropriate Service Manual for additional information.

### Tier III

### WARNING

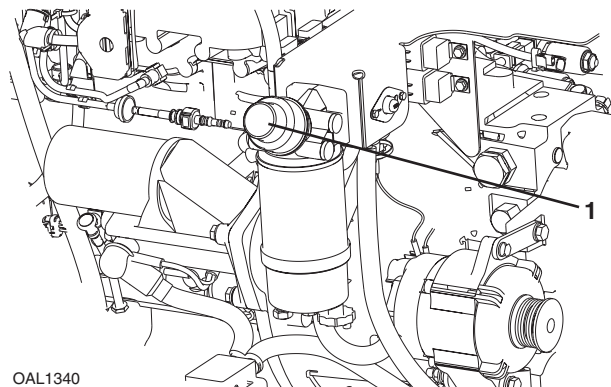
Personal injury or death may result from failure to adhere to the following procedures.

Contact with high pressure fuel may cause fluid penetration and burn hazards.

High pressure fuel spray may cause a fire hazard.

### NOTICE

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



OAL1340

1. Operate fuel priming pump (1).
2. Stop after 100 depressions of the fuel priming pump
3. The engine fuel system should now be primed.
4. Operate engine starter and crank engine. After engine has started, operate at low idle for a minimum of five minutes immediately after air has been removed from fuel system.

#### NOTICE

Operating engine for this period of time helps ensure the fuel system is free of air.

Do not loosen high pressure fuel line to purge air from fuel system.

## Fuel System Water Separator - Drain

### WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

#### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

1. Park the machine on level ground. Fully retract and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.
2. Open the engine enclosure.

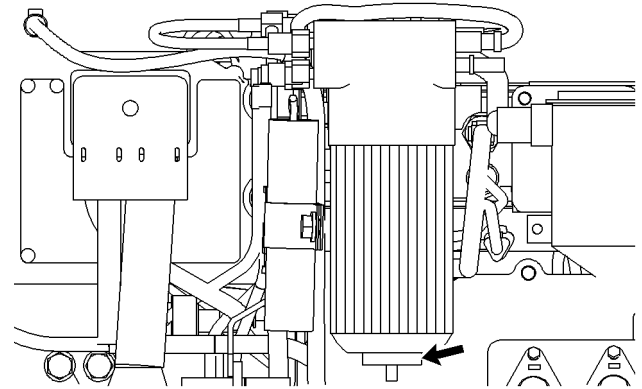
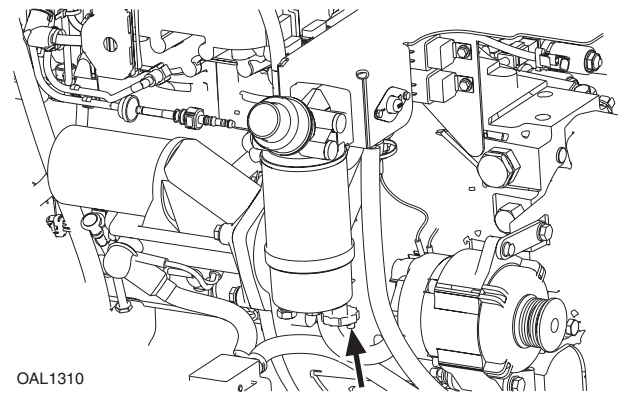


Illustration 230  
Tier II



OAL1310  
Tier III

3. Loosen the valve and drain the water and sediment into a suitable container.
4. Tighten the valve.

## Fuel System Water Separator Element - Replace (Tier II)

### WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

#### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

1. Park the machine on level ground. Fully retract and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.
2. Open the engine enclosure.

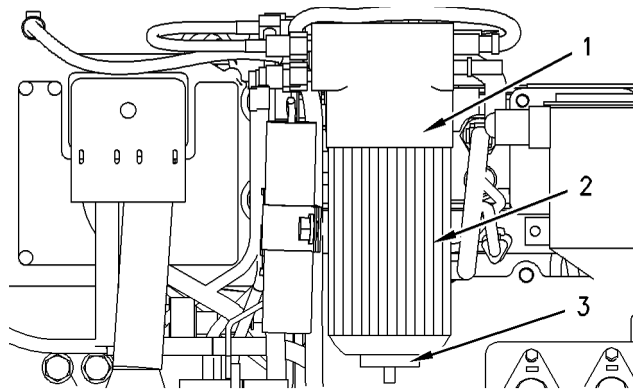


Illustration 231

g00976197

3. Loosen valve (3) and drain the contents of housing (2) into a suitable container. Tighten the valve.
4. Support housing (2) and rotate the housing. Remove the housing.
5. Rotate the element for 90 degrees counterclockwise and lift the element out of housing (2).
6. Clean the gasket sealing surface on mounting base (1). Replace the O-ring seal that is located on housing (2). Insert a new filter element into the housing and rotate the element for 90 degrees clockwise in order to lock the element into position.
7. Lubricate the O-ring seal on the new element with clean diesel fuel.
8. Install the housing onto the mounting base. Tighten the housing by hand. Do not overtighten the housing.

**Note:** Ensure that the O-ring seal is not damaged during the installation of the housing. Replace the O-ring if the O-ring is damaged.

9. Prime the fuel system. Refer to Operation and Maintenance Manual, "Fuel System - Prime" for further instructions.
10. Start the engine and check for leaks.

## Fuel System Water Separator Element - Replace (Tier III)

### WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

### NOTICE

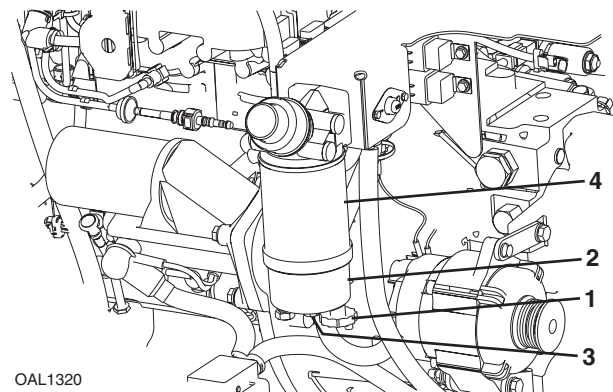
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

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.

### Primary Filter

1. Park the machine on level ground. Fully retract and fully lower the boom. Move the transmission control to the NEUTRAL position and ensure that the parking brake is engaged. Shut off the engine.
2. Open the engine enclosure.

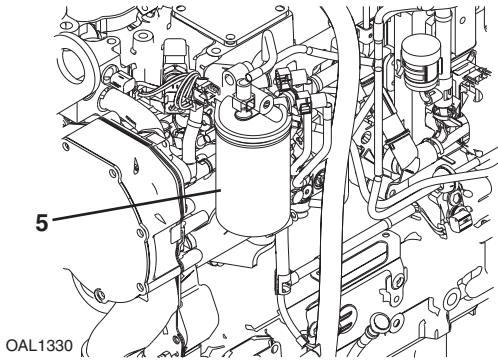


OAL1320

3. Loosen valve (1) and drain contents of glass bowl (2) into suitable container. Tighten valve.
4. Support glass bowl (2) and remove screw (3). Remove glass bowl and clean.
5. Remove canister (4) and old seals.
6. Install new canister and tighten by hand.

7. Install new seals on screw and glass bowl.
8. Align glass bowl to canister and install screw. Torque to 5 Nm (44 lb-in).
9. Replace secondary fuel filter.

### Secondary Filter



1. Place suitable container under fuel filter.
2. Clean outside of filter and remove canister (5).
3. Install new canister and tighten by hand.
4. Prime the fuel system. Refer to Operation and Maintenance Manual, "Fuel System - Prime" for further instructions.
5. Start the engine and check for leaks.

### Fuel Tank Cap - Clean

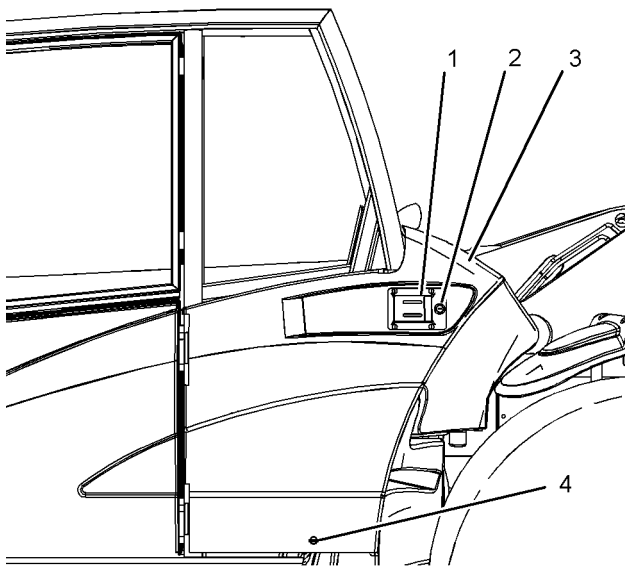


Illustration 232

g01202853

The fuel filler cap is located behind protection cover (3) on the left side of the cab.

