

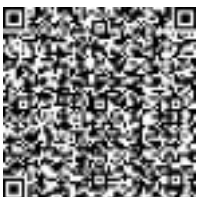


Operation and Maintenance Manual

313 GC Excavator

NFZ 1-UP (313 GC)
RHB 1-UP (313 GC)

Language: Original Instructions



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



Important Safety Information

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

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

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

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

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



The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

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

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

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

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

NOTICE

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

Other parts may not meet certain original equipment specifications.

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

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

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Foreword

California Proposition 65 Warning

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



WARNING – This product can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to:

www.P65Warnings.ca.gov

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



WARNING – This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to:

www.P65Warnings.ca.gov

Wash hands after handling components that may contain lead.

Literature Information

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

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

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

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

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

Safety

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

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

Operation

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

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

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

Maintenance

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

Maintenance Intervals

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

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

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

Certified Engine Maintenance

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

It is prohibited for any person engaged in the business of repairing, servicing, selling, leasing, or trading engines or machines to remove, alter, or to render inoperative, any emission-related device or element of design installed on or in an engine or machine that is in compliance with all applicable regulations of the intended country to which it has been shipped. Certain elements of the machine and engine such as the exhaust system, fuel system, electrical system, intake air system, and cooling system may be emission-related and should not be altered unless approved by Caterpillar.

Machine Capacity

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

Product Identification Number

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

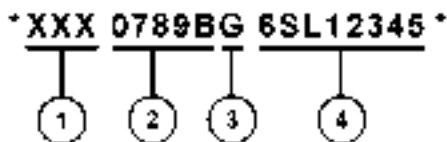


Illustration 1

g03891925

Where:

1. World Manufacturing Code (characters 1-3)

2. Machine Descriptor (characters 4-8)

3. Check Character (character 9)

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

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

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

Safety Section

i08768407

Safety Messages

SMCS Code: 7000; 7405

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

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

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

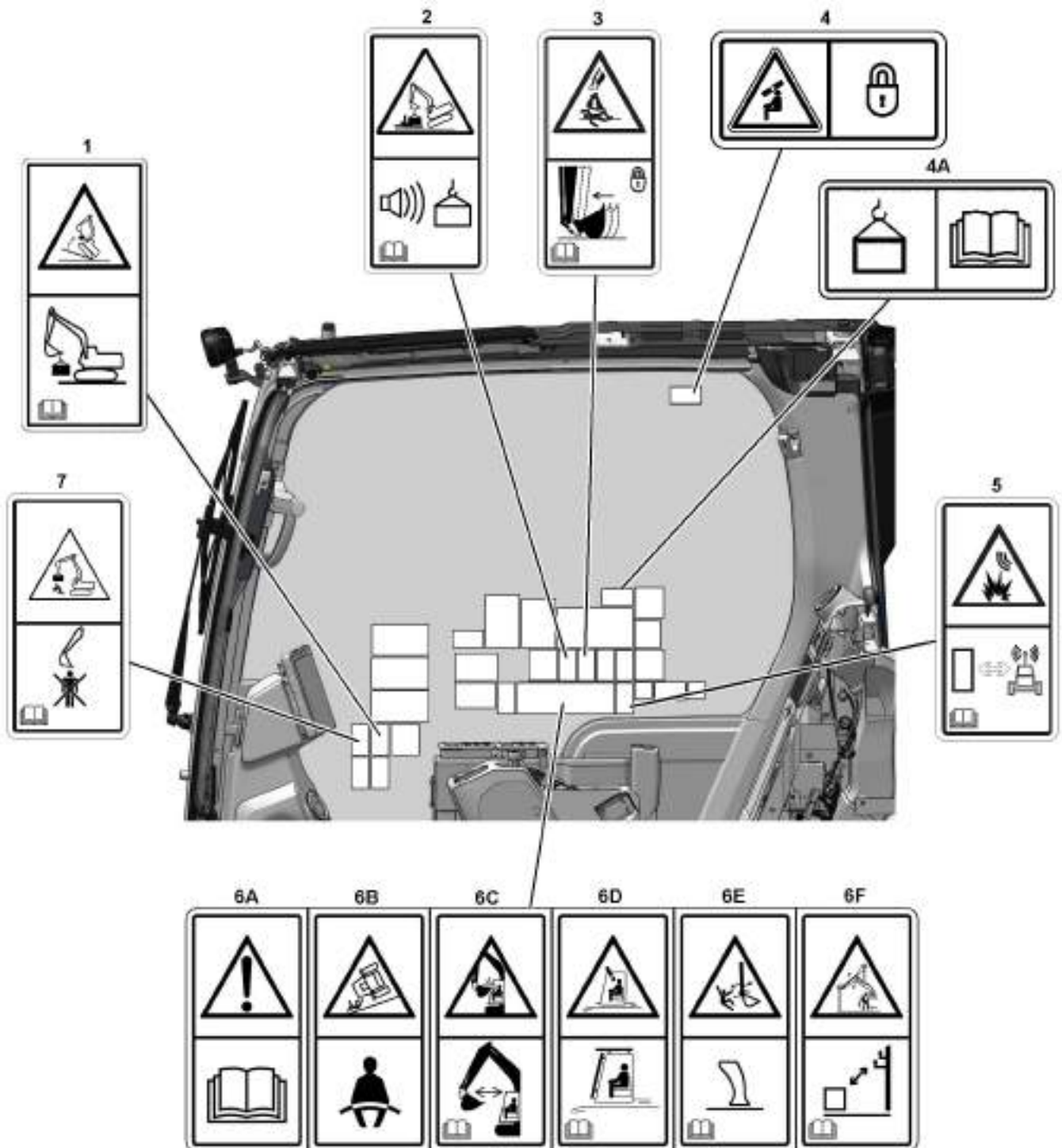


Illustration 2

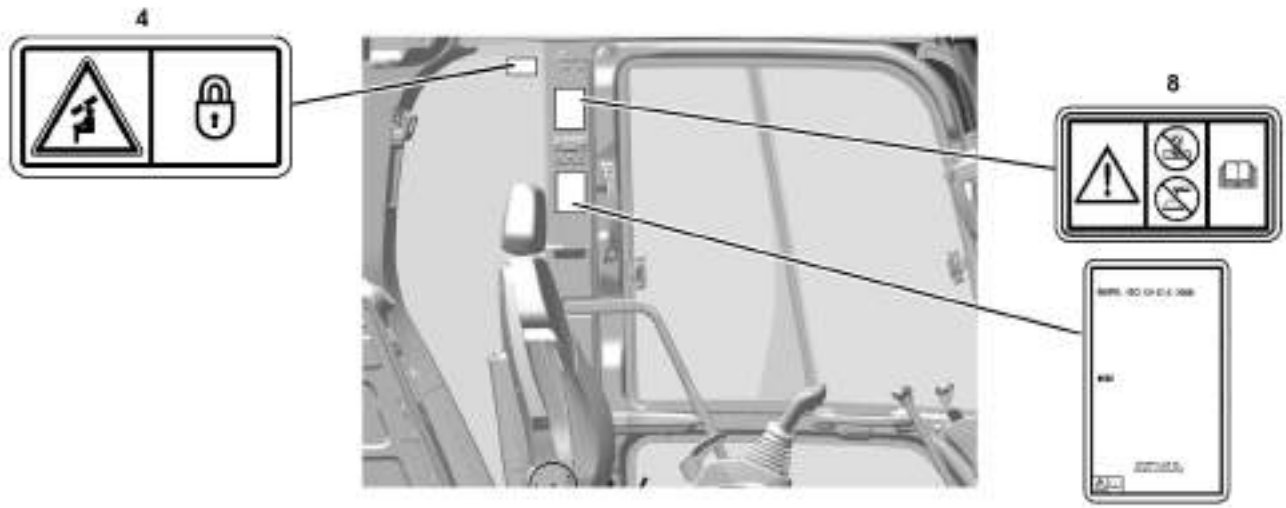


Illustration 3

g06727537

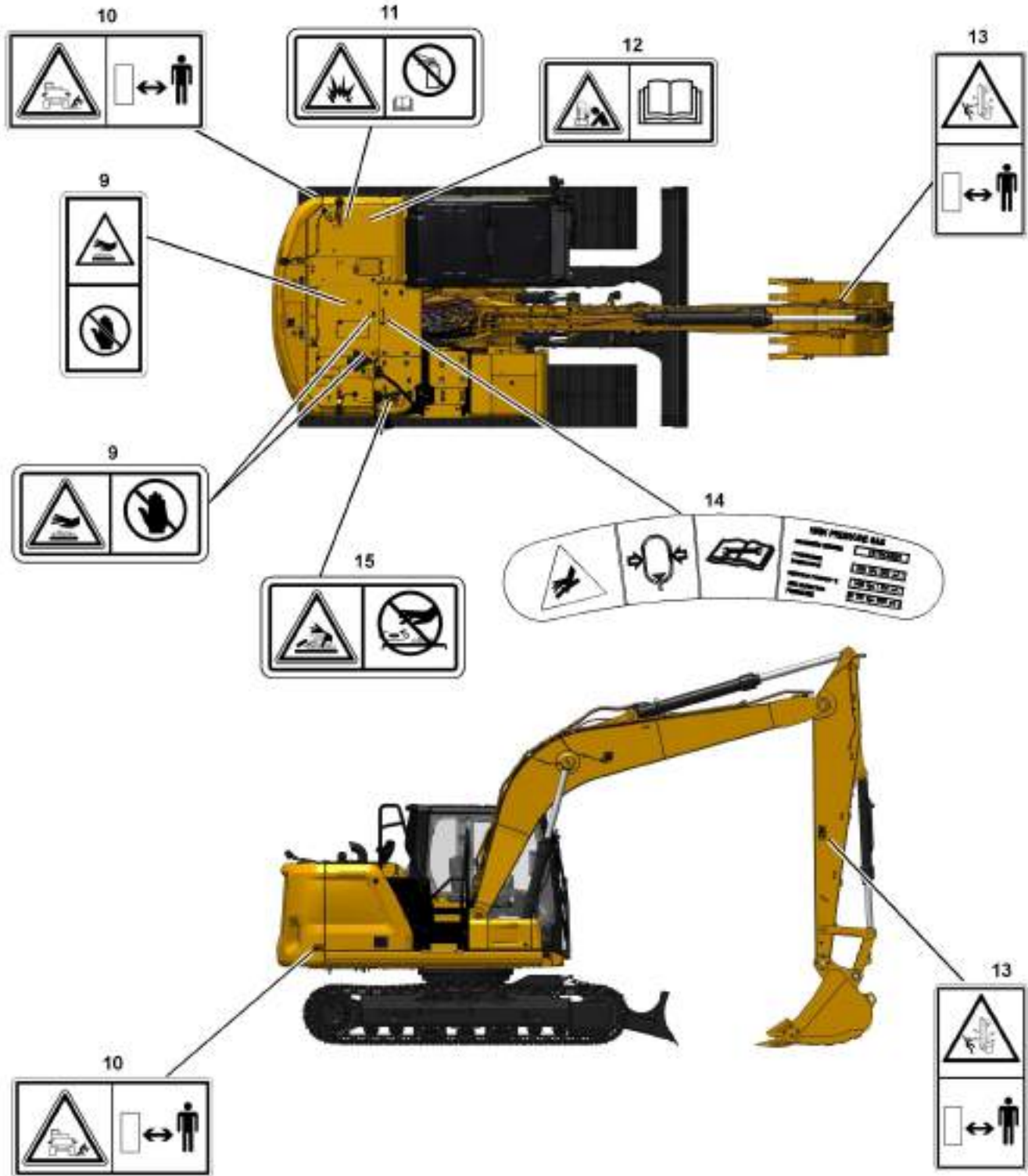


Illustration 4

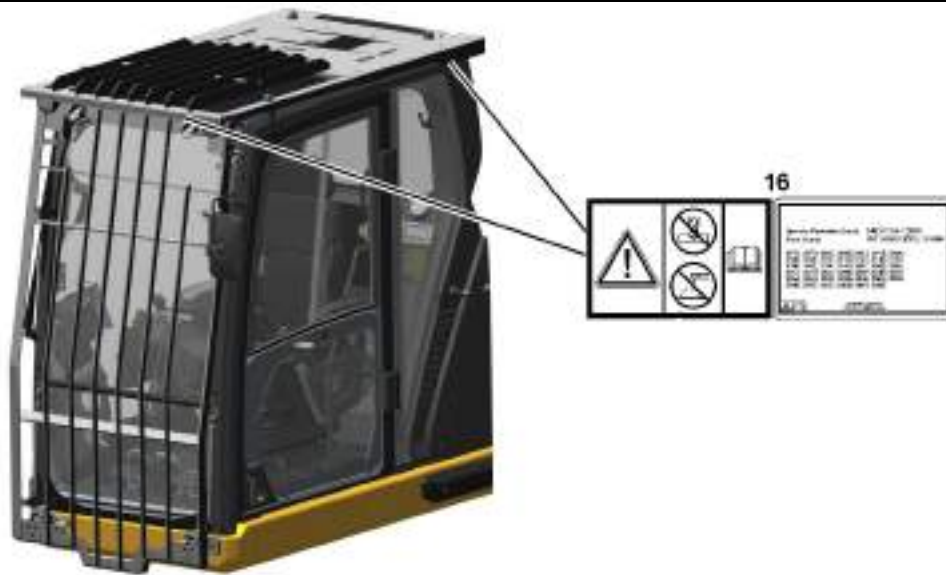


Illustration 5

g06515667

Lifting Level Warning (1)



Illustration 6

g06188532

Overload Warning Device (2)

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



Illustration 7

g06224998



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

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

Crushing Injury (3)

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



Illustration 8

g06188540

⚠ WARNING

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

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

Crushing Hazard (4)

These safety messages are on the left and right side cab windows.



Illustration 9

g02061339

⚠ WARNING

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

Refer to "Window (Front)" for further information.

Lifting Notice (4A)

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

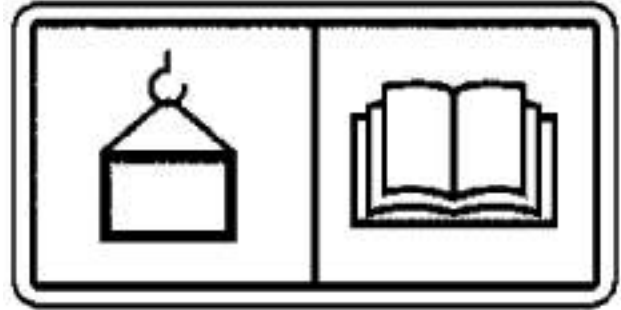


Illustration 10

g06289554

⚠ WARNING

When operating the machine's lift tool, read Operation and Maintenance Manual first for lifting capabilities.

Product Link (5)

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



Illustration 11

g06188657

WARNING

This machine is equipped with a Caterpillar Product Link communication device. When electric detonators are used, this communication device should be deactivated within 12 m (40 ft) of a blast site for satellite-based systems and within 3 m (10 ft) of a blast site for cellular based systems, or within the distance mandated under applicable legal requirements. Failure to do so could cause interference with blasting operations and result in serious injury or death.

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

Refer to "Product Link" for further information.

Do Not Operate (6A)

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



Illustration 12

g06188661

WARNING

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

Seat Belt (6B)

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



Illustration 13

g06188642

⚠ WARNING

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

Crushing Hazard (6C)

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



Illustration 14

g06188644

⚠ WARNING

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

Crushing Hazard (6D)

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



Illustration 15

g06188652

⚠ WARNING

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

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

Refer to “Guards” for further information.

Joystick Controls Alternate Patterns (6E)

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



Illustration 16

g06188665

WARNING

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

Refer to “Joystick Controls Alternate Patterns” for further information.

Electrical Power Lines (6F)

This safety message is located in the cab.



Illustration 17

g06188667

DANGER

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

Refer to “Specifications” for further information.

Do Not Lift Over Personnel (7)

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



Illustration 18

g06188697

Do not lift

Do Not Weld or Drill on Operator Protective Structure (OPS) (8)



Illustration 19

g06719788

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

WARNING

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

Rollover Protective Structure (ROPS) Certification

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

Refer to "Guards" for more information.

Hot Surface (9)

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



Illustration 20

g01372256

WARNING

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

Crushing Hazard (10)

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

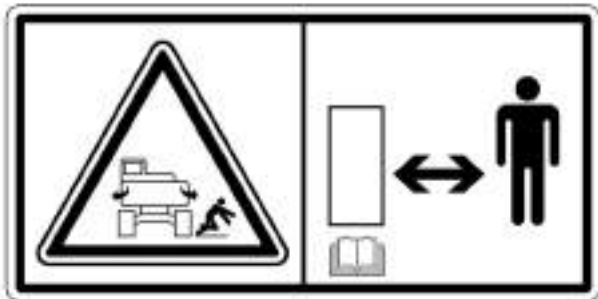


Illustration 21

g06219420

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

Aerosol Starting Aid (11)

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



Illustration 22

g01372254

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

Refer to “Engine Starting” for the proper starting procedure.

Jump-Start Cables (12)

This safety message is located on the battery.

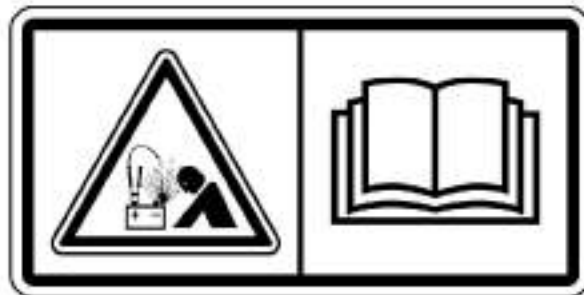


Illustration 23

g01370909

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

Refer to “Engine Starting with Jump Start Cables” for further information.

Crushing Hazard (13)

This safety message is on both sides of the stick.

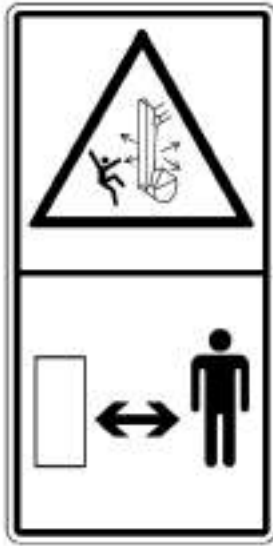


Illustration 24

g01385579

WARNING

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

High-Pressure Gas (14)

This safety message is positioned on the accumulator on the main control valve.



Illustration 25

g06188756

WARNING

Pressurized System!

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

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

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

Refer to "Equipment Lowering with Engine Stopped" for further information.

Relieve Hydraulic Tank Pressure (15)

This safety message is on top of the hydraulic tank.



Illustration 26

g01371640

WARNING

Hot Fluid Under Pressure!

Do NOT remove pressure cap when hot. Hot oil could cause serious injury or death.

Falling Object Guard Structure (16)

If equipped, this safety message is on top of the front falling object guard structure. This safety message is also on the left side of the falling object guard structure on the top of the cab.

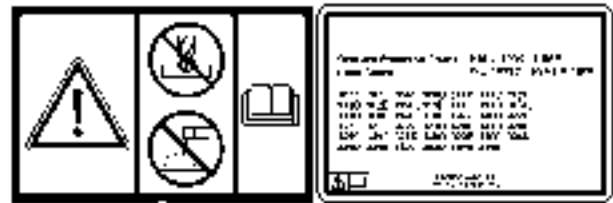


Illustration 27

g02428757

WARNING

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

i08488505

Additional Messages

SMCS Code: 7000; 7405

There are several specific messages on this machine. The exact location of the messages and the description of the information are reviewed in this section. Become familiar with all messages.