**Note:** Before the machine is refueled or before the fuel filler cap is cleaned, remove foreign material from the top of the fuel tank.

1. In order to open protection cover (3), unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

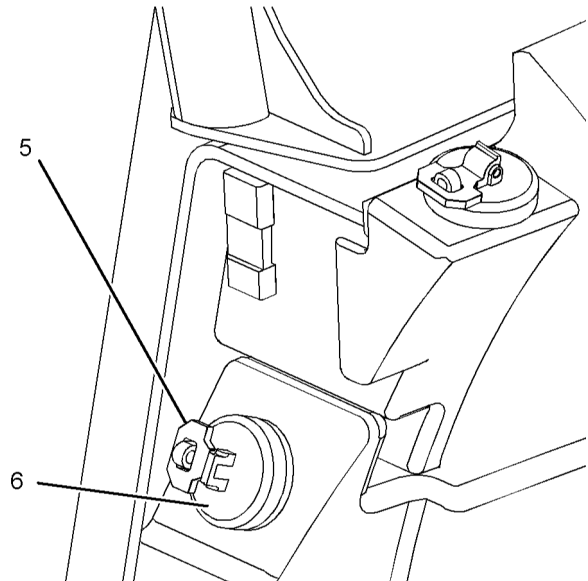


Illustration 233

g01204058

2. Locate fuel filler cap (6) and remove the padlock, if equipped.
3. Lift latch (5) and turn the fuel filler cap counterclockwise. This will release the fuel filler cap.
4. Remove fuel filler cap (6) and inspect the fuel filler cap. Replace the fuel filler cap if the fuel filler cap is damaged.
5. Install the fuel filler cap.
6. Install the padlock, if equipped.
7. Close the protection cover.

### Fuel Tank Water and Sediment - Drain

#### **WARNING**

Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

#### NOTICE

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.

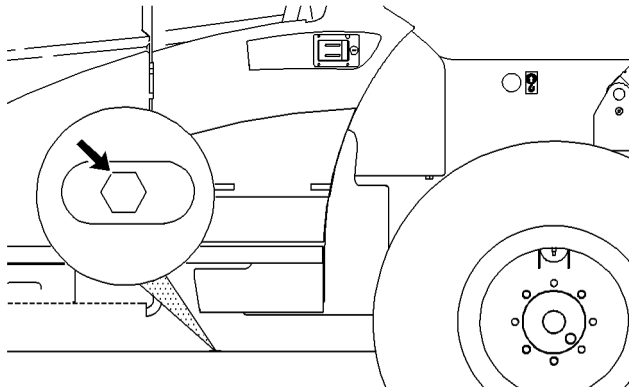


Illustration 234

g00979514

The fuel tank drain plug is located on the bottom of the fuel tank.

1. Loosen the fuel tank drain plug. Do not remove the fuel tank drain plug. Allow the water and the sediment to drain into a suitable container and then tighten the fuel tank drain plug.
2. Add fuel to the fuel tank. Fill the fuel tank at the end of each day of operation. Filling the fuel tank after every day of operation will drive out moist air. Also, filling the fuel tank helps to minimize condensation. Do not fill the fuel tank to the top. Warm fuel expands and the fuel may overflow if the fuel tank is overfilled.

**Note:** Never allow the fuel tank to run dry.

## Fuses and Relays - Replace

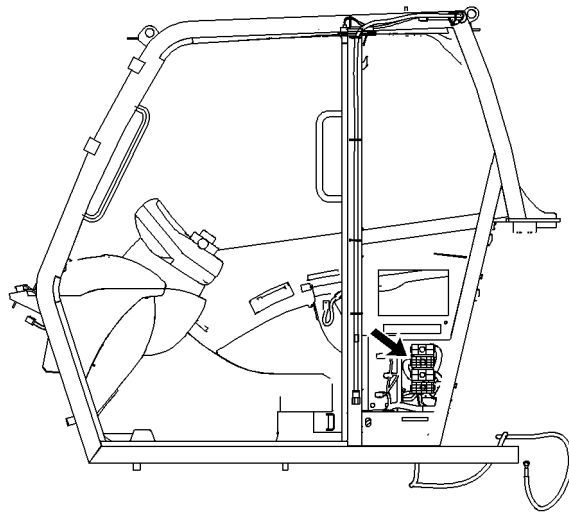


Illustration 235  
Fuse panel

g00951206

The fuse panel is located behind an access cover in the left side of the cab arrangement. Remove the cover in order to expose the fuses and relays.

### Fuses

#### NOTICE

Replace fuses with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to replace fuses frequently, an electrical problem may exist. Contact your Caterpillar dealer.

The fuses protect the electrical system from damage that is caused by overloaded circuits. If the element inside the fuse separates, replace the fuse. Check the circuit if the element is separated in the new fuse. Repair the circuit, if necessary.

**Note:** Your machine may not utilize all of the fuses that are listed here. You should only replace these fuses with fuses of the same type and current rating.

Use the fuse puller in order to remove the fuses. The fuse puller is located to the left of the fuse panel.

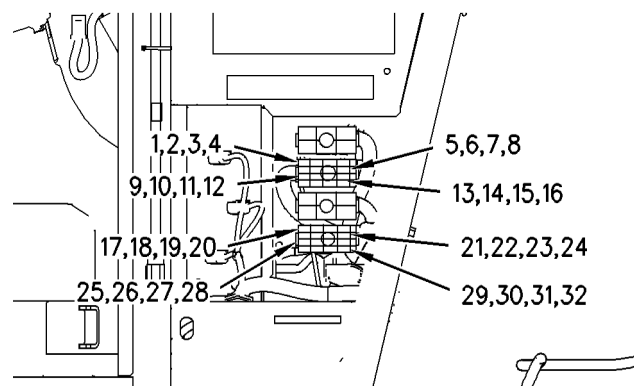
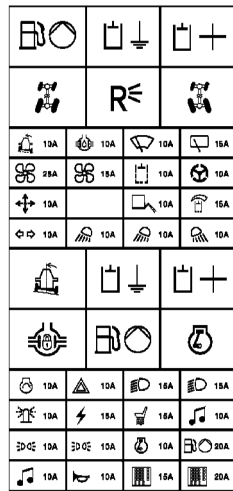


Illustration 236

g00951211

Illustration 236 shows the location of the fuses. The fuses are numbered from the top to the bottom.



OAM1350

Film on fuse access cover

A film with the positions of the fuses is located on the inside of the access cover. The location of the fuse matches the location of the pictograph on the film.



**Frame Level (1) - 10 AMP**



**Differential Lock (2) - 10 AMP**



**Front Window Wiper (3) - 10 AMP**



**Rear Window Wiper (4) - 15 AMP**



**High Speed Air Conditioner Blower (5) - 25 AMP**



**Low Speed Air Conditioner Blower (6) - 15 AMP**



**Hydraulic Auxiliary Circuit (7) - 10 AMP**



**Steering Alignment (8) - 10 AMP**



**Joystick Control (9) - 10 AMP**



**Spare Position (10)**



**Access Platform (11) - 10 AMP**



**PHS Circuit (12) - 15 AMP**



**Turn Signals (13) - 10 AMP**



**Work Light (14) - 10 AMP**



**Work Light (15) - 10 AMP**



**Rear Work Lights (16) - 10 AMP**



**Engine Start (17) - 10 AMP**



**Hazard Flashers (18) - 10 AMP**



**Left Side Parking Light, Left Side Rear Light, and License Plate Light (19) - 15 AMP**



**Right Side Parking Light, Right Side Rear Light, and Fog Light (20) - 15 AMP**



**Rotating Beacon (21) - 10 AMP**



**Alternator Indicator Light and Oil Pressure Indicator Light (22) - 15 AMP**



**Seat Height Adjustment (23) - 15 AMP**





**Radio which is Independent of Engine Start Switch (24) - 10 AMP**


 **LH Tail Lights (25) -10 AMP**

 **RH Tail Lights (26) -10 AMP**

 **Engine Run (27) -10 AMP**

 **Fuel Pump (28)** - This fuse is not used on this machine.

 **Radio which is dependent of Engine Start Switch (29) -10 AMP**

 **Horn (30) -10 AMP**

 **Electrical Monitoring System (31) - 15 AMP**

 **Electrical Monitoring System (32) - 20 AMP**

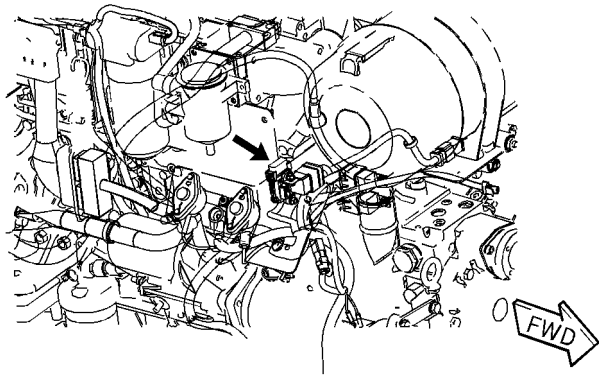


Illustration 238

g01056973

For Tier II machines, the fuse for the fuel pump is located in the engine compartment next to the circuit breakers. Remove the protective cover in order to access the fuse.