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

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

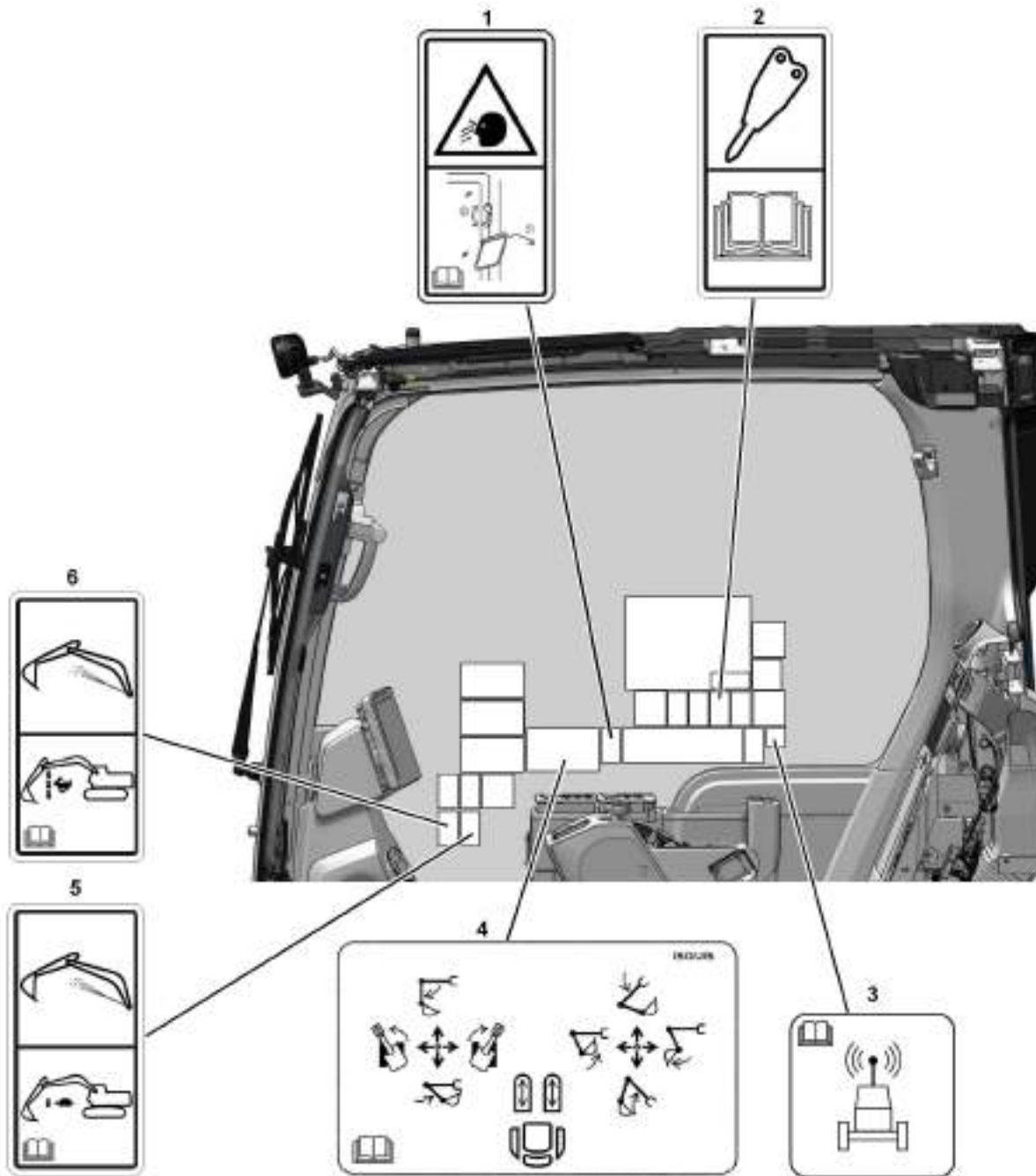


Illustration 28

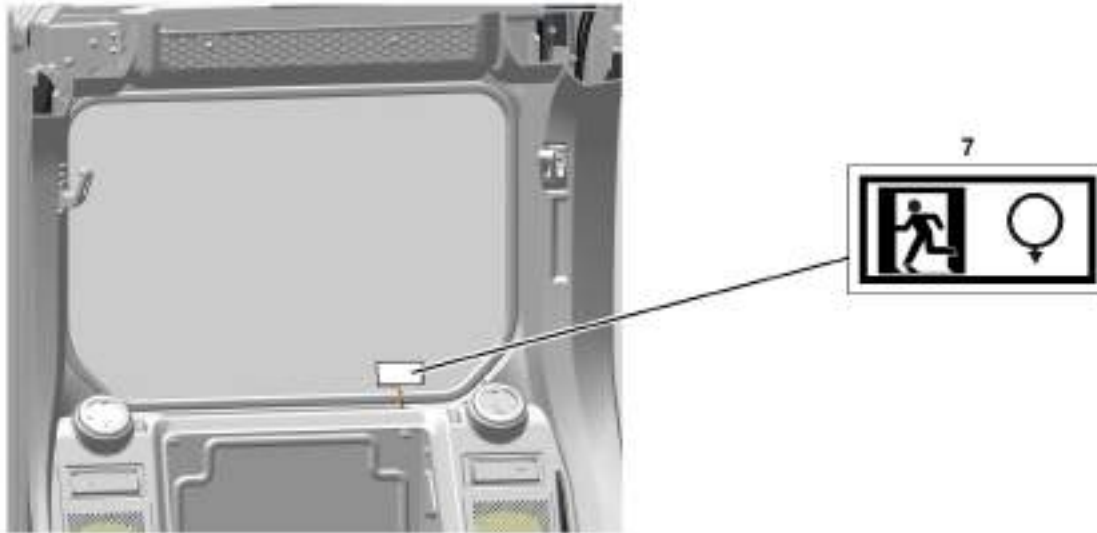


Illustration 29

g06189121

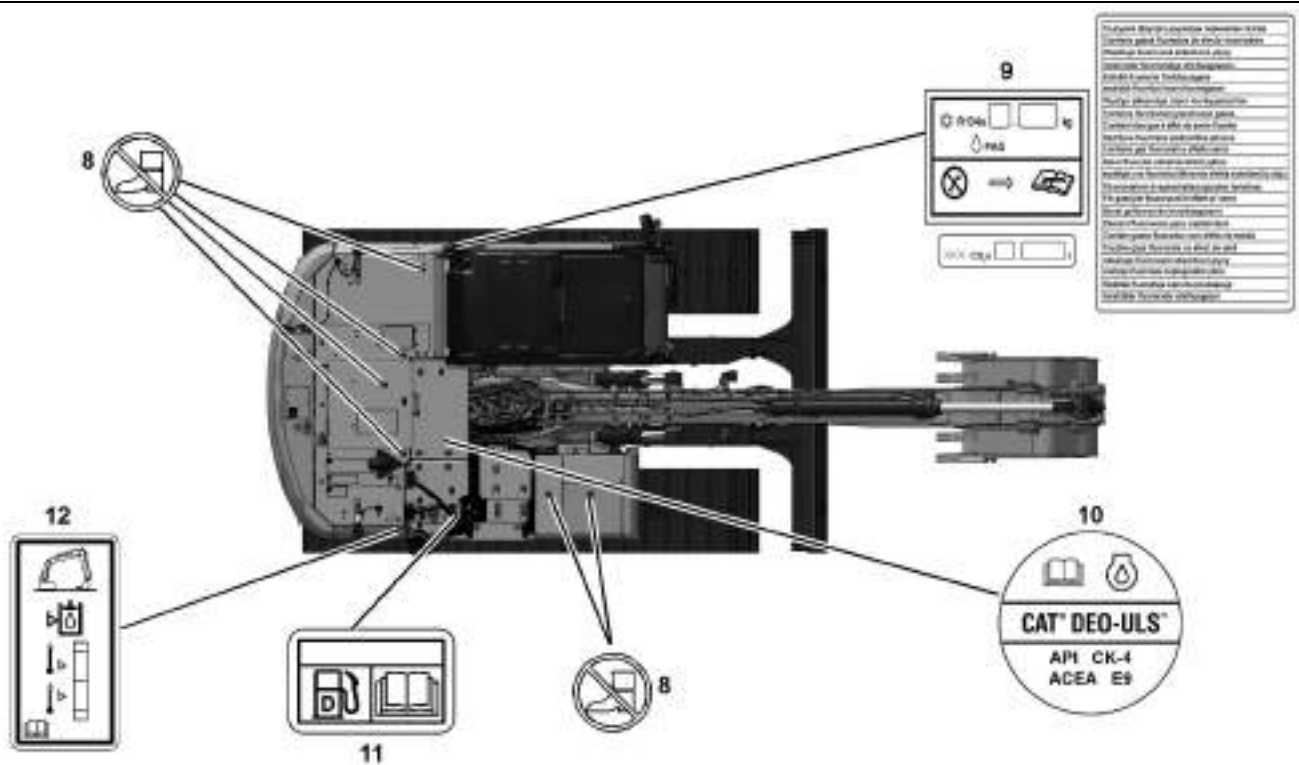


Illustration 30

g06686292

Front Window Usage (1)



Illustration 31

g06214810

This message is located on the window on the right side of the cab.

For machines equipped with the Cat[®] Grade Control monitor, the monitor must be moved downward before lifting or lowering the front window. The monitor is located in the path of the window track in the normal position of the monitor.

Hammer Operation (2)

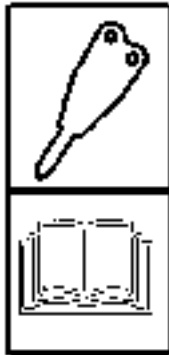


Illustration 32

g06189240

This message is located on the window on the right side of the cab.

Refer to “Work Tool Control (One-Way Flow)” for instructions on hammer operation.

Cat[®]Product Link™ (3)



Illustration 33

g01418953

This message is located on the window on the right side of the cab.

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

Refer to “Product Link” for more information.

Joystick Controls Alternate Patterns (4)

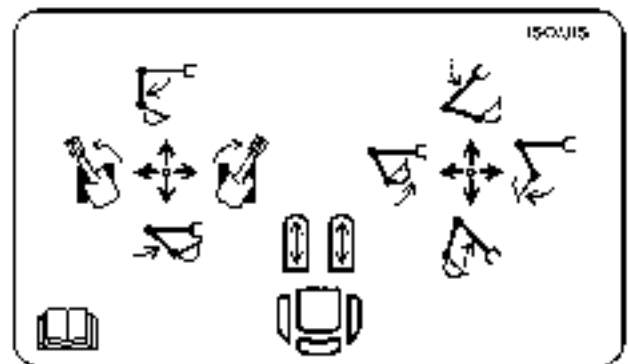


Illustration 34

g06214805

This message is located on the right side window of the cab.

Refer to "Joystick Controls Alternate Patterns" for further information.

Hose Burst (5)

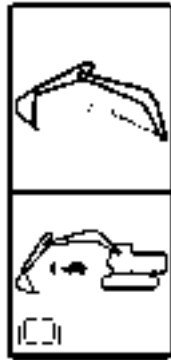


Illustration 35 g06189238

This message is located on the right side window of the cab.

Hose Burst (6)

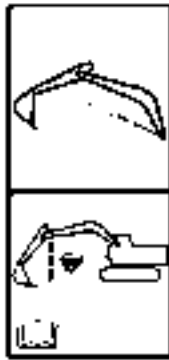


Illustration 36 g06189239

This message is located on the right side window of the cab.

Alternate Exit (7)



Illustration 37 g06189112

This message is located on the rear window of the cab in the lower left-hand corner.

Refer to "Alternate Exit" for more information.

No Step (8)

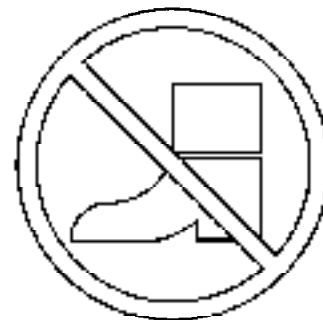


Illustration 38 g00911158

This message is located on various places on the upper structure and covers. The message is also located on the engine valve cover.

Do not step in this area.

Air Conditioner (9)

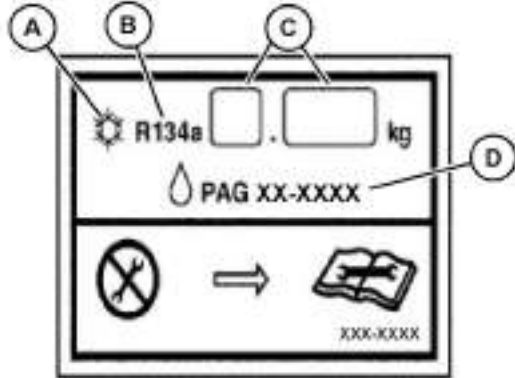


Illustration 39 g06650123

- (A) Air conditioning symbol
- (B) R134a (Refrigerant type common name)
- (C) Refrigerant quantity
- (D) PAG (polyalkylene glycol) lubricating oil part number

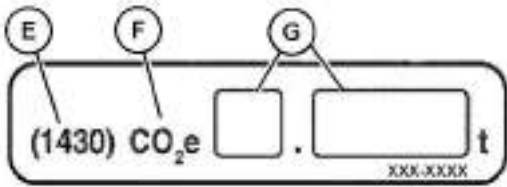


Illustration 40 g06650124

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

- (E) (1430) - This value is the Global Warming Potential of R134a
- (F) CO₂ equivalent
- (G) CO₂ equivalent in metric tonne based on quantity of charged R134a



Illustration 41 g06685232

- (H) If equipped, this film provides the required language translations of the text "Contains fluorinated greenhouse gases"

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

These messages for the air conditioner system have the appropriate information for the following services: the air conditioner lubricant, the refrigerant charge, and the refrigerant capacity. Refer to "Air Conditioning and Heating Control" for more information.

Engine Oil Requirements (10)



Illustration 42
Tier 4 Engines g06208149



Illustration 43
Tier 3 Engines g06217215

This message is located on top of the engine.

DEF is used in the Selective Catalytic Reduction (SCR) system. Refer to "Lubricant Viscosities" for more information.

Diesel Fuel Requirements (11)

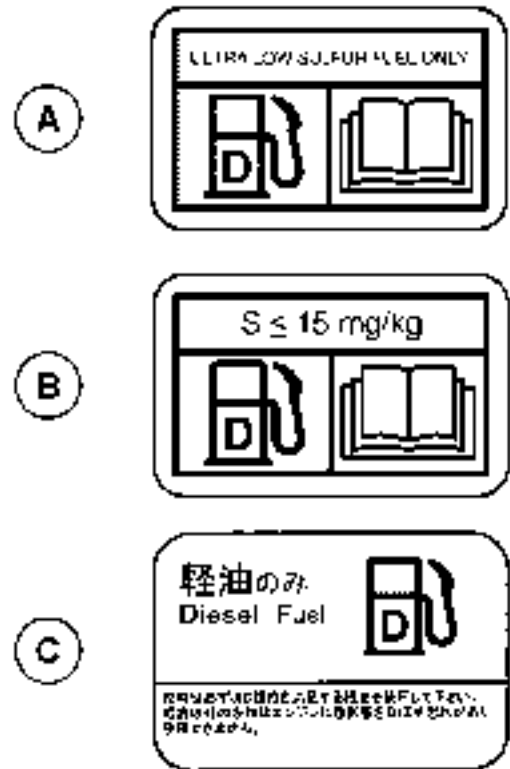


Illustration 44
(A) North America film
(B) Europe, Africa, Middle East film
(C) Japan film g03218956

This message is located by the fuel tank.

Hydraulic Oil Level Check (12)

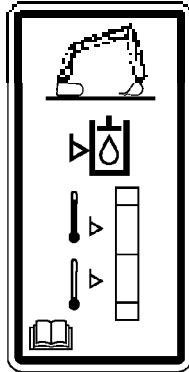


Illustration 45

g01069075

This message is located in the right access compartment next to the sight gauge for the hydraulic oil .

Check hydraulic oil level daily. Refer to “Hydraulic System Oil Level - Check” for more information.

i08313103

General Hazard Information

SMCS Code: 7000

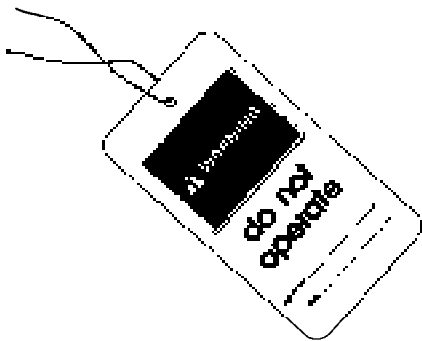


Illustration 46

g00104545

Typical example

Attach a “Do Not Operate” warning tag or a similar warning tag to the start switch or to the controls. Attach the warning tag before you service the equipment or before you repair the equipment. Warning tag SEHS7332 is available from your Cat dealer.

WARNING

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

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

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

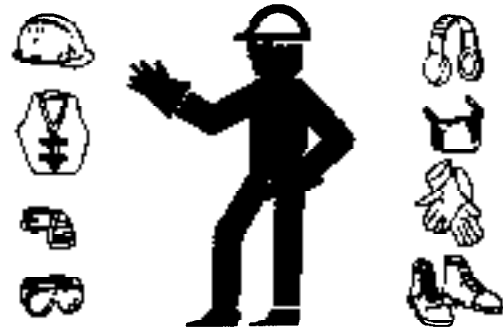


Illustration 47

g00702020

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

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

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

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

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

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

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

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

Obey all local regulations for the disposal of liquids.

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

Do not allow unauthorized personnel on the equipment.

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

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

Pressurized Air and Water

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

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

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

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

Trapped Pressure

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

Fluid Penetration

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

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

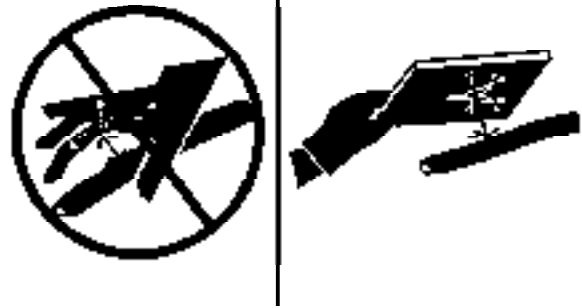


Illustration 48

g00687600

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

Containing Fluid Spillage

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

Refer to Special Publication, NENG2500, "Cat dealer Service Tool Catalog" for the following items:

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

Obey all local regulations for the disposal of liquids.

Inhalation



Illustration 49

g02159053

Exhaust

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

Asbestos Information

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

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

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

- Never use compressed air for cleaning.
- Avoid brushing materials that contain asbestos.
- Avoid grinding materials that contain asbestos.
- Use a wet method in order to clean up asbestos materials.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter (HEPA) can also be used.
- Use exhaust ventilation on permanent machining jobs.
- Wear an approved respirator if there is no other way to control the dust.
- Comply with applicable rules and regulations for the work place. In the United States, use Occupational Safety and Health Administration (OSHA) requirements. These OSHA requirements can be found in "29 CFR 1910.1001". In Japan, use the requirements found in the "Ordinance on Prevention of Health Impairment due to Asbestos" in addition to the requirements of the Industrial Safety and Health Act.
- Obey environmental regulations for the disposal of asbestos.
- Stay away from areas that might have asbestos particles in the air.

Hexavalent Chromium Information

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

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

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

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

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

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

Dispose of Waste Properly

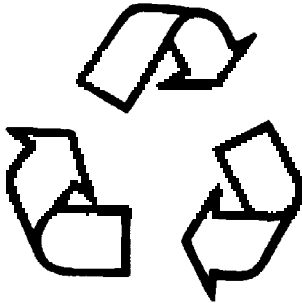


Illustration 50

g00706404

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

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

i01359664

Crushing Prevention and Cutting Prevention

SMCS Code: 7000

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

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

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

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

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

Stay clear of all rotating and moving parts.

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

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

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

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

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

i07746334

Burn Prevention

SMCS Code: 7000

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

Coolant

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

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

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

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

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

Oils

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

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

Batteries

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

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

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

i06179517

Fire Prevention and Explosion Prevention

SMCS Code: 7000



Illustration 51

g00704000

Regeneration

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

General

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

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

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

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

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

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

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

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

Do not operate the machine near any flame.

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

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

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

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

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



Illustration 52

g03839130

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

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

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

Battery and Battery Cables



Illustration 53

g03839133

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

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

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

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

Gases from a battery can explode. Keep any open flames or sparks away from the top of a battery. Do not smoke in battery charging areas. Do not use cell phones or other electronic devices in battery charging areas.

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

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

- Fraying

- Abrasion
- Cracking
- Discoloration
- Cuts on the insulation of the cable
- Fouling
- Corroded terminals, damaged terminals, and loose terminals

Replace damaged battery cable(s) and replace any related parts. Eliminate any fouling, which may have caused insulation failure or related component damage or wear. Ensure that all components are reinstalled correctly.

An exposed wire on the battery cable may cause a short to ground if the exposed area comes into contact with a grounded surface. A battery cable short produces heat from the battery current, which may be a fire hazard.

An exposed wire on the ground cable between the battery and the disconnect switch may cause the disconnect switch to be bypassed if the exposed area comes into contact with a grounded surface. This may result in an unsafe condition for servicing the machine. Repair components or replace components before servicing the machine.

WARNING

Fire on a machine can result in personal injury or death. Exposed battery cables that come into contact with a grounded connection can result in fires. Replace cables and related parts that show signs of wear or damage. Contact your Cat dealer.

Wiring

Check electrical wires daily. If any of the following conditions exist, replace parts before you operate the machine.

- Fraying
- Signs of abrasion or wear
- Cracking
- Discoloration
- Cuts on insulation
- Other damage

Make sure that all clamps, guards, clips, and straps are reinstalled correctly. This will help to prevent vibration, rubbing against other parts, and excessive heat during machine operation.

Attaching electrical wiring to hoses and tubes that contain flammable fluids or combustible fluids should be avoided.

Consult your Cat dealer for repair or for replacement parts.

Keep wiring and electrical connections free of debris.

Lines, Tubes, and Hoses

Do not bend high-pressure lines. Do not strike high-pressure lines. Do not install any lines that are bent or damaged. Use the appropriate backup wrenches in order to tighten all connections to the recommended torque.

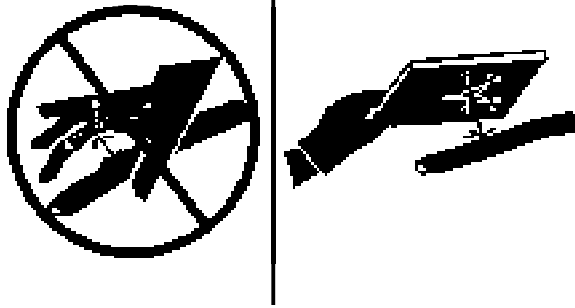


Illustration 54

g00687600

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

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

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

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

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

Ether

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

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

WARNING

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

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

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

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

Fire Extinguisher

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

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

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

i07041871

Fire Safety

SMCS Code: 7000

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

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

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

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

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

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

Notify emergency personnel of the fire and your location.

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

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

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

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

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

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

i06952417

Fire Extinguisher Location

SMCS Code: 7000; 7419



Illustration 55

g06188176

Installation of a fire extinguisher is recommended. Be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instruction plate.

The recommended location for mounting the fire extinguisher is on the upper handrail on the right side of the machine.

i01329108

Track Information

SMCS Code: 4170; 7000

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

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

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

i02546320

High Pressure Fuel Lines

SMCS Code: 1000; 1274; 7000

WARNING

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

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

This is because of the following differences:

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

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

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

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

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

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

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

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

i01122596

Electrical Storm Injury Prevention

SMCS Code: 7000

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

- Mount the machine.
- Dismount the machine.

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

i00771840

Before Starting Engine

SMCS Code: 1000; 7000

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

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

Adjust the seat so that full pedal travel can be achieved with the operator's back against the back of the seat.

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

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

i08473852

Visibility Information

SMCS Code: 7000

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

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

Your machine may be equipped with visual aids. Some examples of visual aids are Closed Circuit Television (CCTV) and mirrors. Before operating the machine, ensure that the visual aids are in proper working condition and that the visual aids are clean. Shut down the machine until damaged or nonfunctional visual aid(s) are repaired (if applicable) or until appropriate job site organization is used to minimize hazards that are caused by any resulting restricted visibility. Adjust the visual aids using the procedures that are located in this Operation and Maintenance Manual. If equipped, the Work Area Vision System shall be adjusted according to Operation and Maintenance Manual, SEBU8157, "Work Area Vision System". If equipped, the Cat Detect Object Detection shall be adjusted according to the Operation and Maintenance Manual, "Cat Detect Object Detection" for your machine.

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

- Safety instructions
- Controlled patterns of machine movement and vehicle movement
- Workers that direct safe movement of traffic
- Restricted areas
- Operator training
- Warning symbols or warning signs on machines or on vehicles
- A system of communication

- Communication between workers and operators prior to approaching the machine

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

i07855297

Restricted Visibility

SMCS Code: 7000

The size and the configuration of this machine may result in areas that cannot be seen when the operator is seated. For restricted visibility areas, an appropriate job site organization must be utilized to minimize hazards of this restricted visibility. For more information regarding job site organization refer to Operation and Maintenance Manual, "Visibility Information".

Illustrations 56 to 58 provide an approximate visual indication of the areas at ground level inside a radius of 12 m (39 ft) from the operator of significant restricted visibility for various machine configurations. Refer to the correct illustration for your machine configuration. All restricted visibility areas less than 300 mm wide may not be shown. These illustrations do not indicate areas of restricted visibility for distances outside of the shown radius. The areas of restricted visibility shown in the illustrations are with the track and work tool of the machine in the Travel position. Illustration 59 shows the position of the work tool in the travel position. The Caterpillar authorized work tool that resulted in the largest visibility restriction was used.

Illustration 56 indicates restricted visibility areas at ground level inside the shown radius from the operator without the use of visual aids that may be optional for this product in some markets.

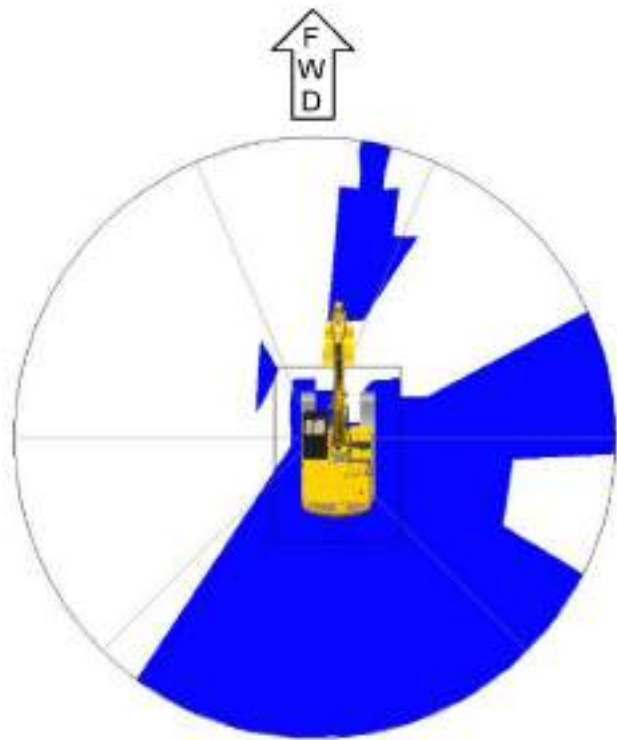


Illustration 56 g06366562
 Top view of the machine, ground level visibility without use of optional visual aids
 (A) 12 m (39 ft)

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

Illustration 57 indicates restricted visibility areas at ground level inside the shown radius from the operator with the use of available rear camera, right side mirror, and left side mirror.

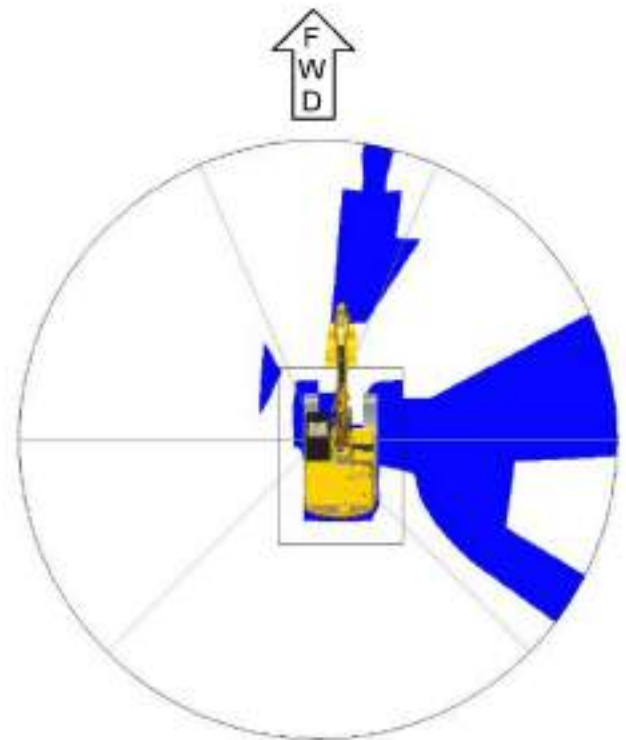


Illustration 57 g06366568
 Top view of the machine, ground level visibility with available camera, left side mirror and right side mirror
 (A) 12 m (39 ft)

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

Illustration 58 indicates restricted visibility areas at ground level inside the shown radius from the operator with the use of available rear camera, right side camera, left side mirrors, and left side second mirror.

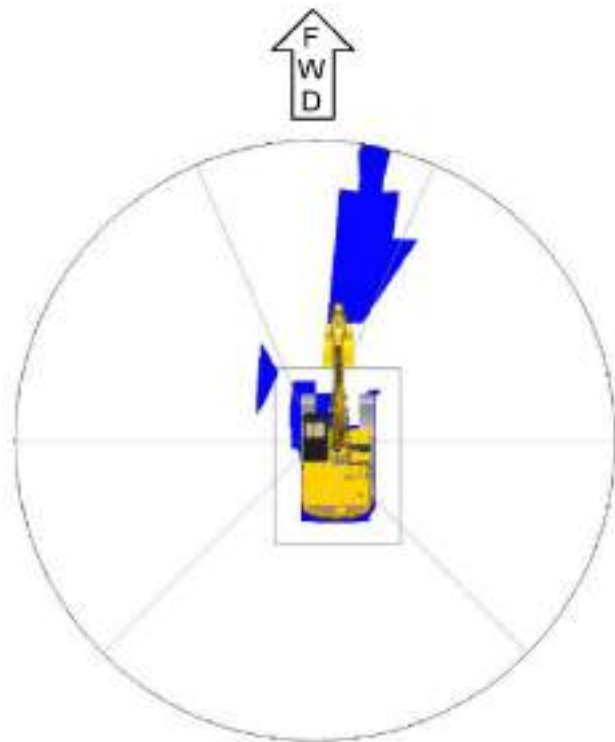


Illustration 58 g06356105

Top view of the machine, ground level visibility with rear camera, right side camera, left side mirror, and left side second mirror.

(A) 12 m (39 ft)

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

Restricted visibility is measured when the front linkage of the machine is in the travel position. Illustration 59 shows the machine in the travel position.

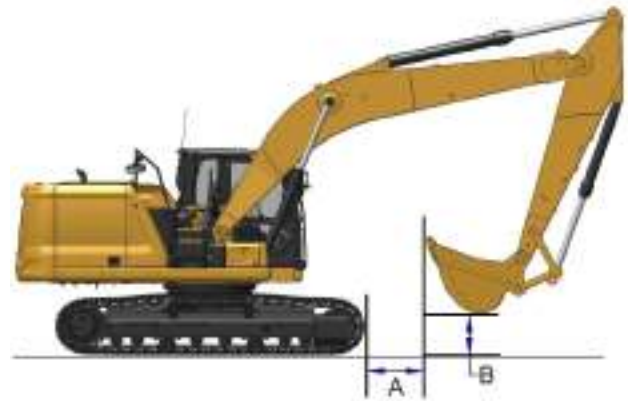


Illustration 59 g06181081

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

i03562260

Engine Starting

SMCS Code: 1000; 7000

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

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

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

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

Briefly sound the horn before you start the engine.

i01340061

Before Operation

SMCS Code: 7000

Clear all personnel from the machine and from the area.

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

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

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

Fasten the seat belt securely.

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

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

i04159629

Work Tools

SMCS Code: 6700

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

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

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

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

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

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

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

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

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

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

Never use the work tool for a work platform.

i08481684

Operation

SMCS Code: 7000

Sound the horn and allow adequate time for bystanders to clear the area before moving the machine into a restricted visibility area. Follow local practices for your machine application. For more information refer to Operation and Maintenance Manual, Restricted Visibility.

Machine Operating Temperature Range

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

Limiting Conditions and Criteria

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

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

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

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

Critical Failures

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

Table 1

System or Component Name	Limiting Condition	Criteria for Action	Required Action
Line, tubes, and hoses	End fittings are damaged or leaking. Outer coverings are chafed or cut. Wires are exposed. Outer coverings are swelling or ballooning. Flexible parts of the hoses are kinked. Outer covers have exposed embedded armoring. End fittings are displaced.	Visible corrosion, loose, or damaged lines, tubes, or hoses. Visible fluid leaks.	Immediately repair any lines, tubes, or hoses that are corroded, loose, or damaged. Immediately repair any leaks as these may provide fuel for fires.
Electrical Wiring	Signs of fraying, abrasion, cracking, discoloration, cuts on the insulation	Visible damage to electrical wiring	Immediately replace damaged wiring
Battery cable(s)	Signs of fraying, abrasion, cracking, discoloration, cuts on the insulation of the cable, fouling, corroded terminals, damaged terminals, and loose terminals	Visible damage to battery cable(s)	Immediately replace damaged battery cables
Operator Protective Structure	Structures that are bent, cracked, or loose. Loose, missing, or damaged bolts.	Visible damage to structure. Loose, missing, or damaged bolts.	Do not operate machine with damaged structure or loose, missing, or damaged bolts. Contact your Cat dealer for inspection and repair or replacement options.
Seat Belt	Worn or damaged seat belt or mounting hardware	Visible wear or damage	Immediately replace parts that are worn or damaged.
Seat Belt	Age of seat belt	Three years after date of installation	Replace seat belt three years after date of installation
Safety Messages	Appearance of safety message	Damage to safety messages making them illegible	Replace the illustrations if illegible.
Audible Warning Device(s) (if equipped)	Sound level of audible warning	Reduced or no audible warning present	Immediately repair or replace audible warning devices not working properly.
Camera(s) (if equipped)	Dirt or debris on camera lens	Dirt or debris obstructing camera view	Clean camera before operating machine.

(continued)

(Table 1, contd)

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

Machine Operation

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

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

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

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

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

Never use the work tool for a work platform.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Know the maximum dimensions of your machine.

Watch the load at all times.

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

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

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

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

Machine Operation when the Machine is not Completely Assembled

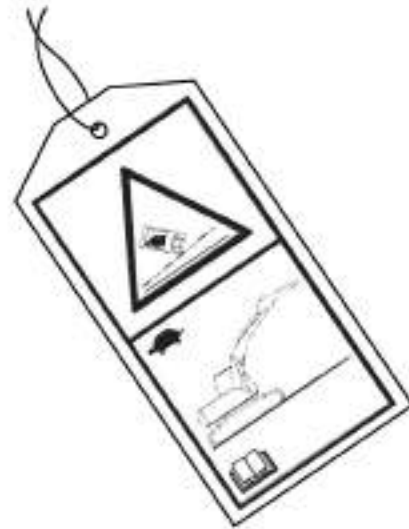


Illustration 60

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

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

i06299648

Engine Stopping

SMCS Code: 1000; 7000

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

After the machine is parked and the parking brake is engaged, allow the engine to run at low idle for 5 minutes before shutdown. Running the engine allows hot areas of the engine to cool gradually.

i08482864

Lifting Objects

SMCS Code: 7000

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

Regional regulations may require the use of an overload warning device and boom and stick lowering control valves when used to lift objects.

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

Contact your Cat dealer for additional information.

i08482613

Demolition

SMCS Code: 6700

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

Note: Obey all local and government regulations.

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

If this machine is used for demolition, regional regulations may require the machine to be equipped with:

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

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

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

i08036879

Parking

SMCS Code: 7000

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

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

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

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

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



Illustration 61

g06181120

Place the machine in the servicing position.

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

Stop the engine.

Turn the engine start switch to the OFF position.

Turn the battery disconnect switch to the OFF position, if you do not intend on operating the machine for an extended period. This will prevent drainage of the battery. A battery short circuit, any current draw from certain components, and vandalism can cause drainage of the battery.

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

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

i07746366

Slope Operation

SMCS Code: 7000

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

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

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

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

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

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

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

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

Surface material – Rocks and moisture of the surface material may drastically affect the machine's

traction and machine's stability. Rocky surfaces may promote side slipping of the machine.

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

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

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

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

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

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

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

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

i08229294

Equipment Lowering with Engine Stopped

SMCS Code: 7000-II

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

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Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

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

Table 2

Sound Level		Test Method
Operator Sound Pressure Level	68 dB(A)	"ISO 6396:2008" ⁽¹⁾
Exterior Sound Power Level	99 dB(A)	"ISO 6395:2008" ⁽²⁾

⁽¹⁾ The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

⁽²⁾ The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds.

The sound levels listed above include both measurement uncertainty and uncertainty due to production variation. Typical measurement uncertainty for this type of machinery is 2 dB(A) in accordance with "ISO 4871".

Sound Level Information for Machines Required by the Applicable Regional Regulations

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

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

Table 3

Declared Dynamic Operator Sound Pressure Level		
Region	Sound Level	Test Method
European Union	68 dB(A)	"ISO 6396:2008" ⁽¹⁾
United Kingdom	68 dB(A)	"ISO 6396:2008" ⁽¹⁾
Eurasian Economic Union	68 dB(A)	"ISO 6396:2008" ⁽¹⁾

⁽¹⁾ The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

Table 4

Declared Exterior Sound Power Level		
Region	Sound Level	Test Method
European Union	99 dB(A)	"ISO 6395:1988" ⁽¹⁾
United Kingdom	99 dB(A)	"ISO 6395:1988" ⁽¹⁾
Eurasian Economic Union	99 dB(A)	"ISO 6395:1988" ⁽¹⁾
Ukraine	99 dB(A)	"ISO 6395:1988" ⁽¹⁾

⁽¹⁾ The measurement was conducted at 70% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds.

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

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

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

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

Vibration Information Applicable to Regional Regulations

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

Vibration Data for Track Type Excavator

Information Concerning Hand/Arm Vibration Level

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

Information Concerning Whole Body Vibration Level

This section provides vibration data and a method for estimating the vibration level for track type excavators.

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

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

It is not possible to get precise vibration levels for this machine. The expected vibration levels can be estimated with the information in Table 5 to calculate the daily vibration exposure. A simple evaluation of the machine application can be used.

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

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

Table 5

"ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment."							
Machine Type	Typical Operating Activity	Vibration Levels			Scenario Factors		
		X axis	Y axis	Z axis	X axis	Y axis	Z axis
Track Type Excavators	excavating	0.44	0.27	0.30	0.24	0.16	0.17
	hydraulic breaker application	0.53	0.31	0.55	0.30	0.18	0.28
	mining application	0.65	0.42	0.61	0.21	0.15	0.32
	transfer	0.48	0.32	0.79	0.19	0.20	0.23

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

The Cat[®] suspension seat meets the criteria of “ISO 7096”. This represents vertical vibration level under severe operating conditions. EAEU typical measurement uncertainty for this type of machinery is 1.25 m/s² (4.101 ft/s²) in accordance with “EN 12096”.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

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

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer recommendations.
 - a. Tire pressures
 - b. Brake and steering systems
 - c. Controls, hydraulic system, and linkages
3. Keep the terrain in good condition.
 - a. Remove any large rocks or obstacles.
 - b. Fill any ditches and holes.
 - c. Provide machines and schedule time to maintain the conditions of the terrain.
4. Use a seat that meets “ISO 7096”. Keep the seat maintained and adjusted.
 - a. Adjust the seat and suspension for the weight and the size of the operator.
 - b. Inspect and maintain the seat suspension and adjustment mechanisms.
5. Perform the following operations smoothly.
 - a. Steer
 - b. Brake
 - c. Accelerate
 - d. Shift the gears
6. Move the attachments smoothly.
7. Adjust the machine speed and the route to minimize the vibration level.
 - a. Drive around obstacles and rough terrain.
 - b. Slow down when driving over rough terrain.
8. Minimize vibrations for a long work cycle or a long travel distance.
 - a. Use machines that are equipped with suspension systems.
 - b. Use the ride control system on track type excavators.
 - c. If no ride control system is available, reduce speed to prevent bounce.
 - d. Haul the machines between workplaces.
9. Less operator comfort may be caused by other risk factors. The following guidelines can be effective to provide better operator comfort:
 - a. Adjust the seat and adjust the controls to achieve good posture.
 - b. Adjust the mirrors to minimize twisted posture.
 - c. Provide breaks to reduce long periods of sitting.
 - d. Avoid jumping from the cab.
 - e. Minimize repeated handling of loads and lifting of loads.
 - f. Minimize any shocks and impacts during sports and leisure activities.

Sources

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

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

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

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

Consult your local Cat[®] dealer for more information about machine features that minimize vibration levels. Consult your local Cat[®] dealer about safe machine operation.

Use the following web site to find your local dealer:

Caterpillar, Inc.
www.cat.com

i07746362

Operator Station

SMCS Code: 7300; 7301; 7325

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

i07746359

Guards (Operator Protection)

SMCS Code: 7000; 7150

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

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

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

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

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

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

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

Other Guards (If Equipped)

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

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

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

- Demolition applications
- Rock quarries

- Forestry products

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

Product Information Section

General Information

i07105852

Regulatory Information (Japan)

SMCS Code: 7000

Qualifications for Machine Operation

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

Excavation and Loading

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

Demolition

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

Mining Jobs

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

Crane Slinging for the Bucket with a Hook

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

Trailer Transportation

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

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

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

Load

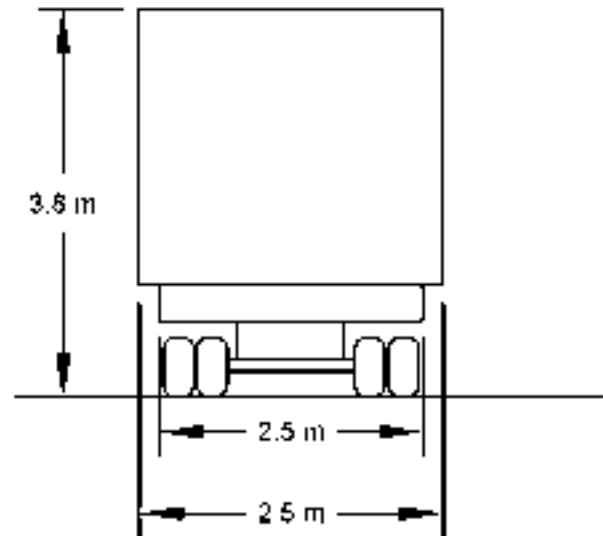


Illustration 62

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

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

Table 6

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

(continued)

(Table 6, contd)

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

Operation of Construction Equipment and the Governing Laws and Regulations

NOTICE

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

NOTICE

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

Qualification of Operators

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

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

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

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

Acquisition of the Qualifications

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

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

Subsidy System

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

Operation of Construction Equipment and the Governing Laws and Regulations

NOTICE

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

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

Request for Periodical Self-Inspection

Rules of Periodical Self-Inspection

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

Ordinance on Industrial Safety and Hygiene

Periodical self-inspections Article 167

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

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

Periodical self-inspections Article 168

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

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

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

Record of Periodical Self-Inspections Article 169

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

Specified Self-Inspection Article 169-2

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

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

Checkup before Commencing the Work Article 170

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

Other Rules

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

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

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

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

Construction Equipment and Environmental Laws

Prohibition of Emissions and Obligations to Recover Fluorocarbons

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

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

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

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

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

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

Standard Certificate of Transfer

Dear Customers

Japan Construction Equipment Manufacturers Association

Standard Certificate of Transfer

Issued by the Japan Construction Equipment Manufacturers Association

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

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

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

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

1. About the standard certificate of transfer

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

2. Purpose of issuance

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

3. Issuer

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

4. Eligibility

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

5. Issuance

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

6. Prohibition of reissuance

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

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

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

Industrial Safety and Health Act

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

Article 164

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

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

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

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

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

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

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

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

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

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

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

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Specifications (Shovel Crane Specifications)

SMCS Code: 7000

WARNING

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

Japan regulations require a shovel crane configuration to lift certain objects. A shovel crane configuration uses a rated load capacity. Refer to the Rated Load specifications below.

Refer to this Operation and Maintenance Manual, "Shovel Crane Control" for additional information.

Refer to this Operation and Maintenance Manual, "Shovel Crane Operation" for additional information.

Contact your Cat dealer for additional information.