## Relays

**Note:** Your machine may not utilize all of the relays that are listed here. You should only replace these relays with relays of the same type.

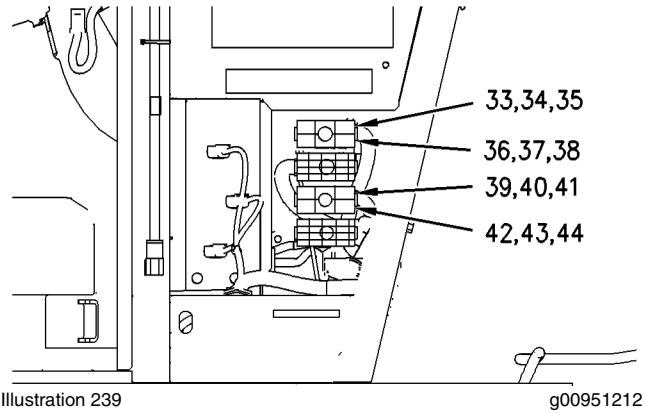


Illustration 239 shows the location of the relays on the fuse panel. A pictograph is located on the access cover. The location of the relay matches the location of the pictograph on the film.

 **Fuel Pump (33)**

 **Ground for Quick Coupler (34)**

 **Power for Quick Coupler (35)**

 **Crab Steering (36)**

 **Reverse Backup Lights (37)**

 **Circle Steer (38)**

 **Frame Level (39)**

 **Ground for Auxiliary Diverter Valve (40)**

 **Power for Auxiliary Diverter Valve (41)**

 **Differential Lock (42)**





### Fuel Pump (43)



### Engine Solenoid (44)

## Indicators and Gauges - Test

Check for broken indicator lights, broken switches or broken lenses on the instrument panel gauges.

Start the engine. Run the engine until the instrument panel gauges have stabilized. Check that the instrument panel gauges are operating correctly.

Stop the engine and perform any necessary repairs before the machine is operated.

## Longitudinal Stability Indicator - Calibrate



**The use of a defective longitudinal stability indicator (LSI) could lead to the instability of the machine. Do not operate the machine if the LSI is not fully serviceable. The instability of the machine could cause personal injury or death.**

Refer to the appropriate Service Manual for information on this procedure.

## Longitudinal Stability Indicator - Test

The following procedure must be followed when you test the operation of the longitudinal stability indicator system.

### Initial Test

1. Perform the following procedures to the machine:
  - a. Remove any work tool from the machine. Remove any load that is applied to the rear hitch.
  - b. Position the machine on level ground. If necessary, level the frame of the machine.
  - c. Raise the stabilizers fully.
  - d. Ensure that all the wheels are facing straight ahead. Drive the machine forward and drive the machine in reverse for 3 m (10 ft).
  - e. Tilt the coupler fully forward.
  - f. Fully lower and retract the boom.
  - g. Engage the parking brake and move the transmission control to the NEUTRAL position.

2. Turn the ignition to the OFF position. Wait for 30 seconds.
3. Turn the ignition to the ON position, but do not crank the engine.

**Note:** The machine will perform the self test. Refer to the "Engine Start Switch" topic in Operation and Maintenance Manual, "Operator Controls" for more information.

4. After the self tests are completed, the machine will test the longitudinal stability indicator system.
  - a. If the test is successful, the gauge will function in the manner that was described in Operation and Maintenance Manual, "Monitoring System". This indicates that the system is operating correctly.
  - b. The needle of the longitudinal stability indicator will move into the red zone of the gauge if the test is failed. An intermittent audible alarm will sound. The warning light will be activated. Turn the ignition to the OFF position in order to stop the alarm.

**Note:** This test is performed automatically. The test will be conducted when the ignition is switched from the OFF position to the ON position.

### Second Test

Perform the following test if the machine fails the system test of the longitudinal stability indicator.

1. Ensure that all of the steps have been performed in Step 1 of "Initial Test".
2. Repeat the test of longitudinal stability indicator system.

**Note:** If the machine continues to fail system tests of the longitudinal stability indicator, the machine must not be operated. Call your Caterpillar dealer for recalibration of the longitudinal stability indicator system.

## Oil Filter - Inspect

### Inspect a Used Filter for Debris

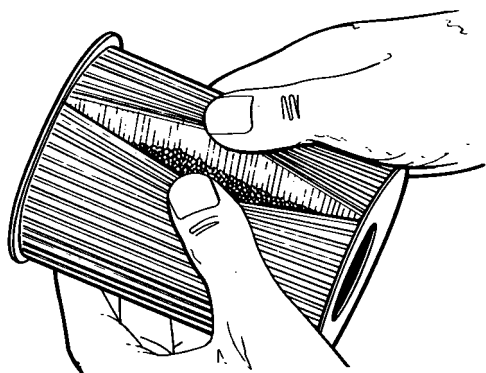


Illustration 240  
The element is shown with debris.

g00100013

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.

## Parking Brake - Adjust

If the machine moves during the "Parking Brake" test in Operation and Maintenance Manual, "Braking System - Test", perform the following procedure in order to adjust the parking brake.

1. Apply the service brakes.

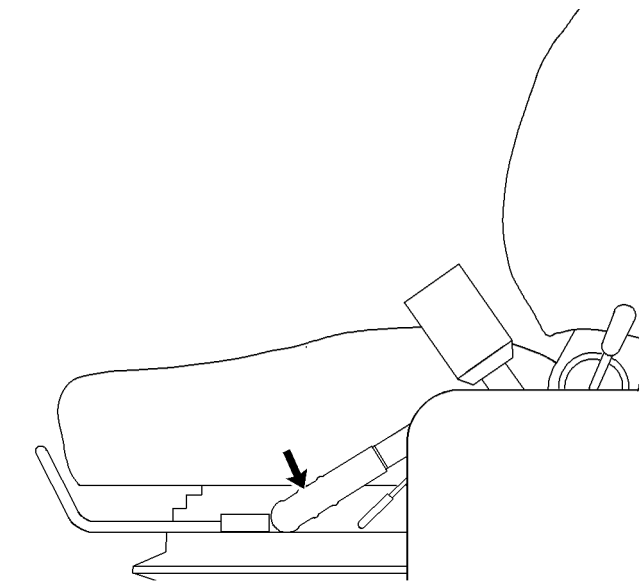


Illustration 241

g00951281

2. Disengage the parking brake.
3. As you view the parking brake handle from the front of the machine and look toward the rear of the machine, turn the handle clockwise for one half of a turn.
4. Repeat the "Parking Brake" test procedure in Operation and Maintenance Manual, "Braking System - Test".

If the machine moves during the parking brake test, then perform the adjustment procedure again. If you run out of adjustment on the parking brake handle, refer to the appropriate Service Manual.

## Pulley for Boom Extension Chain - Lubricate

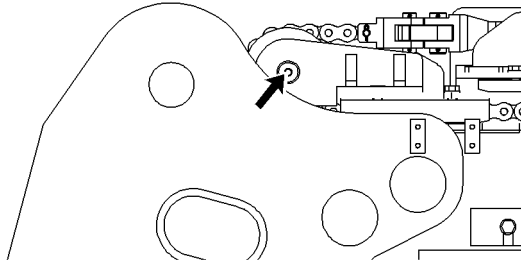


Illustration 242

g00979569

Lubricate the pulley for the boom extension chain through one fitting.

## Pulley for Boom Retraction Chain - Lubricate

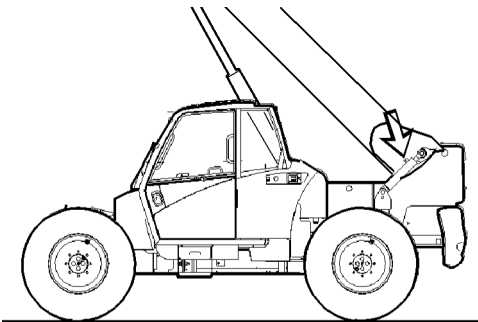


Illustration 243

g00856690

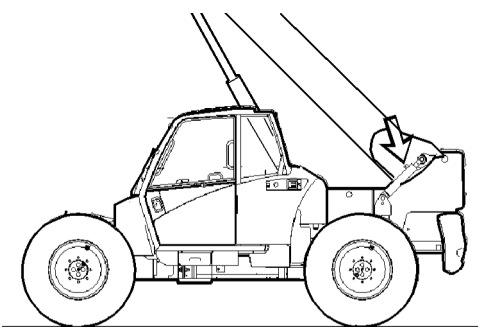


Illustration 244

g00856690

Fully raise the boom and lubricate the boom retraction chain roller through one fitting. Access is through a hole on the left side of the boom.