Rated Load Specification

313 Standard Stick with 0.52 m³ Bucket

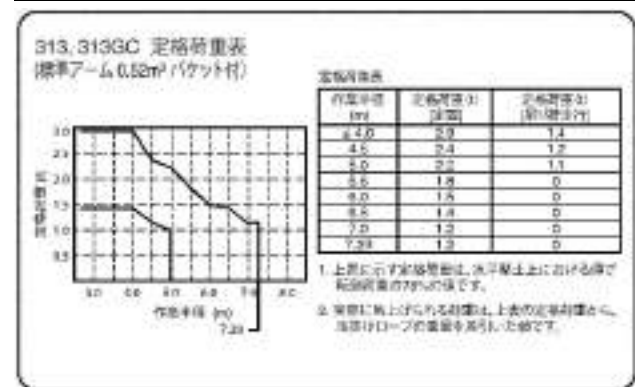


Illustration 63

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Specifications

SMCS Code: 7000

Intended Use

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

Expected Life

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

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

- Perform regular preventive maintenance procedures as described in the Operation and Maintenance Manual.
- Perform machine inspections as described in the Operation and Maintenance Manual and correct any problems discovered.
- Perform system testing as described in the Operation and Maintenance Manual and correct any problems discovered.
- Ensure that machine application conditions comply with Caterpillar's recommendations.
- Ensure that all service letters are addressed in the time intervals described in the letters.
- Ensure that the operating weight does not exceed limits set by manufacturer.
- Ensure that all frame cracks are identified, inspected, and repaired to prevent further development.

Application/Configuration Restrictions

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

The operator station is Roll Over Safety Protection Structure (ROPS) certified up to a mass of 27800 kg (61300 lb) per "ISO 12117-2:2008".

Specification Data

Specifications

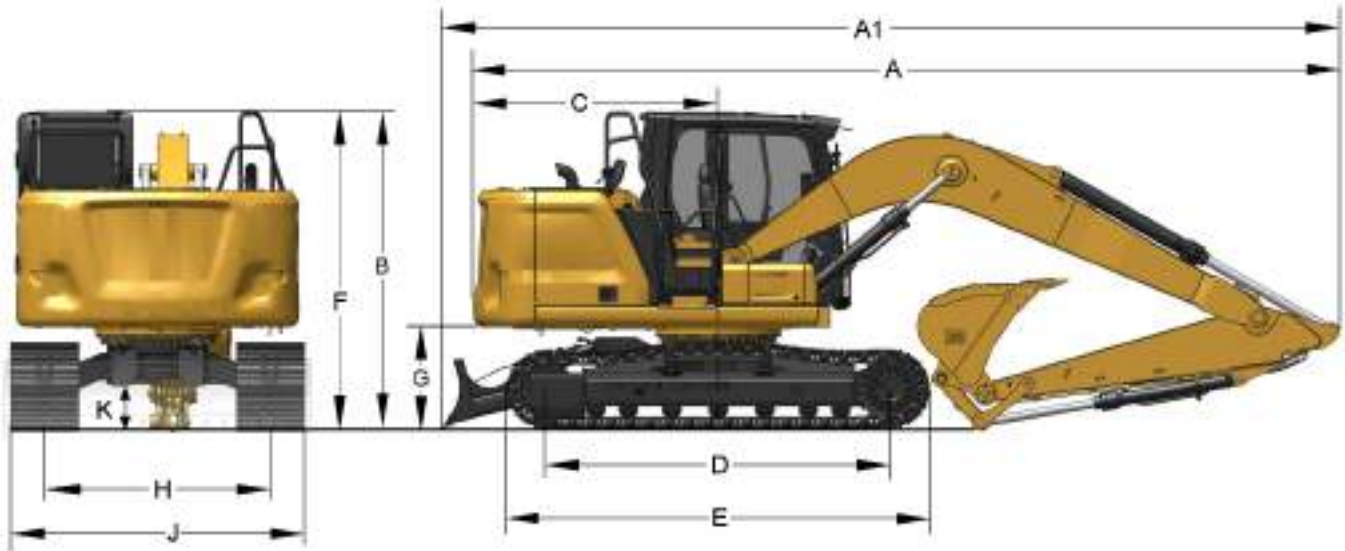


Illustration 64

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Table 7

313GC					
Undercarriage		Standard		Long	
Counterweight		2.14 tonnes		2.47 tonnes	
Boom		Reach Boom			
Stick		2.5 m (8 ft 2 inch)	2.5 m (8 ft 2 inch)	2.8 m (8 ft 9 inch)	3.0 m (9 ft 10 inch)
Bucket		0.52 m ³ (0.65 yd ³)		0.53 m ³ (0.69 yd ³)	
Approximate Operating Weight ⁽¹⁾	Without Blade	13100 kg (28881 lb)	13800 kg (30424 lb)	13700 kg (30203 lb)	13800 kg (30424 lb)
	With Blade	13900 kg (30644 lb)	14600 kg (32187 lb)	14600 kg (32187 lb)	
Overall Length (A)	Without Blade (A)	7690 mm (25 ft 3 in)	7690 mm (25 ft 3 in)	7790 mm (25 ft 6 in)	7780 mm (25 ft 6 in)
	With Blade (A1)	7960 mm (26 ft 1 in)	7970 mm (26 ft 1 in)	8070 mm (26 ft 5 in)	8050 mm (26 ft 4 in)
Overall Height (B)	With FOGS	2950 mm (9 ft 8 in)			
	Without FOGS	2810 mm (9 ft 3 in)			
Swing Radius (C)		2190 mm (7 ft 2 in)			
Length to Center of Rollers (D)		2780 mm (9 ft 1 in)	3040 mm (9 ft 11 in)		
Length of Track (E)		3490 mm (11 ft 5 in)	3750 mm (12 ft 3 in)		
Handrail Height (F)		2810 mm (9 ft 2 in)			
Counterweight Clearance (G) ⁽²⁾		916 mm (3 ft 0 in)			
Track Gauge (H)		1990 mm (6 ft 6 in)			

(continued)

Product Information Section
Specifications

(Table 7, contd)

313GC					
Undercarriage		Standard	Long		
Counterweight		2.14 tonnes	2.47 tonnes		
Boom		Reach Boom			
Stick		2.5 m (8 ft 2 inch)	2.5 m (8 ft 2 inch)	2.8 m (8 ft 9 inch)	3.0 m (9 ft 10 inch)
Bucket		0.52 m ³ (0.65 yd ³)		0.53 m ³ (0.69 yd ³)	
Overall Width (J) Without Blade	500 mm (20.2 inch) Shoes	2490 mm (8 ft 2 in)			
	600 mm (24.6 inch) Shoes	2590 mm (8 ft 5 in)			
	700 mm (28.5 inch) Shoes	2690 mm (8 ft 9 in)			
Ground Clearance (K) ⁽²⁾		446 mm (1 ft 5 in)			

(1) Weights include a 90% fuel tank, 75 kg (165 lbs) operator, 2700 mm (8 ft 10 in) blade, and 700 mm (28.5 in) triple grouser track shoes.

(2) Without grouser height 20 mm (0.8 inch)

Working Ranges and Forces

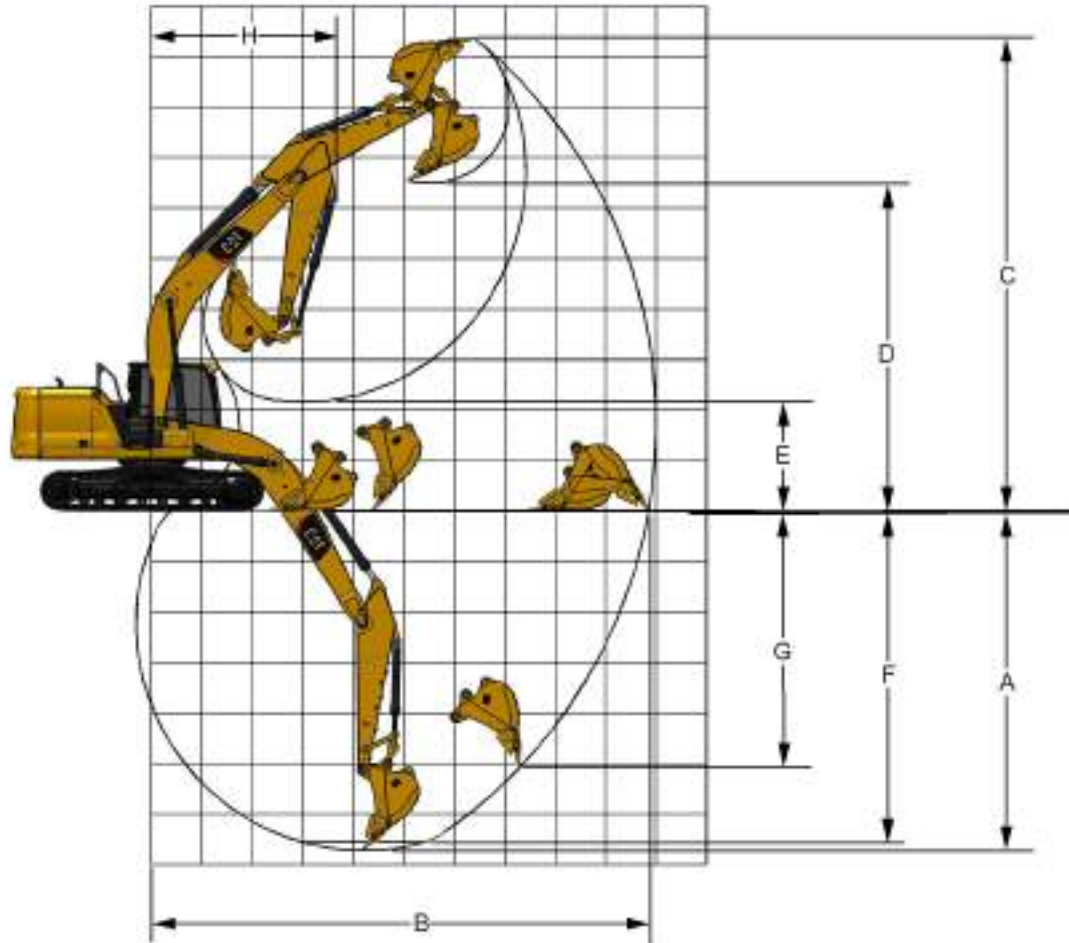


Illustration 65
Reach Boom

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Note: All dimensions are approximate and may vary depending on bucket selection.

Table 8

313GC			
Boom Options	Reach Boom		
	4.65 m (15 ft 3 in)		
Stick Options	Reach Stick		
	R2.5	R2.8	R3.0
	2.5 m (8 ft 2 in)	2.8 m (9 ft 2 in)	3.0 m (9 ft 10 in)
Maximum digging depth (A)	5540 mm (18 ft 2 in)	5840 mm (19 ft 2 in)	6040 mm (19 ft 10 in)
Maximum Reach at Ground Line (B)	8190 mm (26 ft 10 in)	8470 mm (27 ft 9 in)	8660 mm (28 ft 5 in)

(continued)

Product Information Section
Specifications

(Table 8, contd)

313GC				
Boom Options		Reach Boom		
		4.65 m (15 ft 3 in)		
Stick Options		Reach Stick		
		R2.5	R2.8	R3.0
		2.5 m (8 ft 2 in)	2.8 m (9 ft 2 in)	3.0 m (9 ft 10 in)
Maximum cutting height (C)		8580 mm (28 ft 2 in)	8710 mm (28 ft 7 in)	8830 mm (29 ft 0 in)
Maximum Loading Height (D)		6150 mm (20 ft 2 in)	6300 mm (20 ft 8 in)	6420 mm (21 ft 1 in)
Minimum Loading height (E)		2090 mm (6 ft 10 in)	1800 mm (5 ft 11 in)	1600 mm (5 ft 3 in)
Maximum Depth Cut for 2440 mm (8.0 ft) Level Bottom (F)		5330 mm (17 ft 6 in)	5650 mm (18 ft 6 in)	5860 mm (19 ft 3 in)
Maximum Vertical Wall Digging Depth (G)	With Standard Undercarriage	5030 mm (16 ft 6 in)	N/A	N/A
	With Long Undercarriage	4760 mm (15 ft 7 in)	5000 mm (16 ft 5 in)	5190 mm (17 ft 0 in)
Minimum Working Equipment Radius (H)		2430 mm (8 ft 0 in)	2540 mm (8 ft 4 in)	2570 mm (8 ft 5 in)
Bucket Digging Force (ISO)		98.43 kN (22145 lbf)	98.67 kN (22182 lbf)	98.67 kN (22182 lbf)
Stick Digging Force (ISO)		66.51 kN (14952 lbf)	62.34 kN (14015 lbf)	59.29 kN (13329 lbf)
Bucket type				
Bucket Capacity		0.52 m ³ (0.65 yd ³)	0.53 m ³ (0.69 yd ³)	
Bucket Tip Radius		1230 mm (4 ft 0 in)	1240 mm (4 ft 1 in)	

Blade Working Ranges

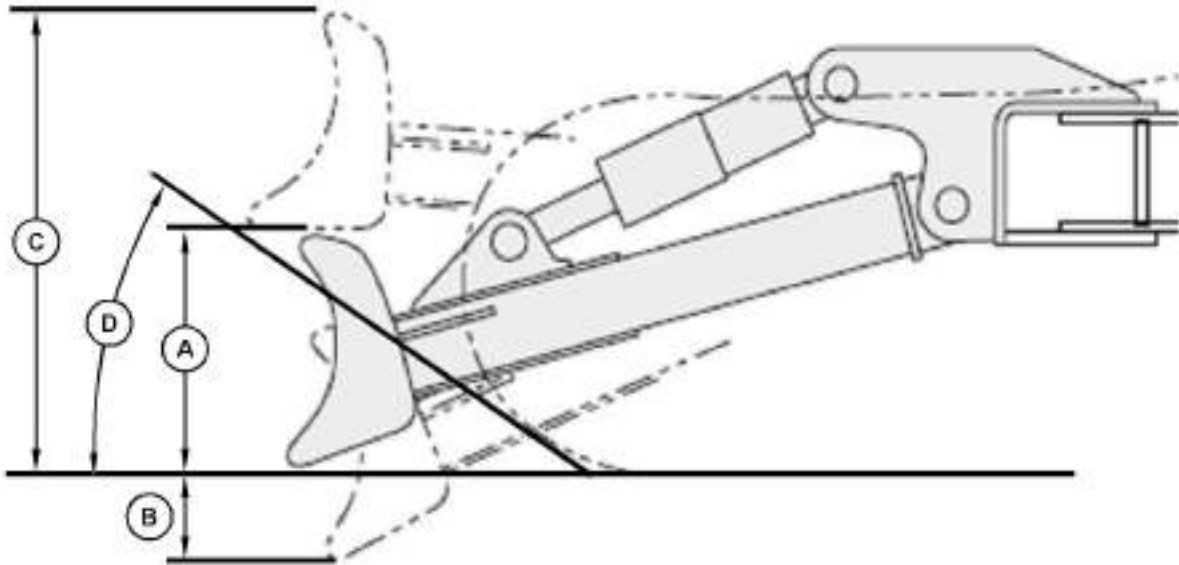


Illustration 66

g06515107

Table 9

313GC			
Blade Options	2500 mm (8 ft 2 in)	2600 mm (8 ft 6 in)	2700 mm (8 ft 10 in)
Blade Height (A)	630 mm (24.8 inch)		
Maximum Lowering Depth from Ground (B)	550 mm (21.6 inch)		
Maximum Raising Height above Ground (C)	1020 mm (40.1 inch)		
Approach Angle (D)	Standard Undercarriage	23 degrees	
	Long Undercarriage	26 degrees	

Lightweight Towing

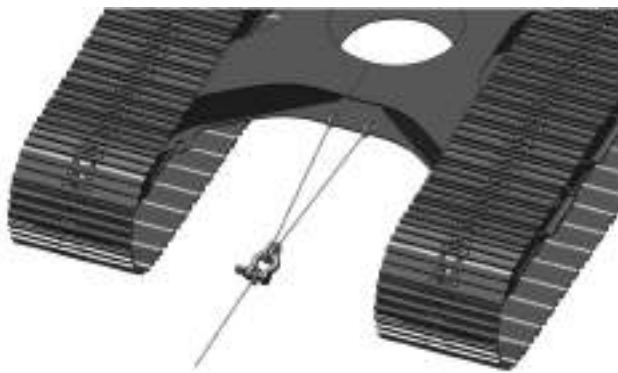


Illustration 67

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Table 10

Maximum Load	58500 N (13151 lb)
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Boom/Stick/Bucket Combinations

SMCS Code: 6000; 6700

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

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

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

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

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

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

Table 11

Excavator without Quick Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.8 m (9 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	450 mm (18 inch)	0.20 m ³ (0.27 yd ³)	268 kg (591 lb)	100	(1)	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	320 kg (706 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	369 kg (814 lb)		(1)	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	420 kg (927 lb)		(1)	(1)
		1050 mm (41 inch)	0.65 m ³ (0.84 yd ³)	468 kg (1031 lb)		(2)	(2)
General Duty - Wide Tip (GD-WT)	312	450 mm (18 inch)	0.27 m ³ (0.36 yd ³)	317 kg (700 lb)	100	(1)	(1)
		600 mm (24 inch)	0.41 m ³ (0.53 yd ³)	372 kg (821 lb)	100	(1)	(1)
		750 mm (30 inch)	0.55 m ³ (0.72 yd ³)	425 kg (936 lb)	101	(1)	(1)
		900 mm (36 inch)	0.71 m ³ (0.92 yd ³)	478 kg (1053 lb)	100	(2)	(3)
		1050 mm (41 inch)	0.86 m ³ (1.13 yd ³)	530 kg (1168 lb)	100	(4)	(4)
		1200 mm (48 inch)	1.02 m ³ (1.13 yd ³)	582 kg (1283 lb)	100	(5)	(5)
Severe Duty (SD)	312	600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	372 kg (820 lb)	90	(1)	(1)
	312	750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	433 kg (954 lb)		(1)	(1)
	312	900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	495 kg (1090 lb)		(1)	(1)
	314	1050 mm (42 inch)	0.65 m ³ (0.84 yd ³)	540 kg (1190 lb)		(1)	(2)
Cleanup (CU)	312	1500 mm (60 inch)	1.02 m ³ (1.33 yd ³)	630 kg (1389 lb)	100	(5)	(5)
Ditch Cleaning (DC)	312	1200 mm (48 inch)	0.57 m ³ (0.74 yd ³)	388 kg (855 lb)	100	(1)	(1)
		1500 mm (59 inch)	0.74 m ³ (0.97 yd ³)	455 kg (1003 lb)		(3)	(3)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 11, contd)

Excavator without Quick Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.8 m (9 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
Ditch Cleaning - Tilt (DCT)	312	1200 mm (48 inch)	0.48 m ³ (0.63 yd ³)	563 kg (1240 lb)	100	(1)	(1)
		1500 mm (60 inch)	0.57 m ³ (0.75 yd ³)	646 kg (1424 lb)		(2)	(2)
Maximum load pin-on (payload + bucket)						1710 kg (3774 lb)	1640 kg (3612 lb)

- (1) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.
(2) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.
(3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.
(4) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.
(5) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

Table 12

Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.8 m (9 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	450 mm (18 inch)	0.20 m ³ (0.27 yd ³)	268 kg (591 lb)	100	(1)	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	320 kg (706 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	369 kg (814 lb)		(1)	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	420 kg (927 lb)		(1)	(2)
		1050 mm (41 inch)	0.65 m ³ (0.84 yd ³)	468 kg (1031 lb)		(3)	(3)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	508 kg (1119 lb)		(4)	(4)
General Duty - Wide Tip (GD-WT)	312	450 mm (18 inch)	0.27 m ³ (0.36 yd ³)	317 kg (700 lb)	100	(1)	(1)
		600 mm (24 inch)	0.41 m ³ (0.53 yd ³)	372 kg (821 lb)	100	(1)	(1)

(continued)

(Table 12, contd)

Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.8 m (9 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
		750 mm (30 inch)	0.55 m ³ (0.72 yd ³)	425 kg (936 lb)	101	(2)	(2)
		900 mm (36 inch)	0.71 m ³ (0.92 yd ³)	478 kg (1053 lb)	100	(3)	(4)
		1050 mm (41 inch)	0.86 m ³ (1.13 yd ³)	530 kg (1168 lb)	100	(4)	(5)
		1200 mm (48 inch)	1.02 m ³ (1.13 yd ³)	582 kg (1283 lb)	100	(5)	(6)
Severe Duty (SD)	312	600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	372 kg (820 lb)	90	(1)	(1)
	312	750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	433 kg (954 lb)		(1)	(1)
	312	900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	495 kg (1090 lb)		(1)	(2)
	314	1050 mm (42 inch)	0.65 m ³ (0.84 yd ³)	540 kg (1190 lb)		(3)	(3)
Cleanup (CU)	312	1500 mm (60 inch)	1.02 m ³ (1.33 yd ³)	630 kg (1389 lb)	100	(5)	(6)
Ditch Cleaning (DC)	312	1200 mm (48 inch)	0.57 m ³ (0.74 yd ³)	388 kg (855 lb)	100	(2)	(2)
		1500 mm (60 inch)	0.74 m ³ (0.97 yd ³)	455 kg (1003 lb)		(3)	(4)
Ditch Cleaning - Tilt (DCT)	312	1200 mm (48 inch)	0.48 m ³ (0.63 yd ³)	563 kg (1240 lb)	100	(2)	(2)
		1500 mm (60 inch)	0.57 m ³ (0.75 yd ³)	646 kg (1424 lb)		(3)	(4)
Maximum load pin-on (payload + bucket)						1512 kg (3334 lb)	1439 kg (3172 lb)

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

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

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

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

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

(6) Not Recommended

Product Information Section
Boom/Stick/Bucket Combinations

Table 13

Excavator without Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	316 kg (696 lb)	100	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	414 kg (914 lb)		(1)
		1000 mm (39 inch)	0.60 m ³ (0.78 yd ³)	438 kg (967 lb)		(1)
		1100 mm (43 inch)	0.68 m ³ (0.89 yd ³)	474 kg (1045 lb)		(2)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	504 kg (1110 lb)		(3)
General Duty - Wide Tip (GD-WT)	312	450 mm (18 inch)	0.20 m ³ (0.26 yd ³)	266 kg (587 lb)	100	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	310 kg (684 lb)		(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	358 kg (790 lb)		(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	407 kg (898 lb)		(1)
		1050 mm (41 inch)	0.65 m ³ (0.84 yd ³)	457 kg (1006 lb)		(2)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	497 kg (1095 lb)		(3)
Heavy Duty (HD)	312	450 mm (18 inch)	0.20 m ³ (0.27 yd ³)	279 kg (615 lb)	100	(1)
		1200 mm (48 inch)	0.76 m ³ (0.99 yd ³)	513 kg (1131 lb)		(3)
Ditch Cleaning (DC)	312	1800 mm (72 inch)	0.68 m ³ (0.89 yd ³)	540 kg (1191 lb)	100	(3)
Ditch Cleaning - Tilt (DCT)	312	1800 mm (72 inch)	0.60 m ³ (0.78 yd ³)	724 kg (1597 lb)	100	(3)
Maximum load pin-on (payload + bucket)						1640 kg (3612 lb)