## Radiator Core - Clean

If your machine is not equipped with an air conditioning system, use compressed air in order to remove dust and other debris from the radiator core.

If your machine is equipped with an air conditioning system, the condenser must be tilted away from the radiator in order to properly clean the radiator core and the condenser core.

1. Open the engine access door.

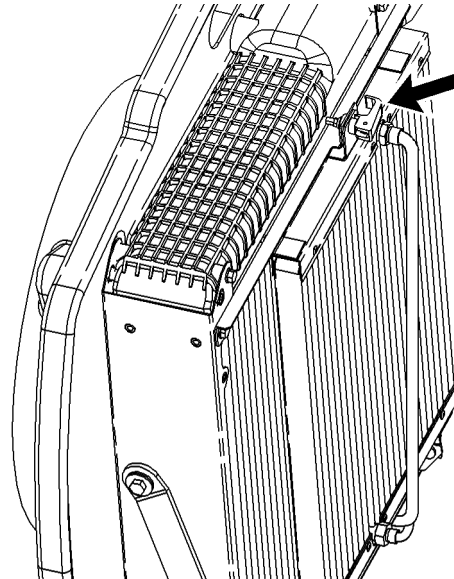


Illustration 245

g00950948

2. Open the latch that is located on top of the condenser.

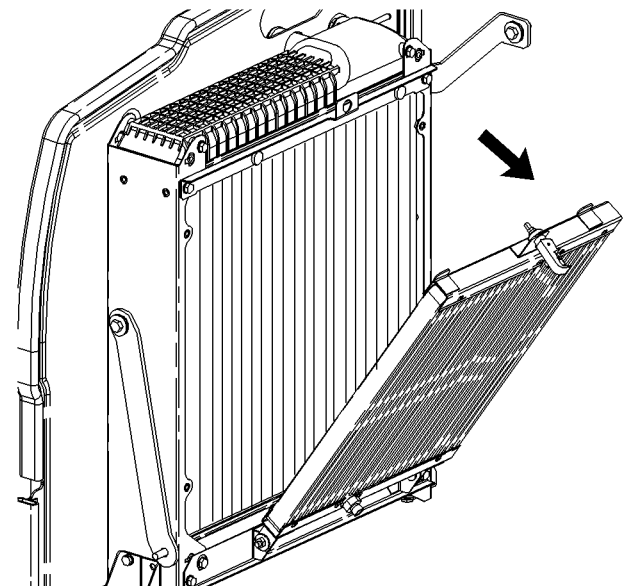


Illustration 246

g00951345

3. Tilt the condenser away from the radiator.
4. Use compressed air to remove dust and other debris from the radiator core and the condenser core.
5. Tilt back the condenser and fasten the latch.

## Refrigerant Dryer - Replace

### **WARNING**

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

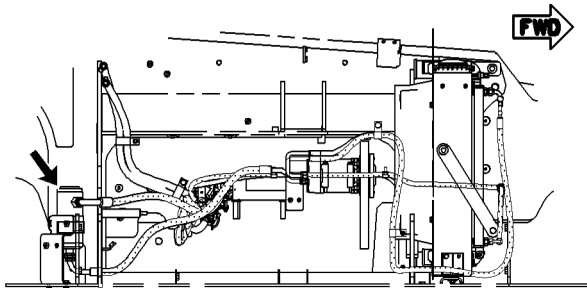


Illustration 247

g00980936

The refrigerant accumulator is located at the rear of the engine compartment.

**Note:** When you operate the machine in a climate with high humidity, replace the refrigerant accumulator after every 1000 service hours or 6 months.

## Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) - Inspect

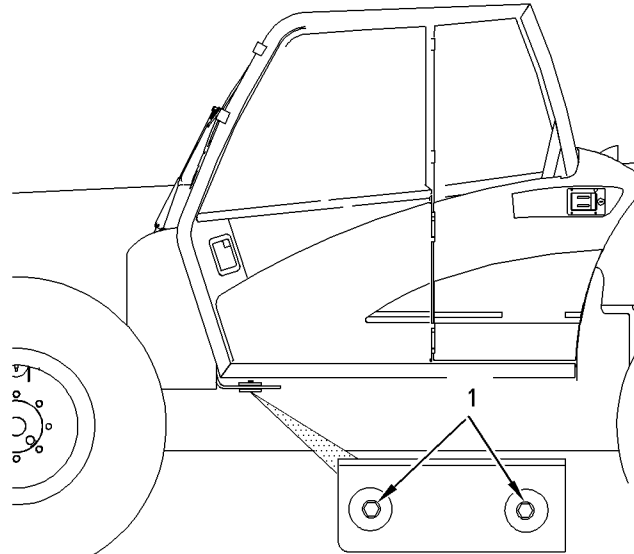


Illustration 248

g00950870

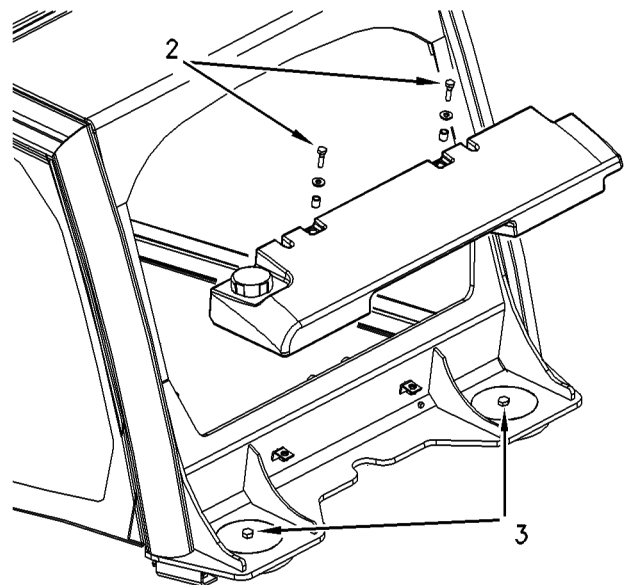


Illustration 249

g00951451

The front bolts (1) are located underneath the left side of the cab.

The rear bolts (3) are located underneath the windshield washer reservoir behind the cab.

1. Remove the bolts (2) in order to remove the windshield washer reservoir.
2. If the bolts are damaged or missing replace the bolts with original equipment parts only. Torque the bolts to 450 Nm (332 lb ft).

**Note:** Apply oil to the bolts before you install the bolts. Failure to apply oil can result in improper bolt torque.

3. Install the windshield washer reservoir, and install the two bolts.
4. Run the machine on a rough surface. Replace the ROPS/FOPS mounting supports if the ROPS/FOPS structure makes a noise or if the ROPS/FOPS structure rattles.

Do not attempt to straighten or repair the ROPS/FOPS structure. If there are any cracks in the welds, in the castings, or in any metal section of the ROPS/FOPS structure, consult your Caterpillar dealer for repairs.

## Seat Belt - Inspect

Always check 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.

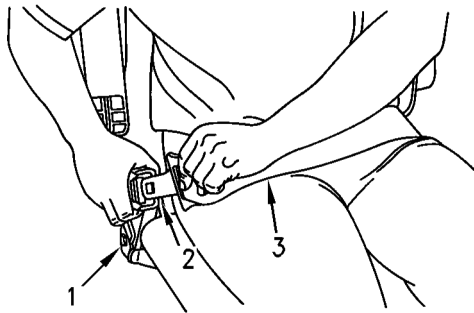


Illustration 250  
Typical example

g00932801

Check the seat belt mounting hardware (1) for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

Check buckle (2) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect the seat belt (3) for webbing that is worn or frayed. Replace the seat belt if the seat belt is worn or frayed.

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

**Note:** Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

## Seat Belt - Replace

Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

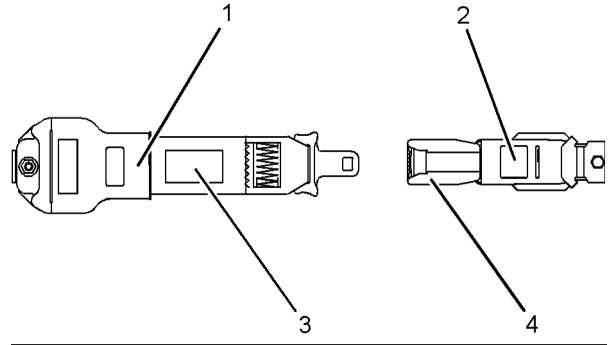


Illustration 251

g01152685

- (1) Date of Installation (retractor)
- (2) Date of installation (buckle)
- (3) Date of manufacture (tag) (fully extended web)
- (4) Date of manufacture (underside) (buckle)

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

## Stabilizer and Cylinder Bearings - Lubricate

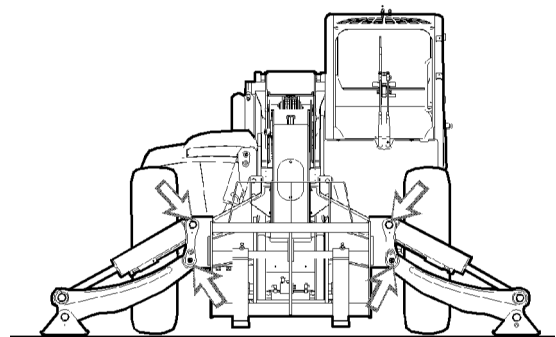


Illustration 252

g01013784

If your machine is equipped with stabilizers, lubricate the stabilizer cylinder bearings and the legs of the stabilizer through eight fittings.

## Tire Inflation - Check

### **WARNING**

Personal injury can result from improper tire inflation.

A tire blowout or rim failure can result from improper or misused equipment.

Use a self-inflating chuck and stand behind the tread when inflating a tire.

Proper inflating equipment, and training in using the equipment, are necessary to avoid overinflating.

Before inflating tire, put the tire in a restraining device.

Some machines are equipped with tires that are filled with air. Other machines are equipped with tires that are filled with foam. Pressures of tires that are filled with air must be checked. Pressures of tires that are filled with foam do not require checking.

1. Park the machine on level ground. Apply the parking brake. Retract and lower the boom. Shut off the engine.
2. Clean the area around the valve stem.
3. Remove the dust cover for the valve stem.
4. Stand behind the tire tread and use a Caterpillar 4S-6524 Pressure Gauge, or 1P-0545 Pressure Gauge to check the tire pressure. If these pressure gauges are not available use an equivalent tool to check the tire pressure. Add air if the pressure is low.
5. Install the dust cover on the valve stem.

Refer to the following additional information about tire inflation:

- Operation and Maintenance Manual, "Tire Pressure"
- Operation and Maintenance Manual, "Tire Inflation Pressure Adjustment"

Consult your Caterpillar Dealer for further information on the correct operating pressures and the correct load ratings.

## Transmission and Hydraulic System Oil - Change

### **WARNING**

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

#### NOTICE

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

Refer to Special Publication, NENG2500, "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.

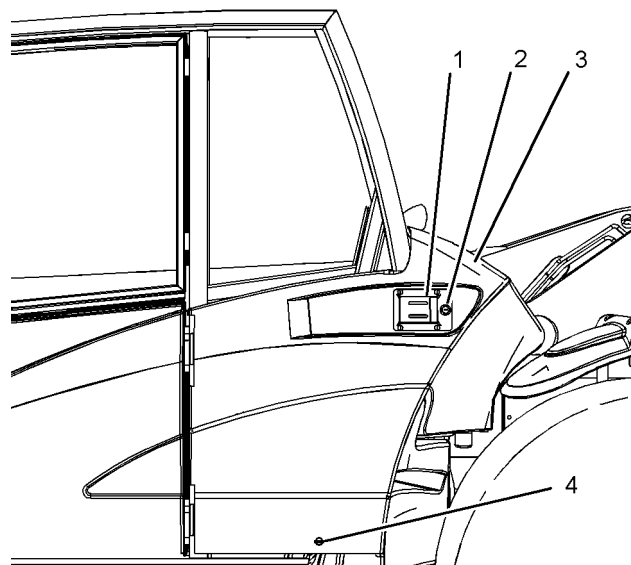


Illustration 253

g01202853

1. In order to open protection cover (3), unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

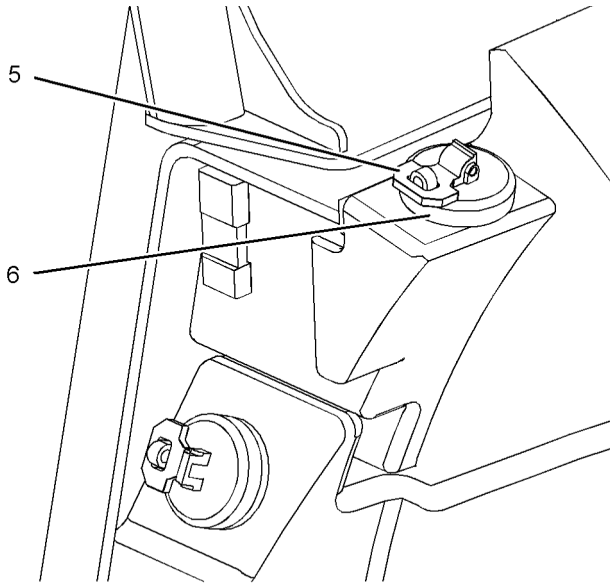


Illustration 254

g01205579

2. Lift latch (5). Turn the latch counterclockwise in order to relieve the pressure in the hydraulic system. Remove hydraulic tank filler cap (6).

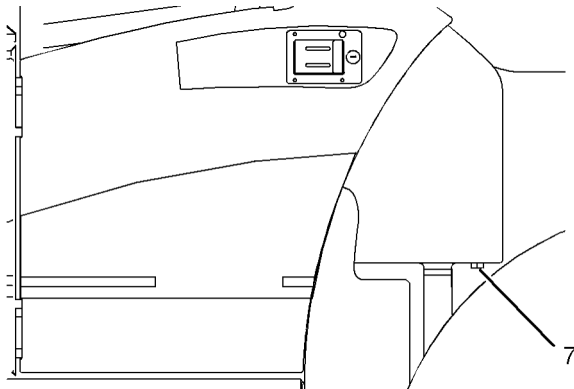


Illustration 255

g01205969

3. Remove drain plug (7) from the bottom of the hydraulic tank and drain the oil into a suitable container. Clean the drain plug. Install the drain plug back into the hydraulic tank.

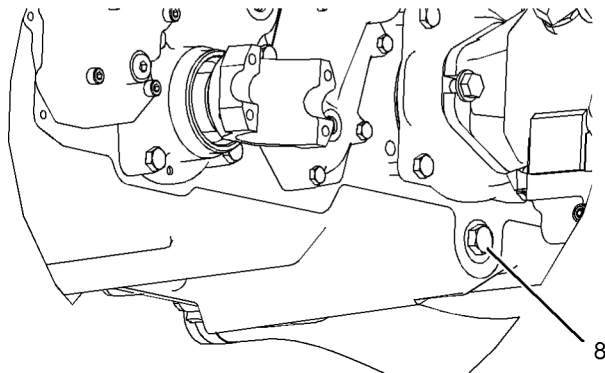


Illustration 256

g01205970

4. Remove drain plug (8) from the bottom of the transmission and drain the oil into a suitable

container. Clean the drain plug. Install the drain plug back into the transmission.

5. Fill the hydraulic tank with new Caterpillar TDTO and install the hydraulic tank filler cap. Clean up any oil that has spilled. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)" for additional information.

**Note:** Do not start the engine until the hydraulic tank is filled with new oil. Starting the engine before refilling with oil may damage the scavenge pump or the transmission.

6. Start the engine. Check for clearance for the boom. The boom will need clearance for full extension. You need enough clearance to fully raise the boom and you need enough clearance to lower the boom. Raise and lower the boom several times. Extend and retract the boom several times.
7. With the boom in the travel position, drive the machine slowly forward. Steer the machine from the left to the right.
8. Park the machine and check the oil level. If necessary, add oil.
9. Close the protection cover.

**Reference:** Refer to Operation and Maintenance Manual, "Transmission and Hydraulic System Oil Level - Check" for additional information.

## Transmission and Hydraulic System Oil Filter - Replace

### WARNING

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

### NOTICE

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

Refer to Special Publication, NENG2500, "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.

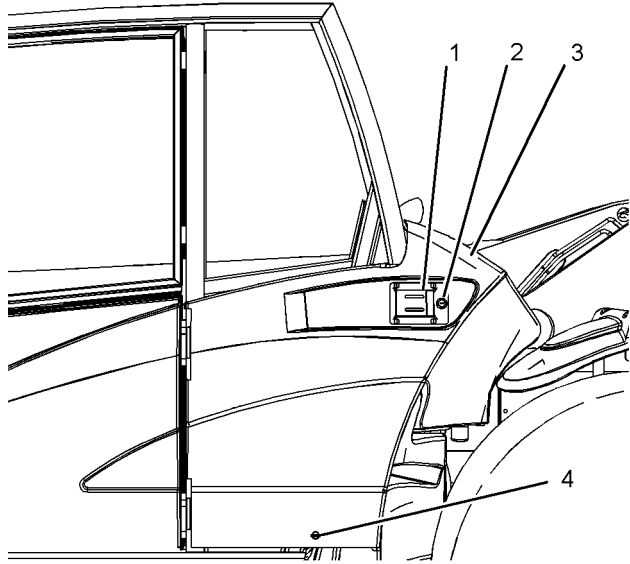


Illustration 257

g01202853

1. In order to open protection cover (3), unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

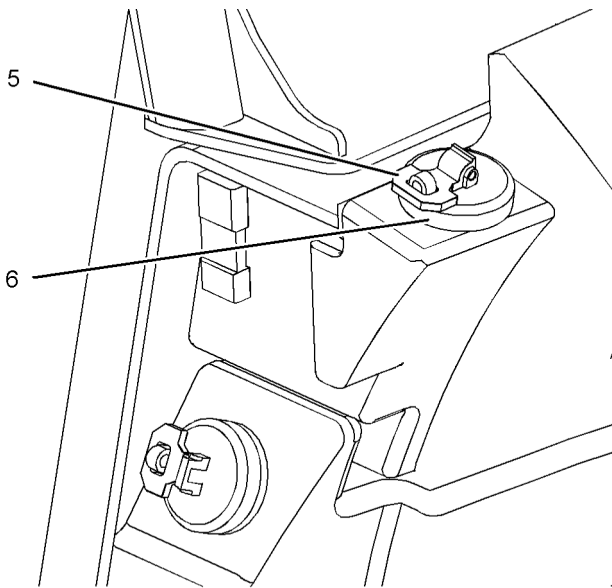


Illustration 258

g01205579

2. Lift latch (5), and turn the latch counterclockwise in order to relieve the pressure in the hydraulic system. Remove hydraulic tank filler cap (6).
3. Open the engine enclosure.