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

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

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

Table 14

Excavator with Pin Grabber Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	316 kg (696 lb)	100	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	414 kg (914 lb)		(2)
		1000 mm (39 inch)	0.60 m ³ (0.78 yd ³)	438 kg (967 lb)		(3)
		1100 mm (43 inch)	0.68 m ³ (0.89 yd ³)	474 kg (1045 lb)		(4)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	504 kg (1110 lb)		(4)
General Duty - Wide Tip (GD-WT)	312	450 mm (18 inch)	0.20 m ³ (0.26 yd ³)	266 kg (587 lb)	100	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	310 kg (684 lb)		(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	358 kg (790 lb)		(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	407 kg (898 lb)		(2)
		1050 mm (41 inch)	0.65 m ³ (0.84 yd ³)	457 kg (1006 lb)		(3)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	497 kg (1095 lb)		(4)
Heavy Duty (HD)	312	450 mm (18 inch)	0.20 m ³ (0.27 yd ³)	279 kg (615 lb)	100	(1)
		1200 mm (48 inch)	0.76 m ³ (0.99 yd ³)	513 kg (1131 lb)		(4)
Ditch Cleaning (DC)	312	1800 mm (72 inch)	0.68 m ³ (0.89 yd ³)	540 kg (1191 lb)	100	(4)
Ditch Cleaning - Tilt (DCT)	312	1800 mm (72 inch)	0.60 m ³ (0.78 yd ³)	724 kg (1597 lb)	100	(4)
Maximum load pin-on (payload + bucket)						1439 kg (3172 lb)

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

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

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

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

Product Information Section
Boom/Stick/Bucket Combinations

Table 15

Excavator with CW-20 Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	341 kg (752 lb)	100	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	426 kg (940 lb)		(2)
		1100 mm (43 inch)	0.68 m ³ (0.89 yd ³)	487 kg (1073 lb)		(3)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	516 kg (1137 lb)		(3)
Heavy Duty (HD)	312	1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	526 kg (1159 lb)	100	(3)
General Duty - Leveling Edge (GD-LE)	312	690 mm (27 inch)	0.40 m ³ (0.52 yd ³)	413 kg (910 lb)	100	(1)
		600 mm (24 inch)	0.33 m ³ (0.43 yd ³)	395 kg (870 lb)		(1)
		790 mm (31 inch)	0.47 m ³ (0.61 yd ³)	455 kg (1003 lb)		(1)
		996 mm (39 inch)	0.63 m ³ (0.83 yd ³)	517 kg (1140 lb)		(4)
		1184 mm (47 inch)	0.80 m ³ (1.05 yd ³)	603 kg (1328 lb)		(5)
Ditch Cleaning (DC)	312	1800 mm (72 inch)	0.68 m ³ (0.89 yd ³)	516 kg (1138 lb)	100	(3)
		1800 mm (72 inch)	0.90 m ³ (1.18 yd ³)	554 kg (1221 lb)		(5)
Maximum load pin-on (payload + bucket)						1434 kg (3160 lb)

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

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

(3) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.

(4) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

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

Table 16

Excavator with CW-20S Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	450 mm (18 inch)	0.20 m ³ (0.26 yd ³)	301 kg (664 lb)	100	(1)
		500 mm (20 inch)	0.24 m ³ (0.31 yd ³)	310 kg (684 lb)		(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	329 kg (726 lb)		(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	377 kg (830 lb)		(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	426 kg (940 lb)		(2)
		1000 mm (39 inch)	0.60 m ³ (0.78 yd ³)	451 kg (995 lb)		(3)
		1100 mm (43 inch)	0.68 m ³ (0.89 yd ³)	487 kg (1073 lb)		(4)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	516 kg (1137 lb)		(4)
Heavy Duty (HD)	312	500 mm (20 inch)	0.24 m ³ (0.31 yd ³)	313 kg (689 lb)	100	(1)
		1200 mm (48 inch)	0.76 m ³ (1.00 yd ³)	524 kg (1154 lb)		(4)
Ditch Cleaning (DC)	312	1800 mm (72 inch)	0.68 m ³ (0.89 yd ³)	548 kg (1207 lb)	100	(4)
		2000 mm (78 inch)	1.00 m ³ (1.31 yd ³)	630 kg (1389 lb)		(5)
Ditch Cleaning - Tilt (DCT)	312	1800 mm (72 inch)	0.60 m ³ (0.78 yd ³)	822 kg (1812 lb)	100	(6)
Maximum load pin-on (payload + bucket)						1456 kg (3209 lb)

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

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

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

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

(5) Not Recommended

(6) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

Product Information Section
 Boom/Stick/Bucket Combinations

Table 17

Excavator with TRS10 Quick Coupler CW-20 Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
Grading - General Duty	312	1600 mm (63inch)	0.76 m ³ (0.99 yd ³)	571 kg (1259 lb)	100	(1)
Maximum load pin-on (payload + bucket)						3067 kg (6762 lb)

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

Table 18

Excavator with TRS10 Quick Coupler CW-20S Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
Grading - General Duty	312	1500 mm (59 inch)	0.65 m ³ (0.85 yd ³)	528 kg (1164 lb)	100	(1)
Trenching - General Duty	312	540 mm (21 inch)	0.37 m ³ (0.48 yd ³)	336 kg (740 lb)	100	(2)
Maximum load pin-on (payload + bucket)						1083 kg (2387 lb)

(1) Not Recommended

(2) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.

Table 19

Excavator with TRS10 Quick Coupler S60 Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
Grading - Heavy Duty	312	1500 mm (59 inch)	0.52 m ³ (0.68 yd ³)	511 kg (1127 lb)	100	(1)
		1500 mm (59 inch)	0.65 m ³ (0.85 yd ³)	535 kg (1179 lb)		(2)
		1600 mm (63 inch)	0.75 m ³ (0.98 yd ³)	576 kg (1270 lb)		(3)
Trenching - Heavy Duty	312	540 mm (21 inch)	0.33 m ³ (0.43 yd ³)	320 kg (706 lb)	100	(4)
Maximum load pin-on (payload + bucket)						1212 kg (2671 lb)

(1) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.

(2) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

(3) Not Recommended

(4) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.

Table 20

Excavator with TRS10 Quick Coupler CW-20S Quick Coupler / CW-20S Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
Grading - Heavy Duty	312	1500 mm (59 inch)	0.65 m ³ (0.85 yd ³)	528 kg (1164 lb)	100	(1)
Trenching - Heavy Duty	312	540 mm (21 inch)	0.33 m ³ (0.43 yd ³)	336 kg (740 lb)	100	(2)
Maximum load pin-on (payload + bucket)						890 kg (1961 lb)

(1) Not Recommended

(2) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

Product Information Section
Boom/Stick/Bucket Combinations

Table 21

Excavator with S60 Quick Coupler / TRS10 S60 Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage
						2470 kg (5445 lb)
						Reach Boom
						3.0 m (9 ft 10 inch) Stick
Grading - Heavy Duty	312	1500 mm (59 inch)	0.52 m ³ (0.68 yd ³)	511 kg (1127 lb)	100	(1)
		1500 mm (59 inch)	0.65 m ³ (0.85 yd ³)	535 kg (1179 lb)		(2)
		1600 mm (63 inch)	0.75 m ³ (0.98 yd ³)	576 kg (1270 lb)		(2)
Trenching - Heavy Duty	312	540 mm (21 inch)	0.33 m ³ (0.43 yd ³)	320 kg (706 lb)	100	(3)
Maximum load pin-on (payload + bucket)						1052 kg (2318 lb)

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

(2) Not Recommended

(3) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.

Table 22

Excavator without Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Standard Undercarriage
						2140 kg (4718 lb)
						Reach Boom
						2.5 m (8 ft 2 inch) Stick
General Duty - Excavation (GD _X)	312	800 mm (32 inch)	0.45 m ³ (0.59 yd ³)	383 kg (845 lb)	100	(1)
		900 mm (35 inch)	0.52 m ³ (0.68 yd ³)	409 kg (903 lb)		(1)
		950 mm (37 inch)	0.57 m ³ (0.75 yd ³)	427 kg (942 lb)		(1)
		1000 mm (39 inch)	0.63 m ³ (0.82 yd ³)	448 kg (989 lb)		(2)
Heavy Duty - Excavation (HD _X)	312	800 mm (32 inch)	0.45 m ³ (0.59 yd ³)	439 kg (967 lb)	100	(1)
		900 mm (35 inch)	0.52 m ³ (0.68 yd ³)	467 kg (1029 lb)		(1)
Heavy Duty - Excavation (Skeleton)	312	900 mm (35.4 inch)	0.52 m ³ (0.68 yd ³)	446 kg (983 lb)	100	(1)

(continued)

(Table 22, contd)

Excavator without Quick Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Standard Undercarriage
						2140 kg (4718 lb)
						Reach Boom
						2.5 m (8 ft 2 inch) Stick
Tamping (TMP)	312	1800 mm (71 inch)	0.29 m ³ (0.38 yd ³)	436 kg (962 lb)	100	(1)
		1800 mm (71 inch)	0.52 m ³ (0.68 yd ³)	453 kg (998 lb)		(1)
Maximum load pin-on (payload + bucket)						1660 kg (3668 lb)

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

Table 23

Excavator with Pin Grabber Coupler						
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Standard Undercarriage
						2140 kg (4718 lb)
						Reach Boom
						2.5 m (8 ft 2 inch) Stick
General Duty - Excavation (GD _X)	312	800 mm (32 inch)	0.45 m ³ (0.59 yd ³)	383 kg (845 lb)	100	(1)
		900 mm (35 inch)	0.52 m ³ (0.68 yd ³)	409 kg (903 lb)		(1)
		950 mm (37 inch)	0.57 m ³ (0.75 yd ³)	427 kg (942 lb)		(2)
		1000 mm (39 inch)	0.63 m ³ (0.82 yd ³)	448 kg (989 lb)		(3)
Heavy Duty - Excavation (HD _X)	312	800 mm (32 inch)	0.45 m ³ (0.59 yd ³)	439 kg (967 lb)	100	(1)
		900 mm (35 inch)	0.52 m ³ (0.68 yd ³)	467 kg (1029 lb)		(2)
Heavy Duty - Excavation (Skeleton)	312	900 mm (35.4 inch)	0.52 m ³ (0.68 yd ³)	446 kg (983 lb)	100	(2)
Tamping (TMP)	312	1800 mm (71 inch)	0.29 m ³ (0.38 yd ³)	436 kg (962 lb)	100	(1)
		1800 mm (71 inch)	0.52 m ³ (0.68 yd ³)	453 kg (998 lb)		(2)
Maximum load pin-on (payload + bucket)						1464 kg (3228 lb)

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

Product Information Section
Boom/Stick/Bucket Combinations

Table 24

Excavator without Quick Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	450 mm (18 inch)	0.20 m ³ (0.26 yd ³)	266 kg (587 lb)	100	(1)	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	310 kg (684 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	358 kg (790 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	410 kg (903 lb)		(1)	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	407 kg (898 lb)		(1)	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	451 kg (994 lb)		(1)	(1)
		1050 mm (42 inch)	0.65 m ³ (0.84 yd ³)	457 kg (1006 lb)		(1)	(2)
Cleanup (CU)	312	1500 mm (60 inch)	1.02 m ³ (1.33 yd ³)	651 kg (1435 lb)	100	(3)	(4)
		1800 mm (72 inch)	1.02 m ³ (1.33 yd ³)	748 kg (1649 lb)		(5)	(5)
Ditch Cleaning - Tilt (DCT)	312	1500 mm (60 inch)	0.48 m ³ (0.63 yd ³)	704 kg (1553 lb)	100	(6)	(3)
		1800 mm (72 inch)	0.57 m ³ (0.75 yd ³)	784 kg (1728 lb)		(3)	(4)
Maximum load pin-on (payload + bucket)						1850 kg (4075 lb)	1640 kg (3612 lb)

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

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

(3) 1200 kg/m³ (3500 lb/yd³) is the maximum density of material.

(4) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

(5) Not Recommended

(6) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

Table 25

Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	Capacity of Bucket	Weight of Bucket	Fill (%)	313GC Long Undercarriage	
						2470 kg (5445 lb)	
						Reach Boom	
						2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
General Duty (GD)	312	450 mm (18 inch)	0.20 m ³ (0.26 yd ³)	266 kg (587 lb)	100	(1)	(1)
		600 mm (24 inch)	0.31 m ³ (0.40 yd ³)	310 kg (684 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	358 kg (790 lb)		(1)	(1)
		750 mm (30 inch)	0.41 m ³ (0.54 yd ³)	410 kg (903 lb)		(1)	(1)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	407 kg (898 lb)		(1)	(2)
		900 mm (36 inch)	0.53 m ³ (0.69 yd ³)	451 kg (994 lb)		(1)	(2)
		1050 mm (42 inch)	0.65 m ³ (0.84 yd ³)	457 kg (1006 lb)		(2)	(3)
Cleanup (CU)	312	1500 mm (60 inch)	1.02 m ³ (1.33 yd ³)	651 kg (1435 lb)	100	(4)	(5)
		1800 mm (72 inch)	1.02 m ³ (1.33 yd ³)	748 kg (1649 lb)		(5)	(5)
Ditch Cleaning - Tilt (DCT)	312	1500 mm (60 inch)	0.48 m ³ (0.63 yd ³)	704 kg (1553 lb)	100	(6)	(4)
		1800 mm (72 inch)	0.57 m ³ (0.75 yd ³)	784 kg (1728 lb)		(4)	(5)
Maximum load pin-on (payload + bucket)						1649 kg (3635 lb)	1439 kg (3172 lb)

(1) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.(2) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.(3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.(4) 900 kg/m³ (1500 lb/yd³) is the maximum density of material.

(5) Not Recommended

(6) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.

i08787132

Lifting Capacities

SMCS Code: 7000



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

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

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

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

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

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

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

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

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

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

Note: Regional regulations may require the use of an overload warning device and boom and stick lowering control valves during object handling applications.

Contact your Cat[®] dealer for additional information.

Configuration Identification

Note: Each component has a stamp to identify the configuration affecting lifting capacity.

The owner will need to check the machine configuration to identify the correct lifting capacity.

The configuration identifier will be located with the part number stamped on the component. Refer to the following table for the abbreviation of the configuration.

Table 26

Configuration Identification		
Component	Configuration	Abbreviation
Front	Reach Boom	R
	Mass Boom	M
	Variable Angle Boom	VA
	Super Long Reach Boom	SLR
	Standard	STD
	Heavy Duty	HD
	Extreme Special	ES
	Thumb Ready Stick	TR
Undercarriage	Short Undercarriage (Crawler)	STD
	Long Undercarriage (Crawler)	LC
	Long Narrow Undercarriage (Crawler)	LN
Cylinder	Standard	-
	Heavy Lift	HL
Counterweight	Metric Ton (tonne)	t ⁽¹⁾

(continued)

(Table 26, contd)

(1) Counterweight stamp indicates metric ton. (example 1.0t = 1000 kg)

Symbols Found in the Lifting Capacity Charts

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

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

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



Lift Capacities are provided in kilograms and pounds



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



Lift point radius



Lift point height



Lifting capacity over the front of the machine



Lifting capacity over the side of the machine



Heavy Lift ON

**Reach Boom with a 2.5 m
(8 ft 2 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC


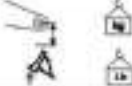










(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550	* 3550			* 2600	* 2600	5440
					* 7900	* 7900			* 5800	* 5800	17'8"
4500 15'0"					* 3800	* 3800	* 3650	2550	* 2450	2300	6410
					* 8300	* 8300	* 7400	5450	* 5350	5050	20'10"
3000 10'0"			* 6400	* 6400	* 4650	3650	3650	2500	* 2450	2000	6930
			* 13700	* 13700	* 10100	8250	7800	5350	* 5300	4350	22'8"
1500 5'0"			* 7350	6400	5450	3600	3500	2400	* 2550	1850	7090
			* 18000	13800	11750	7700	7550	5100	* 5600	4100	23'3"
0 0			* 6500	6100	5250	3400	3400	2300	2800	1900	6930
			* 15000	13100	11300	7300	7350	4900	6100	4150	22'8"
-1500 -5'0"	* 4800	* 4800	* 9600	6050	5200	3350	3400	2250	3100	2100	6410
	* 10700	* 10700	* 20750	13000	11100	7150	7300	4850	6800	4600	20'11"
-3000 -10'0"	* 8850	* 8850	* 8250	6150	5200	3350			3950	2650	5430
	* 20000	* 20000	* 17750	13200	11200	7250			8800	5850	17'8"

Illustration 68

g06775891

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC


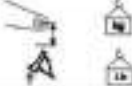









(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'8"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2550 5450	* 2450 * 5350	2300 5050	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3650 8250	3650 7800	2500 5350	* 2450 * 5300	2000 4350	6930 22'8"
1500 5'0"			* 7350 * 18000	8400 13800	5450 11750	3600 7700	3500 7550	2400 5100	* 2550 * 5600	1850 4100	7090 23'3"
0 0			* 6500 * 15000	6100 13100	5250 11300	3400 7300	3400 7350	2300 4900	2800 6100	1900 4150	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	6050 13000	5200 11100	3350 7150	3400 7300	2250 4850	3100 6800	2100 4600	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6150 13200	5200 11200	3350 7250			3950 8800	2650 5850	5430 17'8"

Illustration 69

g06775891

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'8"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2600 5600	* 2450 * 5350	2350 5150	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3900 8400	3700 7950	2550 5450	* 2450 * 5300	2000 4450	6930 22'8"
1500 5'0"			* 7350 * 18000	8550 14050	5550 11950	3650 7850	3600 7700	2450 5200	* 2550 * 5600	1900 4150	7090 23'3"
0 0			* 6500 * 15000	6250 13350	5350 11500	3450 7450	3500 7500	2350 5050	2850 6250	1950 4250	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	6200 13300	5300 11300	3400 7300	3450 7400	2300 4950	3150 6950	2150 4700	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6300 13500	5300 11450	3450 7400			4050 9000	2700 6000	5430 17'8"

Illustration 70

g06775892

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 600 mm (24 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550	* 3550			* 2600	* 2600	5440
					* 7900	* 7900			* 5800	* 5800	17'8"
4500 15'0"					* 3800	* 3800	* 3650	2600	* 2450	2350	6410
					* 8300	* 8300	* 7400	5600	* 5350	5150	20'10"
3000 10'0"			* 6400	* 6400	* 4650	3900	3700	2550	* 2450	2000	6930
			* 13700	* 13700	* 10100	8400	7950	5450	* 5300	4450	22'8"
1500 5'0"			* 7350	8550	5550	3650	3600	2450	* 2550	1900	7090
			* 18000	14050	11950	7850	7700	5200	* 5600	4150	23'3"
0 0			* 6500	6250	5350	3450	3500	2350	2850	1950	6930
			* 15000	13350	11500	7450	7500	5050	6250	4250	22'8"
-1500 -5'0"	* 4800	* 4800	* 9600	6200	5300	3400	3450	2300	3150	2150	6410
	* 10700	* 10700	* 20750	13300	11300	7300	7400	4950	6950	4700	20'11"
-3000 -10'0"	* 8850	* 8850	* 8250	6300	5300	3450			4050	2700	5430
	* 20000	* 20000	* 17750	13500	11450	7400			9000	6000	17'8"

Illustration 71

g06775892

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 600 mm (24 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC

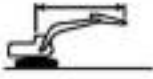












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
 											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2650 5650	* 2450 * 5350	2350 5250	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3950 8500	3750 8050	2550 5600	* 2450 * 5300	2050 4500	6930 22'8"
1500 5'0"			* 7350 * 16000	8650 14250	5650 12100	3700 7950	3650 7800	2450 5300	* 2550 * 5600	1950 4250	7090 23'3"
0 0			* 6500 * 15000	6300 13550	5450 11650	3500 7550	3550 7600	2400 5100	* 2850 * 6250	1950 4300	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	6300 13450	5350 11500	3450 7400	3500 7500	2350 5050	3200 7050	2150 4750	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6400 13700	5400 11600	3500 7500			4100 9100	2750 6050	5430 17'8"

Illustration 72

g06775893

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 700 mm (28 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550	* 3550			* 2600	* 2600	5440
					* 7900	* 7900			* 5800	* 5800	17'8"
4500 15'0"					* 3800	* 3800	* 3650	2650	* 2450	2400	6410
					* 8300	* 8300	* 7400	5700	* 5350	5300	20'10"
3000 10'0"			* 6400	* 6400	* 4650	4000	3800	2600	* 2450	2050	6930
			* 13700	* 13700	* 10100	8600	8100	5550	* 5300	4550	22'8"
1500 5'0"			* 7350	6700	* 5700	3750	3650	2500	* 2550	1950	7090
			* 18000	14400	12250	8050	7900	5350	* 5600	4300	23'3"
0 0			* 6500	6400	5500	3550	3600	2400	* 2850	2000	6930
			* 15000	13700	11600	7650	7700	5150	* 6250	4350	22'8"
-1500 -5'0"	* 4800	* 4800	* 9600	6350	5400	3500	3550	2400	3250	2200	6410
	* 10700	* 10700	* 20750	13600	11600	7500	7600	5100	7150	4800	20'11"
-3000 -10'0"	* 8850	* 8850	* 8250	6450	5450	3550			4150	2750	5430
	* 20000	* 20000	* 17750	13850	11700	7600			9200	6150	17'8"