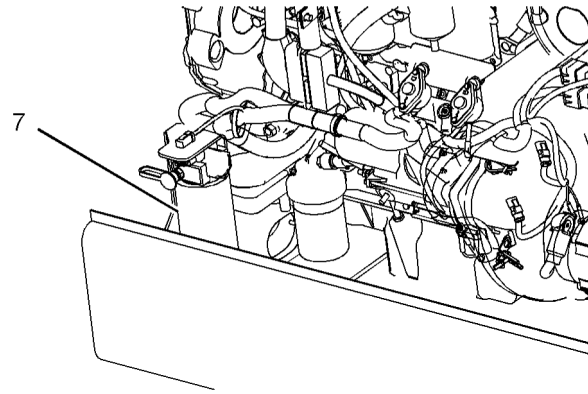


Illustration 259

g01205908

4. Remove oil filter (7). After you remove the oil filter, discard the oil filter. The oil filter will contain oil.
5. Clean the housing base for the oil filter. Make sure that all of the old filter seal has been removed.
6. Apply a thin film of oil to the seal of the new oil filter.
7. Install the new oil filter hand tight until the seal of the 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 oil filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the oil filter, use the rotation index marks as a guide.

8. Tighten the oil filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of 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.

**Reference:** Refer to Operation and Maintenance Manual, "Transmission and Hydraulic System Oil Level - Check" for additional information.

9. Tighten hydraulic tank filler cap (6).
10. Close the protection cover.



## Transmission and Hydraulic System Oil Level - Check

Before you check the level of the hydraulic oil, perform the following procedures:

- Park the machine on a level surface.
- Retract the boom.
- Lower the work tool to the ground.
- Fully raise the stabilizers.

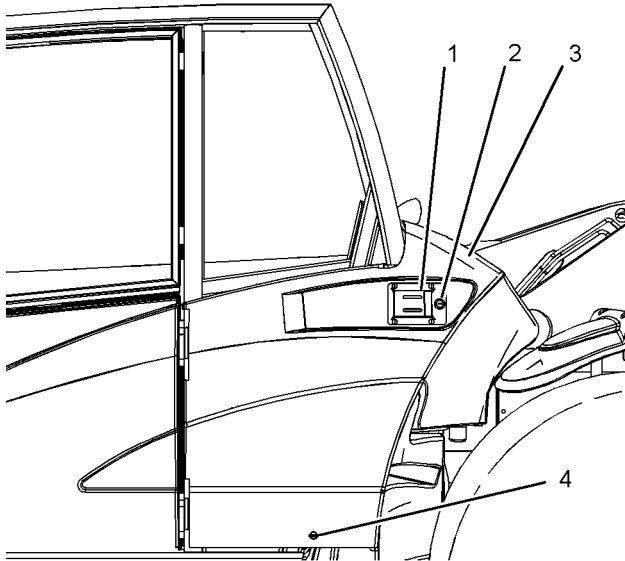


Illustration 260

g01202853

An oil level gauge is located behind protection cover (3) on the left side of the machine. In order to open the protection cover, unlock lock (2) and turn lock (4) counterclockwise. Then, pull latch (1) outward.

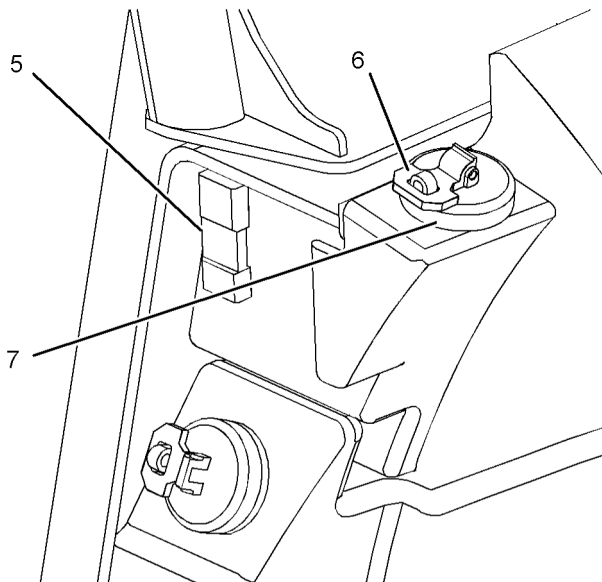


Illustration 261

g01205926

**Note:** Run the machine for at least five minutes in order to pressurize the hydraulic system.

You should look at oil level gauge (5) in order to check the level of oil in the hydraulic system. The oil level of the hydraulic system is correct when the oil level is visible above the red line of oil level gauge (5). If necessary, add Caterpillar TDTO to the correct oil level by the following method:

1. Lift latch (6), and loosen hydraulic tank filler cap (7) slowly in order to relieve the pressure in the hydraulic system. Remove the hydraulic tank filler cap.
2. Top up the hydraulic oil to the required level and install the hydraulic tank filler cap. Clean up any oil that has spilled. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)" for additional information.
3. Close the protection cover.

## Transmission and Hydraulic System Oil Sample - Obtain

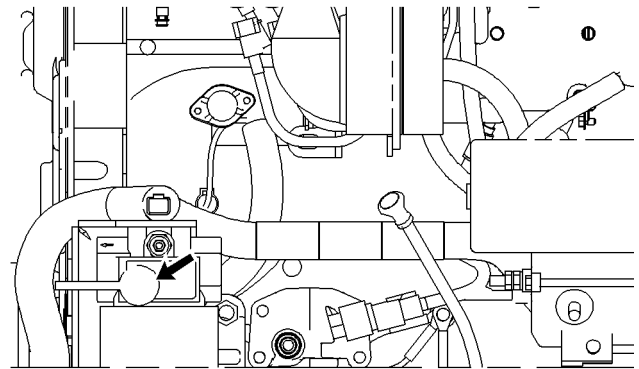


Illustration 262

g00956578

The sampling valve for the transmission and hydraulic system oil is located in the engine compartment on the filter base for the transmission and hydraulic system oil filter.

Refer to the appropriate Service Manual for more information about obtaining a sample of the hydraulic oil.

## Transmission and Hydraulic System Tank Breather - Clean

The breather for the transmission and hydraulic system tank is located directly underneath the windshield washer reservoir.

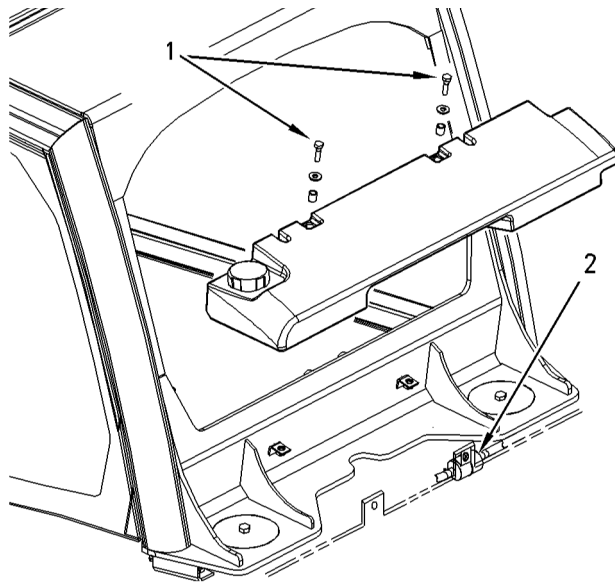


Illustration 263

g00951527

1. Remove two bolts (1) from the top of windshield washer reservoir. Lift the windshield washer reservoir in order to access breather (2).

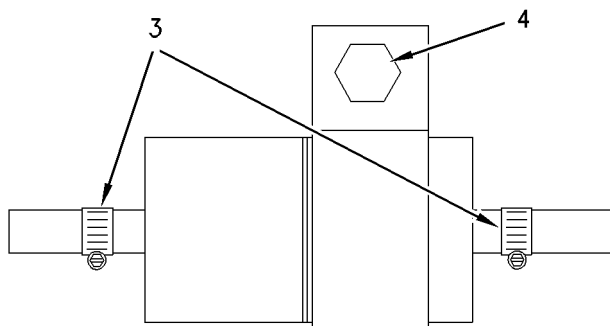


Illustration 264

g00951661

2. Loosen hose clamps (3) and remove the hoses from the breather.
3. Loosen bolt (4) and remove the breather.
4. Wash the breather in clean nonflammable solvent.
5. Install the clean breather, and reattach the two hoses. Tighten the two hose clamps.
6. Install the windshield washer reservoir, and install the two bolts.

## Turbocharger - Inspect

If the turbocharger fails during engine operation, severe damage to the turbocharger compressor wheel and to the entire engine can result.

Turbocharger bearing failures can cause large quantities of oil to enter the intake system and the exhaust system. Loss of engine oil can result in serious engine damage.

Do not continue to operate the engine when a turbocharger bearing failure is accompanied by a significant loss of engine performance. Engine smoke and speeding up of the engine with no load are characteristics of a loss of engine performance.

**Reference:** For more information about inspecting the turbocharger, refer to the appropriate Service Manual for your machine's engine.

## Wheel Nut Torque - Check

Check the wheel nut torque on new wheels and on repaired wheels after every ten service hours until the specified torque is maintained.

Tighten the wheel nuts to a torque of  $460 \pm 60$  Nm ( $340 \pm 45$  lb ft). When you install new wheels or repaired wheels, apply one drop of lubricating oil to the threads before you install the wheel nuts and the washers.

## Window Washer Reservoir -Fill

### NOTICE

Use Caterpillar nonfreezing window washer solvent or a commercially available windshield washer fluid in order to prevent freezing of the windshield washer system.

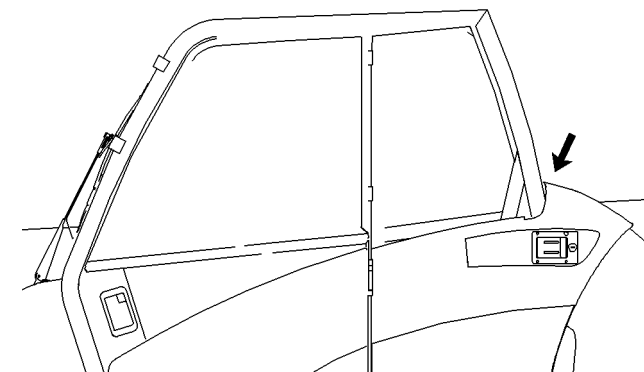


Illustration 265

g00951404

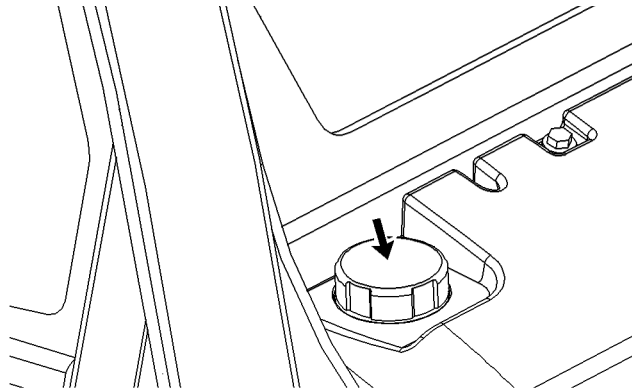


Illustration 266

g00950813

1. 1. Remove the filler cap.
2. Fill the tank with the appropriate window washer solvent.
3. Install the filler cap.

## Window Wiper -Inspect/ Replace

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

## Windows - Clean

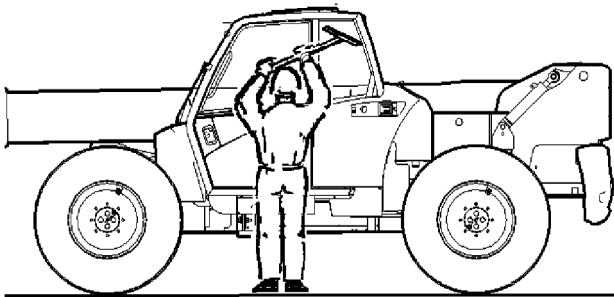


Illustration 267

g00856748

Use commercially available window cleaning solutions to clean the windows. Stand on the ground in order to clean the outside windows, unless handholds are available.

## Work Tool - Inspect/Replace

In order to help minimize unexpected, costly repairs and downtime, inspections need to be carried out on a regular basis. The interval between the inspections depends on the age of the work tool and the severity of the operating conditions.

More frequent inspections will be required of older work tools and work tools that are used in particularly severe operating conditions.

To perform a proper inspection, the work tool must be thoroughly cleaned. It is impossible to inspect the work tool properly if the work tool is dirty.

Early detection and repair of faults will ensure continued operation of the work tool. Also, early detection and repair will improve the availability of the work tool. Repair of faults will also reduce the risk of accidents.

The work tool should only be repaired by a qualified Caterpillar dealer in accordance with the manufacturers recommendations. However, if you decide to carry out your own repairs, consult your Caterpillar dealer for the recommended repair techniques.

Inspect the work tool before the work tool is attached to the machine.

## Forks

Forks can wear out. The cumulative effects of age, abrasion, corrosion, overloading, and misuse can severely weaken forks.

More frequent inspections will be required of older work tools and work tools that are used in particularly severe operating conditions or in a rental fleet.

To perform a proper inspection, the forks must be thoroughly cleaned. It is impossible to inspect the forks properly if the work tool is dirty.

Inspect the forks before the forks are attached to the machine.

Perform the yearly inspection for the forks prior to the start of each contract for all machines that are operating in a rental fleet.

Inspect the forks for deformation. Check that the upright of the fork is at 90 degrees to the blade of the fork. Check the fork for cracks in the metal. Closely inspect the area around the heel of the fork. This is the area of the fork that is subject to the greatest stresses. If a crack is visible, take the fork out of service immediately until the fork can be thoroughly examined.

Keep a record of each fork in order to establish a routine of regular inspection. Include the following initial information in the record:

- Manufacturer of the fork
- Type of fork
- Original size of fork section
- Original length of the fork

Record the date of each inspection and the results of each inspection. Ensure that the following information is included:

- Amount of wear on the blade
- Any damage, failure or deformation which might impair the use of the forks
- Any repairs or maintenance to the forks

An ongoing record of this information will help in identifying appropriate inspection intervals for each operation and in identifying and solving problem areas and in anticipating time for replacement of the forks.

**Daily Inspection**

1. Visually inspect the forks for cracks. Look particularly for cracks in the heel of the forks and for cracks around areas of weld. Look for tips of forks that are broken or bent. Look for twisted blades and shanks. Forks which are twisted should be removed from service. Also, forks which are cracked should be removed from service.
2. Make sure that the bolt for locking the fork is in place and that the bolt is working. Lock the forks in position before you use the forks.
3. Remove all worn forks or damaged forks from service.

**Yearly Inspection**

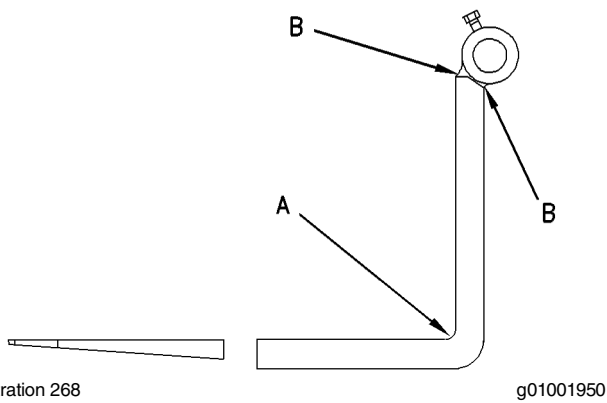


Illustration 268

g01001950

1. Inspect forks carefully for cracks. Pay special attention to heel (A) and mounting brackets (B). Look for cracks around all areas of weld. Inspect the tubes on forks that are mounted on shafts.

Forks with cracks should be removed from service.

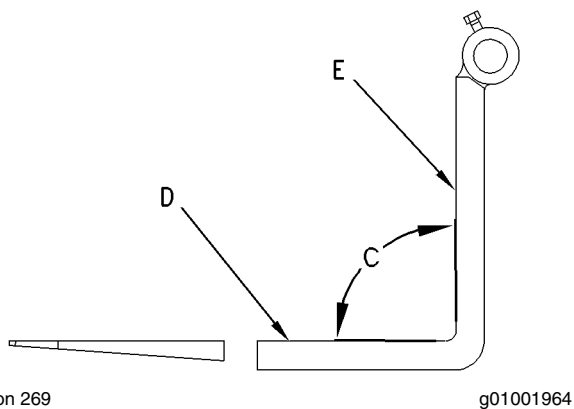


Illustration 269

g01001964

2. Check the angle between the upper face of blade (D) and the front face of shank (E). Remove the fork from service if angle (C) exceeds 93 degrees.