Illustration 73

g06776376

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 770 mm (30 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'8"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2650 5700	* 2450 * 5350	2400 5300	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	4000 8600	3800 8100	2600 5550	* 2450 * 5300	2050 4550	6930 22'8"
1500 5'0"			* 7350 * 18000	6700 14400	* 5700 12250	3750 8050	3650 7900	2500 5350	* 2550 * 5600	1950 4300	7090 23'3"
0 0			* 6500 * 15000	6400 13700	5500 11600	3550 7650	3600 7700	2400 5150	* 2850 * 6250	2000 4350	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	6350 13600	5400 11600	3500 7500	3550 7600	2400 5100	3250 7150	2200 4800	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6450 13850	5450 11700	3550 7600			4150 9200	2750 6150	5430 17'8"

Illustration 74

g06775895

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)


















(mm) (#Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (#Inch)
 	 	 	 	 	 	 	 			(mm) (#Inch)	
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2650 5650	* 2450 * 5350	2350 5200	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3950 8500	3750 8050	2550 5500	* 2450 * 5300	2050 4500	6900 22'8"
1500 5'0"			* 7350 * 18000	6600 14250	5650 12150	3700 7950	3650 7850	2450 5300	* 2550 * 5600	1950 4250	7090 23'3"
0 0			* 6500 * 15000	6300 13550	5450 11700	3500 7550	3550 7650	2400 5100	* 2850 * 6250	1950 4300	6900 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	6250 13450	5400 11550	3450 7400	3500 7550	2350 5050	3200 7100	2150 4750	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 6250 * 17750	6350 13650	5400 11650	3500 7500			4100 9150	2750 6050	5430 17'8"

Illustration 75

g06775897

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe with MT pad, blade UP, and 2470 kg (5445 lb) counter weight

**Reach Boom with a 2.8 m
(9 ft 2 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (inch)	1500 50'		3000 100'		4500 150'		6000 200'				(mm) (inch)
											
7500									* 2900	* 2900	4160
6000 200'									* 2400	* 2400	5790
4500 150'					* 3500	* 3500	* 3500	2500	* 5250	* 5250	18'6"
3000 100'			* 5750	* 5750	* 4350	3850	3650	2500	* 2250	2100	6710
1500 50'			* 12350	* 12350	* 9450	8300	7800	5350	* 4900	4050	237"
0			* 8550	6500	* 5450	3600	3500	2350	* 2350	1750	7360
0			* 18400	13950	* 11750	7700	7550	5100	* 5150	3800	24'1"
-1500 -50'	* 4500	* 4500	* 9450	6000	5150	3300	3350	2250	* 2600	1750	7200
-3000 -100'	* 10100	* 10100	* 21000	12850	11050	7050	7200	4900	* 5750	3850	237"
-4500 -150'	* 8000	* 8000	* 8600	6050	5150	3300			2850	1950	6710
	* 18000	* 18000	* 18500	13000	11100	7100			6300	4250	21'11"
			* 5900	* 5900					3600	2400	5780
									7950	5250	18'9"
									* 4050	3950	4130
									* 10050	* 10050	12'1"

Illustration 76

g06776386

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC













(mm) (inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (inch)	
												
7500										* 2900	* 2900	4160
6000 20'0"										* 2400	* 2400	5790
4500 15'0"					* 3500	* 3500	* 3500	2550	* 2250	2100	6710	
3000 10'0"			* 5750	* 5750	* 4350	3850	3650	2500	* 2250	1850	7210	
1500 5'0"			* 8550	6500	* 5450	3600	3500	2350	* 2350	1750	7360	
0			* 18400	13950	* 11750	7700	7550	5100	* 5150	3800	24'1"	
0			* 6950	6100	5250	3400	3400	2250	* 2600	1750	7200	
-1500 -5'0"	* 4500	* 4500	* 9450	6000	5150	3300	3350	2250	2850	1950	6710	
-3000 -10'0"	* 10100	* 10100	* 21000	12850	11050	7050	7200	4800	6300	4250	21'11"	
-4500 -15'0"	* 8000	* 8000	* 8600	6050	5150	3300			3600	2400	5780	
	* 18000	* 18000	* 18500	13000	11100	7100			7950	5250	18'9"	
			* 5900	* 5900					* 4050	3950	4130	
									* 10050	* 10050	12'1"	

Illustration 77

g06776386

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2600 5600	* 2250 * 4900	2150 4800	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3950 8450	3700 7950	2550 5450	* 2250 * 4800	1900 4150	7210 23'7"
1500 5'0"			* 8550 * 18400	6600 14250	* 5450 * 11750	3650 7900	3600 7700	2450 5200	* 2350 * 5150	1800 3900	7360 24'1"
0 0			* 6950 * 16050	6200 13350	5350 11450	3450 7450	3450 7450	2350 5000	* 2600 * 5750	1800 3950	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	6150 13150	5250 11250	3350 7250	3400 7350	2300 4900	2950 6450	1950 4350	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 9800 * 18500	6200 13300	5250 11300	3400 7250			3650 8100	2450 5400	5790 18'9"
-4500 -15'0"			* 5900 * 5900						* 4050 * 10050	4000 * 10050	4130 12'1"

Illustration 78

g06776387

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 600 mm (24 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC













(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (Inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400	* 2400	5790
4500 15'0"					* 3500	* 3500	* 3500	2600	* 5250	* 5250	18'8"
3000 10'0"			* 5750	* 5750	* 7850	* 7850	* 7550	5600	* 2250	2150	67'10"
1500 5'0"			* 12350	* 12350	* 9450	8450	7950	5450	* 4900	4800	21'10"
0			* 8550	6600	* 5450	3650	3600	2450	* 2250	1900	72'10"
0			* 18400	14250	* 11750	7900	7700	5200	* 4800	4150	23'7"
-1500 -5'0"	* 4500	* 4500	* 6950	6200	* 5350	3450	3450	2350	* 2350	1800	73'60"
-3000 -10'0"	* 10100	* 10100	* 16050	13350	11450	7450	7450	5000	* 2600	1800	7200
-4500 -15'0"	* 4500	* 4500	* 9450	6150	5250	3350	3400	2300	* 5750	3950	23'7"
	* 10100	* 10100	* 21000	13150	11250	7250	7350	4900	2950	1950	67'10"
	* 8000	* 8000	* 9800	6200	5250	3400			6450	4350	21'11"
	* 18000	* 18000	* 18500	13300	11300	7250			3650	2450	57'80"
			* 5900	* 5900					8100	5400	18'3"
									* 4050	4000	41'30"
									* 10050	* 10050	12'1"

Illustration 79

g06776387

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 600 mm (24 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC

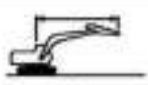












(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (Inch)	
												
7500										* 2900	* 2900	4160
6000 20'0"										* 2400	* 2400	5790
										* 5250	* 5250	18'8"
4500 15'0"					* 3500	* 3500	* 3500	2850		* 2250	2200	6710
					* 7650	* 7650	* 7550	5700		* 4900	4850	21'10"
3000 10'0"			* 5750	* 5750	* 4350	4000	3750	2600		* 2250	1900	7210
			* 12350	* 12350	* 9450	8550	8050	5500		* 4900	4200	23'7"
1500 5'0"			* 8550	6700	* 5450	3700	3650	2450		* 2350	1800	7360
			* 18400	14400	* 11750	8000	7800	5300		* 5150	3950	24'1"
0			* 6950	6300	5400	3500	3500	2350		* 2600	1850	7200
0			* 16050	13500	11650	7550	7550	5050		* 5750	4000	23'7"
-1500 -5'0"	* 4500	* 4500	* 9450	6200	5300	3400	3450	2300		2950	2000	6710
	* 10100	* 10100	* 21000	13350	11400	7350	7450	4950		6550	4400	21'11"
-3000 -10'0"	* 8000	* 8000	* 9800	6300	5350	3450				3700	2450	5780
	* 18000	* 18000	* 18500	13500	11450	7400				8200	5450	18'0"
-4500 -15'0"			* 5900	* 5900						* 4050	* 4050	4130
										* 10050	* 10050	12'1"

Illustration 80

g06776389

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 700 mm (28 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC

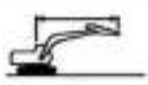












(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (Inch)	
												
7500										* 2900	* 2900	4160
6000 20'0"										* 2400	* 2400	5790
4500 15'0"					* 3500	* 3500	* 3500	2650		* 5250	* 5250	18'8"
3000 10'0"					* 7650	* 7650	* 7550	5700		* 2250	2200	67'10"
1500 5'0"			* 5750	* 5750	* 4350	4000	3750	2600		* 4900	4850	21'10"
0			* 12350	* 12350	* 9450	8550	8050	5500		* 2250	1900	72'10"
0			* 8550	6700	* 5450	3700	3650	2450		* 4900	4200	23'7"
-1500 -5'0"			* 18400	14400	* 11750	8000	7800	5300		* 2350	1800	73'60"
-3000 -10'0"			* 6950	6300	5400	3500	3500	2350		* 5150	3950	24'1"
-4500 -15'0"			* 16050	13500	11650	7550	7550	5050		* 2600	1850	72'00"
-1500 -5'0"	* 4500	* 4500	* 9450	6200	5300	3400	3450	2300		* 5750	4000	23'7"
-3000 -10'0"	* 10100	* 10100	* 21000	13350	11400	7350	7450	4950		2950	2000	67'10"
-4500 -15'0"	* 8000	* 8000	* 9800	6300	5350	3450				6550	4400	21'11"
	* 18000	* 18000	* 18500	13500	11450	7400				3700	2450	57'80"
			* 5900	5900						8200	5450	18'0"
										* 4050	* 4050	41'30"
										* 10050	* 10050	12'1"

Illustration 81

g06776389

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 770 mm (30 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)

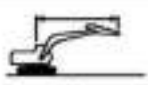
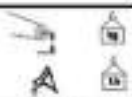










(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (Inch)
											
7500 25'0"									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2650 5650	* 2250 * 4900	2200 4800	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3950 8500	3750 8050	2550 5500	* 2250 * 4900	1900 4200	7210 23'7"
1500 5'0"			* 8550 * 18400	6650 14300	* 5450 * 11750	3700 7900	3600 7750	2450 5250	* 2350 * 5150	1800 3950	7360 24'1"
0 0			* 6950 * 16050	6250 13400	5400 11600	3500 7450	3500 7550	2350 5000	* 2600 * 5750	1800 4000	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	6150 13200	5300 11350	3400 7250	3450 7400	2300 4900	2950 6500	2000 4350	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 9800 * 18500	6250 13400	5300 11400	3400 7300			3700 8200	2450 5400	5790 18'9"
-4500 -15'0"			* 5900 * 5900						* 4050 * 10050	4050 * 10050	4130 12'1"

Illustration 82

g06776394

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)	
												
7500 25'0"										* 2900	* 2900	4160
6000 20'0"										* 2400	* 2400	5790
4500 15'0"					* 3500	* 3500	* 3500	2650	* 2250	2200	6710	
3000 10'0"			* 5750	* 5750	* 4350	4000	3750	2550	* 2250	1900	7210	
1500 5'0"			* 8550	6700	* 5450	3700	3650	2450	* 2350	1800	7360	
0 0			* 18400	14400	* 11750	7950	7800	5250	* 5150	3950	24'1"	
-1500 -5'0"	* 4500	* 4500	* 9450	6200	5350	3400	3500	2300	3000	2000	6710	
-3000 -10'0"	* 10100	* 10100	* 21000	13300	11450	7300	7500	4950	6550	4400	21'11"	
-4500 -15'0"	* 8000	* 8000	* 9600	6250	5350	3400			3700	2450	5780	
	* 18000	* 18000	* 18500	13450	11500	7350			8250	5450	18'8"	
			* 5900	* 5900					* 4050	* 4050	4130	
									* 10050	* 10050	12'1"	

Illustration 83

g06776395

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe with MT pad, blade UP, and 2470 kg (5445 lb) counter weight

**Reach Boom with a 3.0 m
(9 ft 10 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC


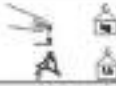












(mm) (Inch)	1530 5'9"		3000 10'0"		4500 15'0"		6000 20'0"		7500				(mm) (Inch)
													
7500 25'0"											* 2600	* 2600	4480
											* 5850	* 5850	14'1"
6000 20'0"							* 2250	* 2250			* 2200	* 2200	6030
											* 4850	* 4850	19'6"
4500 15'0"							* 3350	2600			* 2050	2050	6920
							* 7300	5550			* 4500	4500	22'6"
3000 10'0"			* 5350	* 5350	* 4200	3900	3650	2500			* 2050	1800	7400
			* 11450	* 11450	* 9050	8350	7850	5350			* 4500	3900	24'2"
1500 5'0"			* 8200	6550	* 5300	3800	3550	2400	* 2400	1700	* 2150	1700	7550
			* 17650	14150	* 11400	7750	7550	5100			* 4750	3700	24'9"
0 0			* 7250	6100	5250	3400	3400	2300			* 2400	1700	7400
			* 16750	13100	11300	7300	7300	4900			* 5250	3700	24'3"
-1500 -5'0"	* 4350	* 4350	* 9200	6000	5150	3300	3350	2200			2750	1850	6910
	* 9700	* 9700	* 21000	12850	11050	7050	7200	4750			6050	4050	22'7"
-3000 -10'0"	* 7450	* 7450	* 8800	8050	5150	3300	3350	2250			3350	2250	6020
	* 16800	* 16800	* 19050	12950	11050	7050					7450	4950	19'7"
-4500 -15'0"			* 6400	6250							* 4000	3450	4480
			* 13550	13450							* 8800	7900	14'4"

Illustration 84

g06776433

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC














(mm) (Inch)	1530 5'9"		3000 10'0"		4500 15'0"		6000 20'0"		7500				(mm) (Inch)		
															
7500 25'0"													* 2600	* 2600	4480
													* 5850	* 5850	14'1"
6000 20'0"							* 2250	* 2250					* 2200	* 2200	6030
													* 4850	* 4850	19'6"
4500 15'0"							* 3350	2600					* 2050	2050	6920
							* 7300	5550					* 4500	4500	22'6"
3000 10'0"			* 5350	* 5350	* 4200	3900	3650	2500					* 2050	1800	7400
			* 11450	* 11450	* 9050	8350	7850	5350					* 4500	3900	24'2"
1500 5'0"			* 8200	6550	* 5300	3800	3550	2400	* 2400	1700			* 2150	1700	7550
			* 17650	14150	* 11400	7750	7550	5100					* 4750	3700	24'9"
0 0			* 7250	6100	5250	3400	3400	2300					* 2400	1700	7400
			* 16750	13100	11300	7300	7300	4900					* 5250	3700	24'3"
-1500 -5'0"	* 4350	* 4350	* 9200	6000	5150	3300	3350	2200					2750	1850	6910
	* 9700	* 9700	* 21000	12850	11050	7050	7200	4750					6050	4050	22'7"
-3000 -10'0"	* 7450	* 7450	* 8800	8050	5150	3300	3350	2250					3350	2250	6020
	* 16800	* 16800	* 19050	12950	11050	7050							7450	4950	19'7"
-4500 -15'0"			* 6400	6250									* 4000	3450	4480
			* 13550	13450									* 8800	7900	14'4"

Illustration 85

g06776433

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC



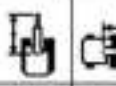
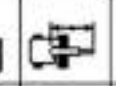
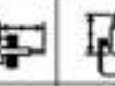

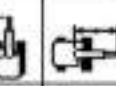


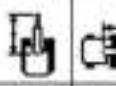
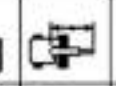
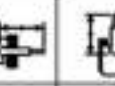

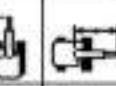

(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)	
														
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350 * 7300	2650 5650				* 2050 * 4500	* 2050 * 4500	6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3950 8500	* 3700 8000	2550 5500				* 2050 * 4500	1800 4000	7400 24'2"
1500 5'0"			* 8200 * 17650	6700 14400	* 5300 * 11400	3700 7950	3600 7700	2450 5250	* 2400	1750		* 2150 * 4750	1700 3750	7550 24'9"
0 0			* 7250 * 16750	6250 13400	5350 11500	3450 7450	3450 7450	2350 5000				* 2400 * 5250	1750 3800	7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	6100 13100	5250 11250	3350 7200	3400 7300	2250 4900				2800 6150	1900 4150	6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	6150 13250	5250 11250	3350 7250	3450	2300				3450 7600	2300 5050	6020 19'7"
-4500 -15'0"			* 6400 * 13550	6400 13550								* 4000 * 8800	3550 8100	4480 14'4"

Illustration 86

g06776436

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 600 mm (24 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC




















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)	
 	 	 	 	 	 	 	 	 						
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4480 14'1"
6000 20'0"							* 2250 * 2250					* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350 * 7300	2650 5650				* 2050 * 4500	* 2050 * 4500	6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3950 8500	* 3700 8000	2550 5500				* 2050 * 4500	1800 4000	7400 24'2"
1500 5'0"			* 8200 * 17650	6700 14400	* 5300 * 11400	3700 7950	3600 7700	2450 5250	* 2400 1750			* 2150 * 4750	1700 3750	7550 24'9"
0 0			* 7250 * 16750	6250 13400	5350 11500	3450 7450	3450 7450	2350 5000				* 2400 * 5250	1750 3800	7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	6100 13100	5250 11250	3350 7200	3400 7300	2250 4900				2800 6150	1900 4150	6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	6150 13250	5250 11250	3350 7250	3450 7250	2300				3450 7600	2300 5050	6020 19'7"
-4500 -15'0"			* 6400 * 13550	6400 13550								* 4000 * 8800	3550 8100	4480 14'4"

Illustration 87

g06776436

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 600 mm (24 inch) rubber shoe, blade UP, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC















(mm) (inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (inch)	
														
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350	2700				* 2050 * 4500	* 2050 * 4500	6920 22'6"
3000 10'0"			* 5350	* 5350	* 4200	4090	* 3700	2600				* 2050 * 4500	1850 4050	7400 24'2"
1500 5'0"			* 8200	6800	* 5300	3750	3650	2450	* 2400	1760		* 2150 * 4750	1750 3850	7550 24'9"
0 0			* 7250	6350	5450	3500	3500	2350				* 2400 * 5250	1750 3850	7400 24'3"
-1500 -5'0"	* 4350	* 4350	* 9200	8200	5300	3400	3450	2300				* 2850 * 6250	1900 4200	6910 22'7"
-3000 -10'0"	* 7450	* 7450	* 8800	8250	5300	3400	3500	2350				3500 7700	2350 5150	6020 19'7"
-4500 -15'0"			* 6400	* 6400								* 4000 * 8800	3600 8200	4480 14'4"

Illustration 88

g06776437

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 700 mm (28 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC
















(mm) (Inch ³)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch ³)	
														
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350 * 7300	2700 5800				* 2050 * 4500	* 2050 * 4500	6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	4050 8700	* 3700 * 8500	2600 5600				* 2050 * 4500	1850 4100	7400 24'2"
1500 5'0"			* 8200 * 17650	6850 14750	* 5300 * 11400	3800 8100	3700 7900	2600 5350	* 2400	1800		* 2150 * 4750	1750 3850	7550 24'9"
0 0			* 7250 * 16750	6400 13750	5500 11800	3550 7650	3550 7650	2400 5150				* 2400 * 5250	1800 3900	7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	6250 13450	5350 11550	3450 7400	3500 7500	2350 5000				* 2850 * 6250	1950 4250	6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	6300 13550	5400 11550	3450 7400	3550 7400	2350				3500 7800	2350 5200	6020 19'7"
-4500 -15'0"			* 6400 * 13550	* 8400 * 13550								* 4000 * 8800	3650 8250	4480 14'4"

Illustration 89

g06776440

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 770 mm (30 inch) TG shoe, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)




















(mm) (inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (inch)
 	 	 	 	 	 	 	 	 					
7500 25'0"													* 2600 * 2600 4490 * 5850 * 5850 14'1"
6000 20'0"							* 2250 * 2250						* 2200 * 2200 6030 * 4850 * 4850 19'6"
4500 15'0"							* 3350 2650 * 7300 5700						* 2050 * 2050 6920 * 4500 * 4500 22'6"
3000 10'0"			* 5350 * 5350 * 11450 * 11450	* 4200 4000 * 9050 8550	* 3700 2550 * 8000 5500								* 2050 1850 7400 * 4500 4000 24'2"
1500 5'0"			* 8200 6750 * 17650 14500	* 5300 3700 * 11400 8000	* 3650 2450 * 7800 5250	* 2400 1750							* 2150 1750 7550 * 4750 3800 24'9"
0 0			* 7250 6300 * 16750 13450	5400 3500 11650 7500	3500 2350 7550 5050								* 2400 1750 7400 * 5250 3800 24'3"
-1500 -5'0"	* 4350 * 4350 * 9700 * 9700	* 9200 6150 * 21000 13200	5300 3400 11350 7250	3450 2300 7400 4800									* 2850 1900 6910 * 6250 4150 22'7"
-3000 -10'0"	* 7450 * 7450 * 16800 * 16800	* 8800 6200 * 19050 13300	5300 3400 11400 7300	3500 2300									3450 2300 6020 7700 5100 19'7"
-4500 -15'0"		* 6400 * 6400 * 13550 * 13550											* 4000 3550 4480 * 8800 8100 14'4"

Illustration 90

g06776443

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, blade UP, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)




















(mm) (Inch)	1530 6'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)
 	 	 	 	 	 	 	 	 					
7500 25'0"													* 2600 * 2600 4490 * 5850 * 5850 14'1"
6000 20'0"							* 2250 * 2250						* 2200 * 2200 8030 * 4850 * 4850 19'6"
4500 15'0"							* 3050 2650 * 7300 5700						* 2050 * 2050 6920 * 4500 * 4500 22'6"
3000 10'0"			* 5350 * 5350 * 11450 * 11450	* 4200 4000	* 3700 2600 * 8000 5550								* 2050 1850 7400 * 4500 4050 24'2"
1500 5'0"			* 8200 6800 * 17650 14600	* 5300 3750 * 11400 8050	* 3650 2450 * 7850 5300	* 2400 1750							* 2150 1750 7650 * 4750 3800 24'9"
0 0			* 7250 6300 * 16750 13550	5450 3500	3550 2350 7600 5050								* 2400 1750 7400 * 5250 3850 24'3"
-1500 -5'0"	* 4350 * 4350 * 9700 * 9700	* 8200 6200 * 21000 13300	5350 3400	3500 2300 7450 4950									* 2850 1900 6910 * 6250 4200 22'7"
-3000 -10'0"	* 7450 * 7450 * 16800 * 16800	* 8800 6250 * 19050 13400	5350 3400	3500 2350									3500 2300 6020 7750 5150 19'7"
-4500 -15'0"		* 6400 * 6400 * 13550 * 13550											* 4000 3500 4480 * 8800 8200 14'4"

Illustration 91

g06776465

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe with MT pad, blade UP, and 2470 kg (5445 lb) counter weight

**Reach Boom with a 2.5 m
(8 ft 2 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC














(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
 											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 8300	* 3650 * 7400	2450 5200	* 2450 * 5350	* 2150 4800	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3650 7850	3650 7800	2350 5050	* 2450 * 5300	1900 4150	6930 22'8"
1500 5'0"			* 7350 * 16000	8100 13150	5500 11800	3400 7350	3550 7550	2250 4850	* 2550 * 5600	1750 3850	7090 23'3"
0 0			* 6500 * 15000	5800 12450	5300 11300	3250 6950	3450 7350	2200 4650	2800 6150	1800 3900	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	5750 12350	5200 11150	3150 6800	3400 7300	2150 4600	3100 6850	2000 4350	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	5850 12550	5250 11250	3200 6900			4000 8850	2500 5550	5430 17'8"

Illustration 92

g06774622

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 8300	* 3650 * 7400	2450 5200	* 2450 * 5350	2150 4800	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3650 7850	3650 7800	2350 5050	* 2450 * 5300	1900 4150	6930 22'8"
1500 5'0"			* 7350 * 16000	8100 13150	5500 11800	3400 7350	3550 7550	2250 4850	* 2550 * 5600	1750 3850	7090 23'3"
0 0			* 6500 * 15000	5800 12450	5300 11300	3250 6950	3450 7350	2200 4650	2800 6150	1800 3900	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	5750 12350	5200 11150	3150 6800	3400 7300	2150 4600	3100 6850	2000 4350	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	5850 12550	5250 11250	3200 6900			4000 8850	2500 5550	5430 17'8"

Illustration 93

g06774622

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC


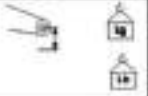










(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2500 5300	* 2450 * 5350	2200 4900	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3750 8000	3700 7950	2400 5150	* 2450 * 5300	1900 4200	6930 22'8"
1500 5'0"			* 7350 * 16000	6200 13400	5600 12000	3450 7450	3600 7700	2300 4950	* 2550 * 5600	1800 3950	7090 23'3"
0 0			* 6500 * 15000	5900 12700	5400 11550	3300 7100	3500 7500	2200 4750	* 2850 * 6250	1850 4000	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9500 * 20750	5850 12600	5300 11400	3200 6900	3450 7450	2200 4700	3150 7000	2000 4450	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	5950 12800	5350 11500	3250 7000			4050 9050	2550 5650	5430 17'8"

Illustration 94

g06774629

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 600 mm (24 inch) TG shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC














(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
 											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2500 5300	* 2450 * 5350	2200 4900	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3750 8000	3700 7950	2400 5150	* 2450 * 5300	1900 4200	6930 22'8"
1500 5'0"			* 7350 * 16000	6200 13400	5600 12000	3450 7450	3600 7700	2300 4950	* 2550 * 5600	1800 3950	7090 23'3"
0 0			* 6500 * 15000	5900 12700	5400 11550	3300 7100	3500 7500	2200 4750	* 2850 * 6250	1850 4000	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	5850 12600	5300 11400	3200 6900	3450 7450	2200 4700	3150 7000	2000 4450	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	5950 12800	5350 11500	3250 7000			4050 9050	2550 5650	5430 17'8"

Illustration 95

g06774629

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 600 mm (24 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC

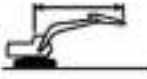












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
 											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2500 5400	* 2450 * 5350	* 2250 4950	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3750 8100	3750 8100	2450 5250	* 2450 * 5300	1950 4250	6930 22'8"
1500 5'0"			* 7350 * 16000	6300 13550	5650 12150	3500 7550	3650 7850	2350 5000	* 2550 * 5600	1850 4000	7090 23'3"
0 0			* 6500 * 15000	6000 12850	5450 11700	3350 7200	3550 7650	2250 4850	* 2850 * 6250	1850 4050	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	5950 12750	5400 11550	3250 7000	3500 7550	2200 4750	3200 7100	2050 4500	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6050 13000	5400 11650	3300 7100			4100 9150	2600 5750	5430 17'8"

Illustration 96

g06774632

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 700 mm (28 inch) TG shoe, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC














(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				
 											(mm) (ft/inch)
6000 20'0"					* 3550	* 3550			* 2600	* 2600	5440
					* 7900	* 7900			* 5800	* 5800	17'6"
4500 15'0"					* 3800	* 3800	* 3650	2550	* 2450	2250	6410
					* 8300	* 8300	* 7400	5450	* 5350	5000	20'10"
3000 10'0"			* 6400	* 6400	* 4650	3800	3800	2450	* 2450	1950	6930
			* 13700	* 13700	* 10100	8200	8150	5300	* 5300	4300	22'8"
1500 5'0"			* 7350	6350	* 5700	3550	3700	2350	* 2550	1850	7090
			* 18000	13700	* 12250	7650	7900	5100	* 5600	4050	23'3"
0 0			* 6500	6050	5500	3400	3600	2300	* 2850	1850	6930
			* 15000	13000	11850	7250	7700	4900	* 6250	4100	22'8"
-1500 -5'0"	* 4800	* 4800	* 9600	6000	5450	3300	3550	2250	3250	2050	6410
	* 10700	* 10700	* 20750	12900	11650	7100	7650	4850	7150	4550	20'11"
-3000 -10'0"	* 8650	* 8650	* 8250	6100	5500	3350			4150	2600	5430
	* 20000	* 20000	* 17750	13150	11800	7200			9250	5800	17'8"

Illustration 97

g06774635

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 770 mm (30 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)















(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
  											
6000 20'0"					* 3550 * 7900	* 3550 * 7900			* 2600 * 5800	* 2600 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2500 5350	* 2450 * 5350	2250 4950	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3750 8100	3750 8050	2450 5200	* 2450 * 5300	1950 4250	6930 22'8"
1500 5'0"			* 7350 * 18000	6300 13500	5650 12100	3500 7550	3650 7800	2350 5000	* 2550 * 5600	1800 4000	7090 23'3"
0 0			* 6500 * 15000	5950 12800	5450 11650	3350 7150	3550 7600	2250 4800	* 2850 * 6250	1850 4050	6930 22'8"
-1500 -5'0"	* 4500 * 10700	* 4800 * 10700	* 9500 * 20750	5950 12700	5350 11500	3250 7000	3500 7550	2200 4750	3200 7050	2050 4500	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6050 12950	5400 11600	3300 7100			4100 9100	2600 5700	5430 17'8"

Illustration 98

g06774638

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)













(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
6000 20'0"					* 3650 * 7900	* 3550 * 7900			* 2600 * 5800	* 2500 * 5800	5440 17'6"
4500 15'0"					* 3800 * 8300	* 3800 * 8300	* 3650 * 7400	2500 5400	* 2450 * 5350	2250 5000	6410 20'10"
3000 10'0"			* 6400 * 13700	* 6400 * 13700	* 4650 * 10100	3800 8150	3750 8100	2450 5250	* 2450 * 5300	1950 4300	6930 22'8"
1500 5'0"			* 7350 * 18000	6300 13600	* 5700 12200	3550 7600	3650 7850	2350 5050	* 2550 * 5600	1850 4000	7090 23'3"
0 0			* 6500 * 15000	6000 12900	5450 11750	3350 7200	3550 7650	2250 4850	* 2850 * 6250	1850 4050	6930 22'8"
-1500 -5'0"	* 4800 * 10700	* 4800 * 10700	* 9600 * 20750	5950 12800	5400 11550	3300 7050	3550 7600	2250 4800	3250 7100	2050 4500	6410 20'11"
-3000 -10'0"	* 8850 * 20000	* 8850 * 20000	* 8250 * 17750	6050 13000	5450 11700	3300 7150			4150 9200	2600 5750	5430 17'8"

Illustration 99

g06774642

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2500 mm (98 inch) stick, 500 mm (20 inch) TG shoe with MT pad, and 2470 kg (5445 lb) counter weight

**Reach Boom with a 2.8 m
(9 ft 2 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (inch)	1500 50'		3000 100'		4500 150'		6000 200'				(mm) (inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2450 5250	* 2250 * 4900	2000 4450	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3700 7950	3650 7850	2350 5100	* 2250 * 4900	1750 3850	7210 23'7"
1500 5'0"			* 8550 * 18400	6200 13300	* 5450 * 11750	3400 7350	3550 7550	2250 4850	* 2350 * 5150	1650 3600	7360 24'1"
0			* 6950 * 16050	5800 12400	5250 11300	3200 6900	3400 7350	2150 4650	* 2600 * 5750	1650 3650	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5700 12200	5150 11050	3100 6700	3350 7200	2100 4550	2900 6350	1850 4000	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 8600 * 18500	5750 12350	5200 11100	3150 6750			3600 7950	2250 5000	5780 18'8"
-4500 -15'0"			* 5900 * 5900						* 4050 * 10050	3750 9600	4130 12'1"

Illustration 100

g06775842

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC












(mm) (inch)	1500 50"		3000 100"		4500 150"		6000 200"				(mm) (inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2450 5250	* 2250 * 4900	2000 4450	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3700 7950	3650 7850	2350 5100	* 2250 * 4900	1750 3850	7210 23'7"
1500 5'0"			* 8550 * 18400	6200 13300	* 5450 * 11750	3400 7350	3550 7550	2250 4850	* 2350 * 5150	1650 3600	7360 24'1"
0			* 6950 * 16050	5800 12400	5250 11300	3200 6900	3400 7350	2150 4650	* 2600 * 5750	1650 3650	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5700 12200	5150 11050	3100 6700	3350 7200	2100 4550	2900 6350	1850 4000	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 8600 * 18500	5750 12350	5200 11100	3150 6750			3600 7950	2250 5000	5780 18'8"
-4500 -15'0"			* 5900 * 5900						* 4050 * 10050	3750 9600	4130 12'1"

Illustration 101

g06775842

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (ft/inch)	1500 50'		3000 100'		4500 150'		6000 200'				(mm) (ft/inch)
											
7500									* 2900	* 2900	4160
6000 200'									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 150'					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2500 5350	* 2250 * 4900	2050 4550	6710 21'10"
3000 100'			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3750 8050	3700 8000	2400 5200	* 2250 * 4900	1800 3950	7210 23'7"
1500 50'			* 8550 * 18400	6300 13550	* 5450 * 11750	3500 7500	3600 7700	2300 4950	* 2350 * 5150	1700 3700	7360 24'1"
0 0			* 6950 * 16050	5900 12650	5350 11550	3300 7050	3500 7500	2200 4700	* 2600 * 5750	1700 3750	7200 23'7"
-1500 -50'	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5800 12450	5250 11300	3200 6850	3450 7350	2150 4600	2950 6500	1850 4100	6710 21'11"
-3000 -100'	* 8000 * 18000	* 8000 * 18000	* 8800 * 18500	5900 12600	5300 11350	3200 6900			3650 8150	2300 5100	5780 18'9"
-4500 -150'			* 5900 * 5900						* 4050 * 10050	3800 9800	4130 12'1"

Illustration 102

g06775843

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 600 mm (24 inch) TG shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC












(mm) (ft/inch)	1500 50'		3000 100'		4500 150'		6000 200'				(mm) (ft/inch)
											
7500									* 2900	* 2900	4160
6000 200'									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 150'					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2500 5350	* 2250 * 4900	2050 4550	6710 21'10"
3000 100'			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3750 8050	3700 8000	2400 5200	* 2250 * 4900	1800 3950	7210 23'7"
1500 50'			* 8550 * 18400	6300 13550	* 5450 * 11750	3500 7500	3600 7700	2300 4950	* 2350 * 5150	1700 3700	7360 24'1"
0 0			* 6950 * 16050	5900 12650	5350 11550	3300 7050	3500 7500	2200 4700	* 2600 * 5750	1700 3750	7200 23'7"
-1500 -50'	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5800 12450	5250 11300	3200 6850	3450 7350	2150 4600	2950 6500	1850 4100	6710 21'11"
-3000 -100'	* 8000 * 18000	* 8000 * 18000	* 8800 * 18500	5900 12600	5300 11350	3200 6900			3650 8150	2300 5100	5780 18'9"
-4500 -150'			* 5900 * 5900						* 4050 * 10050	3800 9800	4130 12'1"

Illustration 103

g06775843

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 600 mm (24 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2550 5400	* 2250 * 4900	2100 4800	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3800 8150	3750 8100	2450 5250	* 2250 * 4900	1800 4000	7210 23'7"
1500 5'0"			* 8550 * 18400	8400 13750	* 5450 * 11750	3550 7600	3650 7800	2350 5000	* 2350 * 5150	1700 3750	7360 24'1"
0 0			* 6950 * 16050	6000 12650	5450 11700	3350 7150	3550 7800	2250 4800	* 2500 * 5750	1750 3800	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5900 12550	5350 11450	3250 6950	3500 7500	2200 4700	3000 6600	1900 4150	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 8600 * 18500	5950 12800	5350 11500	3250 7000			3700 8250	2350 5150	5780 18'9"
-4500 -15'0"			* 5900 * 5900						* 4050 * 10050	3850 9900	4130 12'1"

Illustration 104

g06775858

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 700 mm (28 inch) TG shoe, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC












(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)
											
7500									* 2900	* 2900	4160
6000 20'0"									* 2400 * 5250	* 2400 * 5250	5790 18'8"
4500 15'0"					* 3500 * 7650	* 3500 * 7650	* 3500 * 7550	2550 5450	* 2250 * 4900	2100 4650	6710 21'10"
3000 10'0"			* 5750 * 12350	* 5750 * 12350	* 4350 * 9450	3850 8250	* 3800 8200	2450 5300	* 2250 * 4900	1850 4050	7210 23'7"
1500 5'0"			* 8550 * 18400	6450 13850	* 5450 * 11750	3550 7650	3700 7900	2350 6050	* 2350 * 5150	1750 3800	7360 24'1"
0 0			* 6950 * 16050	6050 12950	5500 11800	3350 7200	3600 7700	2250 4850	* 2600 * 5750	1750 3850	7200 23'7"
-1500 -5'0"	* 4500 * 10100	* 4500 * 10100	* 9450 * 21000	5950 12750	5400 11600	3250 7000	3500 7550	2200 4750	3000 6650	1900 4200	6710 21'11"
-3000 -10'0"	* 8000 * 18000	* 8000 * 18000	* 8500 * 18500	6050 12950	5400 11650	3300 7050			3750 8350	2350 5250	5780 18'9"
-4500 -15'0"			* 5900	* 5900					* 4050 * 10050	3800 10000	4130 12'1"

Illustration 105

g06775861

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 770 mm (30 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)












(mm) (inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (inch)		
													
7500									* 2900	* 2900	4160		
6000 20'0"									* 2400	* 2400	5790		
4500 15'0"					* 3500	* 3500	* 3500	2500	* 5250	* 5250	18'8"		
3000 10'0"			* 5750	* 5750	* 7650	* 7650	* 7550	5400	* 2250	2100	6710		
1500 5'0"			* 12350	* 12350	* 9450	8150	8050	5200	* 4900	4000	23'7"		
0			* 8550	6350	* 18400	13650	* 5450	3500	3650	2300	* 2350	1700	7360
0			* 11750	7550	* 6950	5950	5450	3300	3500	2250	* 5150	3750	24'1"
-1500 -5'0"	* 4500	* 4500	* 16050	12750	11650	7100	7550	4750	* 2600	1700	7200		
-3000 -10'0"	* 9450	5850	5300	3200	3450	2200	3000	1900	* 6750	3750	23'7"		
-4500 -15'0"	* 8000	* 8000	* 21000	12600	11400	6900	7450	4650	3000	1900	6710		
	* 18000	* 18000	* 8600	5950	5350	3250			6550	4150	21'11"		
			* 5900	5900					3700	2350	5780		
									8200	5150	18'9"		
									* 4050	3850	4130		
									* 10050	9900	12'1"		

Illustration 106

g06775876

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)














(mm) (ft/inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"				(mm) (ft/inch)		
													
7500											* 2900	* 2900	4160
6000 20'0"											* 2400	* 2400	5790
4500 15'0"					* 3500	* 3500	* 3500	2550	* 2250	2100	6710		
3000 10'0"			* 5750	* 5750	* 4350	3800	3800	2450	* 2250	1800	7210		
1500 5'0"			* 12350	* 12350	* 9450	8200	8100	5250	* 4900	4000	237"		
0			* 8550	6400	* 5450	3550	3650	2350	* 2350	1700	7360		
0			* 18400	13750	* 11750	7600	7950	5000	* 5150	3750	24'1"		
-1500 -5'0"	* 4500	* 4500	* 9450	5900	5350	3250	3500	2200	3000	1900	6710		
-3000 -10'0"	* 10100	* 10100	* 21000	12650	11500	6950	7500	4700	6600	4150	21'11"		
-4500 -15'0"	* 8000	* 8000	* 8600	6000	5400	3250			3750	2350	5790		
	* 18000	* 18000	* 18500	12850	11550	7000			8250	5200	18'9"		
			* 5900	* 5900					* 4050	3900	4130		
									* 10050	9950	12'1"		

Illustration 107

g06775879

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 2800 mm (110 inch) stick, 500 mm (20 inch) TG shoe with MT pad, and 2470 kg (5445 lb) counter weight

**Reach Boom with a 3.0 m
(9 ft 10 inch) Stick and 2470 kg
(5445 lb) Counterweight**

500 mm (20 inch) Triple Grouser (TG) Shoe (GC) LC

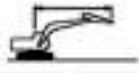













(mm) (inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (inch)
													
7500 250'												* 2600 * 5850	* 2600 * 5850 4490 14'1"
6000 200'							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850 6030 19'5"
4500 150'							* 3350 * 7300	2500 5300				* 2050 * 4500	1950 4250 6920 22'6"
3000 100'			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3700 8050	3650 7850	2400 5100				* 2050 * 4500	1700 3700 7400 24'2"
1500 50'			* 8200 * 17650	8250 13500	* 5300 * 11400	3450 7400	3550 7500	2250 4850	* 2400	1800		* 2150 * 4750	1600 3500 7550 24'9"
0 0			* 7250 * 16750	5800 12450	5300 11350	3250 6950	3400 7350	2150 4650				* 2400 * 5250	1600 3500 7400 24'3"
-1500 -50'	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	5700 12200	5150 11050	3100 6700	3350 7200	2100 4500				2750 6050	1750 3850 6910 22'7"
-3000 -100'	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	5750 12300	5150 11100	3100 6700	3400	2150				3350 7500	2100 4700 8020 19'7"
-4500 -150'			* 5400 * 13550	5950 12900								* 4000 * 8800	3300 7500 4480 14'4"

Illustration 108

g06775880

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Rubber Shoe (GC) LC

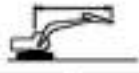













(mm) (#inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (#inch)
													
7500 25'0"												* 2600 * 5850	* 2600 * 5850 4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850 6030 19'5"
4500 15'0"							* 3350 * 7300	2500 5300				* 2050 * 4500	1950 4250 6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3700 8000	3650 7850	2400 5100				* 2050 * 4500	1700 3700 7400 24'2"
1500 5'0"			* 8200 * 17650	8250 13500	* 5300 * 11400	3450 7400	3550 7500	2250 4850	* 2400	1800		* 2150 * 4750	1600 3500 7550 24'9"
0 0			* 7250 * 16750	5800 12450	5300 11350	3250 6950	3400 7350	2150 4650				* 2400 * 5250	1600 3500 7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	5700 12200	5150 11050	3100 6700	3350 7200	2100 4500				2750 6050	1750 3850 6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	5750 12300	5150 11100	3100 6700	3400	2150				3350 7500	2100 4700 8020 19'7"
-4500 -15'0"			* 5400 * 13550	5950 12900								* 4000 * 8800	3300 7500 4480 14'4"

Illustration 109

g06775880

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Triple Grouser (TG) Shoe (GC) LC















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)	
														
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350 * 7300	2500 5400				* 2050 * 4500	1950 4350	5920 22'6"
3000 10'0"			* 5350	* 5350	* 4200	3800	* 3700	2450				* 2050 * 4500	1700 3800	7400 24'2"
1500 5'0"			* 8200	6400	* 5300	3500	3600	2300	* 2400	1650		* 2150 * 4750	1650 3550	7550 24'9"
0 0			* 7250	5900	5400	3300	3500	2200				* 2400 * 5250	1550 3600	7400 24'3"
-1500 -5'0"	* 4350	* 4350	* 9200	5800	5250	3200	3450	2150				2800 6200	1800 3900	6910 22'7"
-3000 -10'0"	* 7450	* 7450	* 8800	5650	5250	3200	3450	2200				3450 7650	2150 4800	6020 19'7"
-4500 -15'0"			* 6400	6050								* 4000 * 8800	3350 7650	4480 14'4"