3. Check the straightness of the upper face of blade (D) and the front face of shank (E) with a straight edge.

Remove the fork from service if the deviation from straightness exceeds 0.5 percent of the length of the blade. Remove the fork from service if the deviation from height exceeds 0.5 percent of the height of the shank.

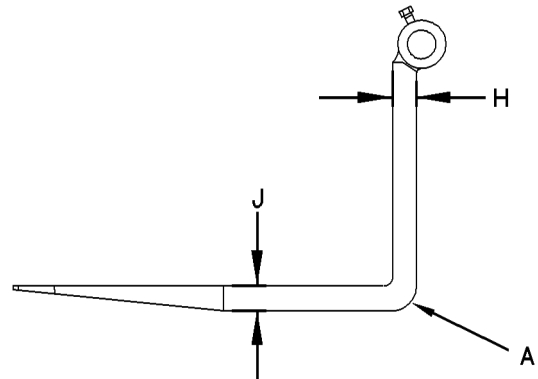


Illustration 271

g01001977

4. Check the difference in the height of the tip of one fork against the height of the tip of the other fork when the forks are mounted on the carriage. A difference in the height of the tip of the fork can result in uneven support of the load. This could cause problems when the forks are entering the pockets of the load.

The maximum recommended difference in the height of the tip of the forks (F) is 6.5 mm (0.25 inch) for pallet forks. The maximum recommended difference in the height of the tip of the forks (F) is 3 mm (0.125 inch) for fully tapered forks. The maximum allowable difference in the height of the tips between two or more forks is 3 percent of the length (L) of the blade.

Replace one or both forks when the difference in the height of the tip of the fork exceeds the maximum allowable difference.

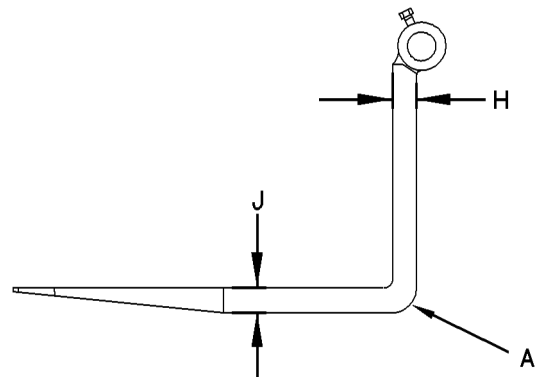


Illustration 271

g01001977

5. Check the thickness (J) of the blade and the thickness (H) of the shank for wear. Pay special attention to heel (A). Remove the fork from service if the thickness is reduced to 90 percent or less of the original thickness.

The length of the fork may also be reduced by wear, especially on tapered forks. Remove the forks from service when the length of the blade is no longer adequate for the intended loads.

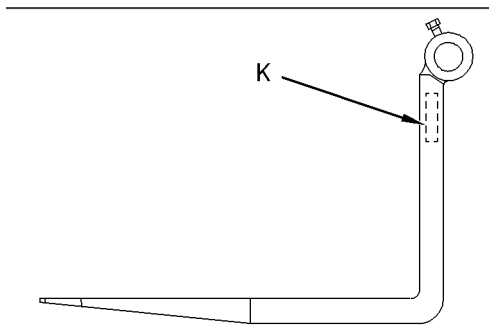


Illustration 272

g01001990

6. Check markings (K) for readability. Renew the markings if the markings are not legible.

## Buckets

### Mounting Bracket

Inspect the mounting brackets on the bucket and ensure that the mounting plates are not bent or otherwise damaged. Inspect the angled plate and ensure that the plate is not bent or otherwise damaged. If any wear or damage is suspected, consult your Caterpillar dealer before you use the bucket.

### Bucket Cutting Edges

#### **WARNING**

**Personal injury or death can result from bucket falling.**

**Block the bucket before changing bucket cutting edges.**

1. Raise the bucket. Place a block under the bucket.
2. Lower the bucket to the block.

Do not block up the bucket too high. Block up the bucket so that the bucket is high enough to remove the cutting edges and the end bits.

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. Tighten the bolts to the specified torque. Refer to the appropriate Service Manual for more information.
8. Raise the bucket. Remove the block.
9. Lower the bucket to the ground.
10. After a few hours of operation, check the bolts for proper torque.

### Bucket Wear Plates

#### **WARNING**

**Personal injury or death can result from falling bucket.**

**When working under or around the bucket or linkage, with the bucket raised, proper support must be provided for the bucket and/or the linkage.**

Replace the wear plates before damage to the bottom of the bucket occurs.

1. Raise the bucket and block up the bucket.
2. Loosen bolts and remove wear plates.
3. Install new wear plates. Tighten the bolts to the specified torque. Refer to the appropriate Service Manual for more information.



---

# Reference Information Section

## Approved Work Tools



### **WARNING**

Use of non approved work tools on Telehandler machines could result in injury or death.

Before installing a work tool on this machine, ensure that it is approved by Caterpillar and that a Caterpillar load chart covering its use is installed in the machine's cab.

### NOTICE

When certain work tools are fitted, the work tools can contact the front tires or the front fenders. This situation can occur when the boom is retracted and the work tool is rotated fully forward. Always check for interference when first operating a new work tool.

The work tools that are listed in these tables are approved by Caterpillar for use on the machines that are covered by this manual. The part number of the work tool is marked on the identification plate for the work tool. Use the following tables to determine that the work tool has been approved by Caterpillar. Additional work tools may have been approved since the publication of this manual. You must consult your Caterpillar dealer before using any work tool that is not in these tables. All work tools must be used in conjunction with the appropriate load chart. Use the following tables to ensure that you are using the correct load chart. You must know the load carrying capacity of these work tools. Make sure that you are using the correct load chart.

Table 13

<b>Approved Work Tools</b>	
<b>Part Number</b>	<b>Work Tool</b>
215-4350	Fork Carriage Gp
222-6210	Fork Carriage Ar (Sideshift)
174-7731	Fork Carriage Gp (Wide)
231-3229	Rotating Carriage
227-5748	Rotating Carriage (Wide)
145-5349	Fork Gp (1220 mm Long)
252-1459	Fork Gp (1220 mm Long)
215-7965	Fork Gp (1525 mm Long)
252-1457	Fork Gp (Pallet 1220 mm)
252-1458	Fork Gp (Pallet 1525 mm)
145-5347	Fork Gp (Block)
252-1460	Fork Gp (Block)
186-5838	Material Handling Bucket Gp
219-5515	Grapple Bucket Ar
229-9714	Material Handling Arm Gp
190-0913	Hopper
169-6460	Lifting Hook Gp
169-3945	Truss Boom Gp
221-1960	Pickup Broom Ar



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JLG Industries, Inc.

## TRANSFER OF OWNERSHIP

To Product Owner:

If you now own but ARE NOT the original purchaser of the product covered by this manual, we would like to know who you are. For the purpose of receiving safety-related bulletins, it is very important to keep JLG Industries, Inc. updated with the current ownership of all JLG products. JLG maintains owner information for each JLG product and uses this information in cases where owner notification is necessary.

Please use this form to provide JLG with updated information with regard to the current ownership of JLG products. Please return completed form to the JLG Product Safety & Reliability Department via facsimile or mail to address as specified below.

Thank You,  
Product Safety & Reliability Department  
JLG Industries, Inc.  
1 JLG Drive  
McConnellsburg, PA 17233-9533  
USA  
Telephone: (717) 485-5161  
Fax: (717) 485-6573

NOTE: Leased or rented units should not be included on this form.

Mfg. Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Previous Owner: \_\_\_\_\_

Address: \_\_\_\_\_

Country: \_\_\_\_\_ Telephone: (\_\_\_\_\_) \_\_\_\_\_

Date of Transfer: \_\_\_\_\_

Current Owner: \_\_\_\_\_

Address: \_\_\_\_\_

Country: \_\_\_\_\_ Telephone: (\_\_\_\_\_) \_\_\_\_\_

Who in your organization should we notify?

Name: \_\_\_\_\_

Title: \_\_\_\_\_



# Product and Dealer Information

**Note:** For product identification plate locations, see the section "Product Identification Information" in the Operation and Maintenance Manual.

**Delivery Date:** \_\_\_\_\_

## Product Information

Model: \_\_\_\_\_

Product Identification Number: \_\_\_\_\_

Engine Serial Number: \_\_\_\_\_

Transmission Serial Number: \_\_\_\_\_

Generator Serial Number: \_\_\_\_\_

Attachment Serial Numbers: \_\_\_\_\_

Attachment Information: \_\_\_\_\_

Customer Equipment Number: \_\_\_\_\_

Dealer Equipment Number: \_\_\_\_\_

## Dealer Information

Name: \_\_\_\_\_ Branch: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Dealer Contact

Phone Number

Hours

Sales: \_\_\_\_\_

Parts: \_\_\_\_\_

Service: \_\_\_\_\_

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