Illustration 110

g06775882

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 600 mm (24 inch) TG shoe, and 2470 kg (5445 lb) counter weight

600 mm (24 inch) Rubber Shoe (GC) LC















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)		
															
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4480 14'1"	
6000 20'0"							* 2250	* 2250					* 2200 * 4850	* 2200 * 4850	6030 19'6"
4500 15'0"							* 3350	2500					* 2050 * 4500	1950 4350	5920 22'6"
3000 10'0"			* 5350	* 5350	* 4200	3800	* 3700	2450					* 2050 * 4500	1700 3800	7400 24'2"
1500 5'0"			* 8200	6400	* 5300	3500	3600	2300	* 2400	1650			* 2150 * 4750	1650 3550	7550 24'9"
0 0			* 7250	5900	5400	3300	3500	2200					* 2400 * 5250	1550 3600	7400 24'3"
-1500 -5'0"	* 4350	* 4350	* 9200	5800	5250	3200	3450	2150					2800 6200	1800 3900	6910 22'7"
-3000 -10'0"	* 7450	* 7450	* 8800	5650	5250	3200	3450	2200					3450 7650	2150 4800	6020 19'7"
-4500 -15'0"			* 6400	6050									* 4000 * 8800	3350 7650	4480 14'4"

Illustration 111

g06775882

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 600 mm (24 inch) rubber shoe, and 2470 kg (5445 lb) counter weight

700 mm (28 inch) Triple Grouser (TG) Shoe (GC) LC















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)
													
7500 25'0"												* 2600 * 5850	* 2600 * 5850 4490 14'1"
6000 20'0"							* 2250	* 2250				* 2200 * 4850	* 2200 * 4850 6030 19'8"
4500 15'0"							* 3350 * 7300	2550 5450				* 2050 * 4500	2000 4400 6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3850 8250	* 3700 * 8000	2450 5300				* 2050 * 4500	1750 3850 7400 24'2"
1500 5'0"			* 8200 * 17650	6450 13900	* 5300 * 11400	3550 7650	3550 7850	2350 5050	* 2400	1650		* 2150 * 4750	1650 3600 7550 24'9"
0 0			* 7250 * 16750	6000 12900	5450 11750	3350 7150	3550 7600	2250 4800				* 2400 * 5250	1650 3650 7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	5900 12600	5350 11450	3250 6950	3500 7450	2200 4700				* 2850 * 6250	1800 3950 6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	6950 12750	5350 11450	3250 6950	3500 7450	2200				3500 7750	2200 4850 6020 19'7"
-4500 -15'0"			* 6400 * 13550	6150 13250								* 4000 * 8800	3400 7750 4480 14'4"

Illustration 112

g06775883

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 700 mm (28 inch) TG shoe, and 2470 kg (5445 lb) counter weight

770 mm (30 inch) Triple Grouser (TG) Shoe (GC) LC















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)
													
7500 25'0"													* 2600 * 2600 4490 * 5850 * 5850 14'1"
6000 20'0"							* 2250 * 2250						* 2200 * 2200 8030 * 4850 * 4850 19'5"
4500 15'0"							* 3350 2600 * 7300 5500						* 2050 2000 5820 * 4500 4450 22'6"
3000 10'0"			* 5350 * 5350 * 11450 * 11450	* 4200 3850 * 9050 8300	* 3700 2500 * 8000 5350								* 2050 1750 7400 * 4500 3900 24'2"
1500 5'0"			* 8200 8550 * 17850 14050	* 5300 3800 * 11400 7750	* 3700 2350 7950 5100	* 2400 1700							* 2150 1650 7550 * 4750 3650 24'9"
0 0			* 7250 6050 * 16750 13050	5550 3350 11850 7250	3600 2250 7700 4850								* 2400 1700 7400 * 5250 3700 24'3"
-1500 -5'0"	* 4350 * 4350 * 9700 * 9700	* 9200 5950 * 21000 12750	5400 3250 11600 7000	3500 2200 7550 4750									* 2850 1850 5910 * 6250 4000 22'7"
-3000 -10'0"	* 7450 * 7450 * 16800 * 16800	* 8800 6000 * 19050 12850	5400 3250 11600 7000	3550 2250									3550 2200 6020 7850 4900 19'7"
-4500 -15'0"		* 8400 6200 * 13550 13350											* 4000 3450 4480 * 8800 7850 14'4"

Illustration 113

g06775884

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 770 mm (30 inch) TG shoe, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (Eagle Pad)















(mm) (Inch)	1500 6'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)
													
7500 25'0"													* 2600 * 2600 4490 * 5850 * 5850 14'1"
6000 20'0"							* 2250 * 2250						* 2200 * 2200 6030 * 4850 * 4850 15'8"
4500 15'0"							* 3350 2550 * 7300 5450						* 2050 2000 6920 * 4500 4400 22'6"
3000 10'0"			* 5350 * 5350 * 11450 * 11450	* 4200 3800 * 9050 8200	* 3700 2450 * 8000 5250								* 2050 1750 7400 * 4500 3800 24'2"
1500 5'0"			* 8200 6450 * 17650 13850	* 5300 3550 * 11400 7600	* 3550 2350 * 7800 5000	* 2400 1650							* 2150 1650 7550 * 4750 3600 24'9"
0 0			* 7250 6000 * 16750 12850	* 5450 3300 * 11700 7150	* 3550 2250 * 7550 4800								* 2400 1650 7400 * 5250 3600 24'3"
-1500 -5'0"	* 4350 * 4350 * 9700 * 9700	* 8200 5850 * 21000 12550	* 5300 3200 * 11400 6900	* 3450 2150 * 7450 4650									* 2850 1800 6910 * 6250 3950 22'7"
-3000 -10'0"	* 7450 * 7450 * 16800 * 16800	* 8800 5900 * 19050 12700	* 5300 3200 * 11400 6900	* 3500 2200									3500 2200 6020 7700 4850 19'7"
-4500 -15'0"		* 6400 6150 * 13550 13200											* 4000 3400 4480 * 8800 7750 14'4"

Illustration 114

g06775885

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe with eagle pad, and 2470 kg (5445 lb) counter weight

500 mm (20 inch) Triple Grouser (TG) Shoe LC (MT Pad)















(mm) (Inch)	1500 5'0"		3000 10'0"		4500 15'0"		6000 20'0"		7500 25'0"				(mm) (Inch)		
															
7500 25'0"												* 2600 * 5850	* 2600 * 5850	4490 14'1"	
6000 20'0"							* 2250	* 2250					* 2200 * 4850	* 2200 * 4850	6030 19'8"
4500 15'0"							* 3350 * 7300	2550 5450					* 2050 * 4500	2000 4400	6920 22'6"
3000 10'0"			* 5350 * 11450	* 5350 * 11450	* 4200 * 9050	3850 8250	* 3700 * 8000	2450 5300					* 2050 * 4500	1750 3850	7400 24'2"
1500 5'0"			* 8200 * 17650	6500 13950	* 5300 * 11400	3650 7650	3650 7850	2350 5050	* 2400	1650			* 2150 * 4750	1650 3600	7550 24'9"
0 0			* 7250 * 16750	6000 12900	5500 11750	3350 7200	3550 7600	2250 4800					* 2400 * 5250	1650 3650	7400 24'3"
-1500 -5'0"	* 4350 * 9700	* 4350 * 9700	* 9200 * 21000	5900 12650	5350 11500	3250 6950	3500 7500	2200 4700					* 2850 * 6250	1800 4000	6910 22'7"
-3000 -10'0"	* 7450 * 16800	* 7450 * 16800	* 8800 * 19050	5950 12750	5350 11500	3250 6950	3500 7500	2200					3500 7750	2200 4900	6020 19'7"
-4500 -15'0"			* 6400 * 13650	6150 13250									* 4000 * 8800	3450 7800	4480 14'4"

Illustration 115

g06775887

Lift Chart Above: 313GC, 4650 mm (183 inch) reach boom, 3000 mm (118 inch) stick, 500 mm (20 inch) TG shoe with MT pad, and 2470 kg (5445 lb) counter weight

Identification Information

i09732576

Plate Locations and Film Locations

SMCS Code: 1000; 7000

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

Serial Numbers will be used to identify engines, transmissions, and major attachments.

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

Product Identification Number (PIN) Plate



Illustration 116

g06276619

PIN plate location

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

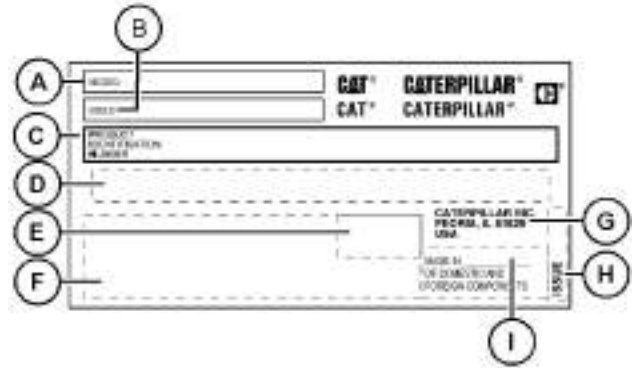


Illustration 117

g06201159

PIN plate

Model (A) _____

Build (B) _____

Product Identification Number (C) _____

Bar Code (D) _____

Month and/or Year of Manufacture Plate (If Required) (E) _____

Regional Certification Plate (If Required) (F) _____

Address of Manufacturer (G) _____

Issue (H) _____

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

Local regulation may require documentation of the Month and/or Year of Manufacture in the Operation and Maintenance Manual. Comply with these regulations.

Regional Product Marking (If Equipped)

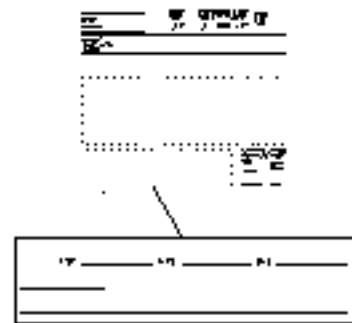


Illustration 118

g06650998

Regional marking plate

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

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

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



CE mark



UKCA mark



EAC mark



Gulf Standardization Organization (GSO) mark



Ukraine mark

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

- Engine Power Primary Engine (kW) _____
- Engine Power for Additional Engine (If Equipped) _____
- Typical Machine Operating Weight (kg) _____
- Month and/or Year of Manufacture _____
- Machine Type _____

Eurasian Economic Union

Manufacturer Information

Manufacturer:

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

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

CATERPILLAR CENTRAL ASIA LLP
Kunaev Str., 77, Almaty,
Medeu district 050000, Republic of Kazakhstan

Machine Specification Film

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

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

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

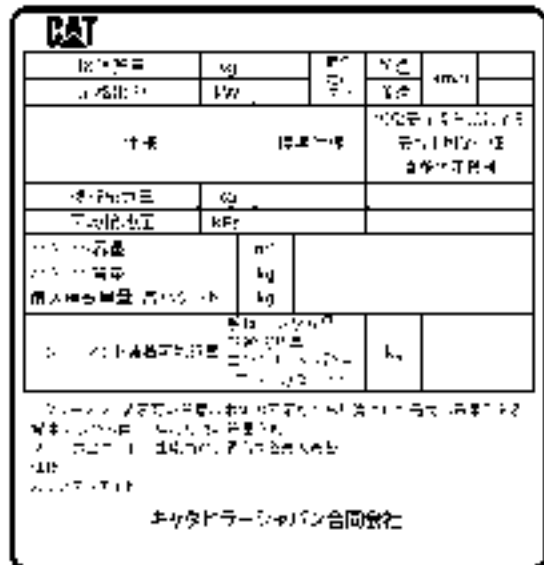


Illustration 119

g06178867

Typical example

Electromagnetic Emissions

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

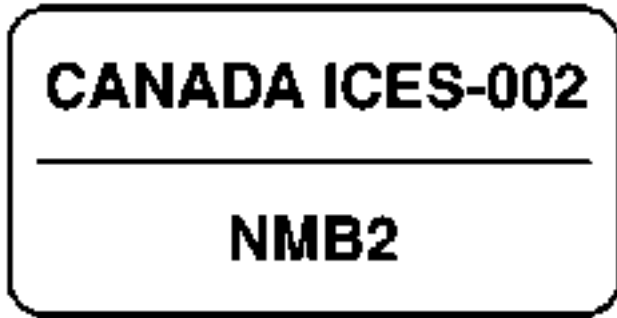


Illustration 120

g06063443

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

Roll Over Protective Structure (ROPS) / Falling Object Protective Structure (FOPS) Film



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 your Cat dealer to determine this structure's limitations without voiding its certification.



Illustration 121

g06344390

This safety message is on the left side of the machine near the cab door.

Certification for Rollover Protective Structure (ROPS) and for Falling Object Protective Structure (FOPS)

The unaltered ROPS or the FOPS structure meets the following standards for the ROPS at the time of installation: "ISO 3471-2008" and "GB/T 17922-2014". Also, the FOPS canopy meets the following standards at the time of installation: "ISO 3449-2005 LEVEL II" and "GB/T 17771-2010 LEVEL II".

The maximum mass of the machine, which includes the operator and the attachments without a payload, should not exceed the mass on the certification label.

Engine Serial Number

This label is on the engine.

Engine Serial Number _____

Sound Certification

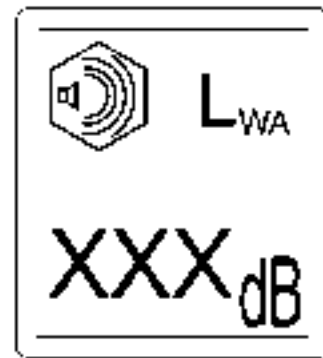


Illustration 122

g06675270

Sound certification film

A typical example of this film is shown.

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

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

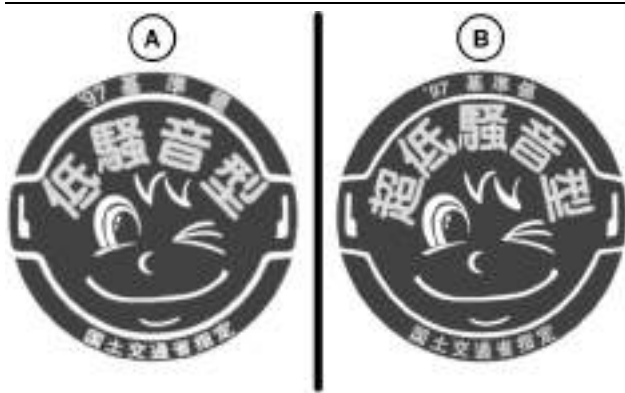


Illustration 123

g03105800

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

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

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

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

i05757951

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Note: This information is pertinent in Japan.



Illustration 124

g03654940

2014 certification label example

A certification label is located on the cab door.

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

i08756279

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Consult your Cat dealer for an Emission Control Warranty Statement.

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

Declaration of Conformity (European Union)

SMCS Code: 1000; 7000

Table 27

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

ORIGINAL EU DECLARATION OF CONFORMITY

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

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

Standards & Regulations Manager, Caterpillar France SAS
40 Avenue Leon-Blum 38000 Grenoble, France

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

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Hydraulic Excavator
	Model/Type:	313 GC
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfills all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2000/14/EC amended by 2005/88/EC, Note (1)		
2006/42/EC	N/A	
2014/30/EU	N/A	

Note (1) Guaranteed Sound Power Level - _____dB (A) Annex VI
Representative Equipment Type Sound Power Level - _____dB (A)
[Engine Power per ISO 14396 - _____ kW, Rated engine speed - _____ rpm
Technical Documentation accessible through person listed above authorized to compile the Technical File

Done at:

Signature

Date:

Name/Position

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

Declaration of Conformity (Great Britain)

SMCS Code: 1000; 7000

Table 28

A Declaration of Conformity document was provided with the machine if it was manufactured to comply with specific requirements for the Great Britain. In order to determine the details of the applicable legislation, review the complete Declaration of Conformity provided with the machine. The extract shown below from a Great Britain Declaration of Conformity for machines that are declared compliant to 2008 No. 1597 applies only to those machines originally "UKCA" marked by the manufacturer listed and which have not since been modified.

DECLARATION OF CONFORMITY

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

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

Standards & Regulations Manager Caterpillar France SAS
40 Avenue Leon-Blum 38000 Grenoble, France

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

Description:	Generic Denomination:	Earth - moving Equipment
	Function:	Hydraulic Excavator
	Model/Type:	313 GC
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfills all the relevant provisions of these regulations and/or other enactments as listed below:

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

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

Note (2) If applicable, information related to Approved Body.

Done at:

Signature

Date:

Name/Position

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

Operation Section

Before Operation

i07103304

Mounting and Dismounting

SMCS Code: 6700; 7000



Illustration 125

g06224270

Typical example

Mount the machine and dismount the machine only at locations that have steps and/or handholds. Before you mount the machine, clean the steps and the handholds. Inspect the steps and handholds. Make all necessary repairs.

Face the machine whenever you get on the machine and whenever you get off the machine.

Maintain a three-point contact with the steps and with the handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

Do not mount a moving machine. Do not dismount a moving machine. Never jump off the machine. Do not carry tools or supplies when you try to mount the machine or when you try to dismount the machine. Use a hand line to pull equipment onto the platform. Do not use any controls as handholds when you enter the operator compartment or when you exit the operator compartment.

Machine Access System Specifications

The machine access system has been designed to meet the intent of the technical requirements in “ISO 2867 Earth-moving Machinery – Access Systems”. The access system provides for operator access to the operator station and to conduct the maintenance procedures described in Maintenance section.

Alternate Exit

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

i09682045

Daily Inspection

SMCS Code: 1000; 6319; 6700; 7000

WARNING

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

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

Steam can cause personal injury.

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

Remove the cooling system pressure cap slowly to relieve pressure.

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

NOTICE

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

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

First 100 Hours

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

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

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

Daily Basis

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

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

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

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



Illustration 126

g06181597

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

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

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

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

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



Illustration 127

g06181620

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

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

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

Operation Section
Daily Inspection

Inspect the swing drive for leaks.

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

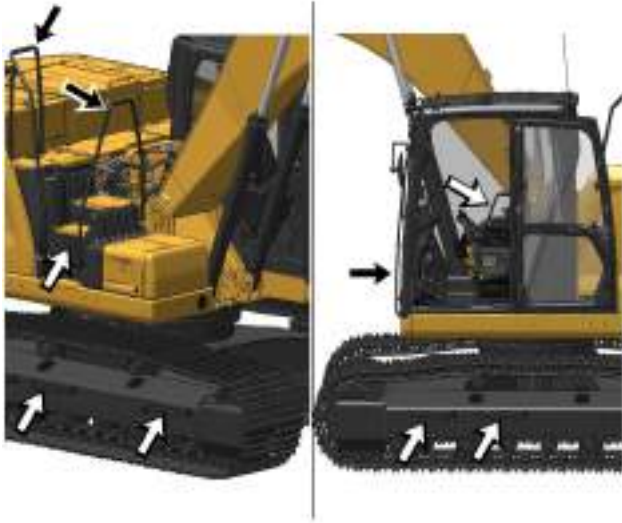


Illustration 128

g06181696

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

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

Adjust the mirrors to achieve the best visibility.

Machine Operation

i06952448

Alternate Exit

SMCS Code: 7310

Rear Window with Ring Seal (If Equipped)

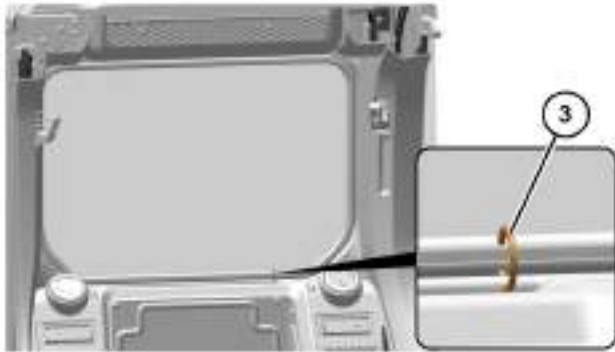


Illustration 129

g06187008



Alternate Exit – The rear window serves as an alternate exit.

To remove the rear window, pull ring (3) and completely remove the window seal, then push out the glass. Climb through the rear window opening to exit the cab.

Rear Window with Lever (If Equipped)



Illustration 130

g06213470

Inside lever in latched position



Alternate Exit – The rear window serves as an alternate exit.

To remove the rear window, rotate handle from its latched position, then push out the glass. Climb through the rear window opening to exit the cab.

i07868899



Illustration 131

g06213471

The window is also equipped with an outside handle. If the operator is unable, outside personnel can rotate the outside handle and pull the window out.

Seat

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

Comfort Seat



Illustration 132

g06225151

- (1) Headrest
- (2) Backrest adjuster
- (3) Seat and console fore and aft adjuster
- (4) Indicator
- (5) Seat height adjustment lever
- (6) Seat fore and aft lever

The operator can adjust the height of headrest (1). To adjust the headrest, hold the headrest with both hands. Move the headrest up and down. Release the headrest when the desired position is attained. The headrest will remain in the desired position.

Pull up on backrest adjuster (2) to release the lock. Move the backrest to the desired position and then release the adjuster.

Lift up on fore and aft adjuster (3) to release the seat from the locked position. Adjust the seat and console forward or rearward to the desired position and then release the lever to lock the seat.

Use seat height adjustment lever (5) to adjust the seat for the operator's height and weight. Move the adjuster switch to the "+" symbol to raise the height. Ratchet the seat upward without sitting in the seat. Then sit in the seat to check the color of indicator (4). When the indicator is showing green, the seat is in the right range for the operator. Further adjustment can be made as long as the indicator stays green.

To lower the seat, move the adjust switch to the "-" symbol. Ratchet the adjuster downward without sitting in the seat. Then sit in the seat to check the color of indicator (4). When the indicator is showing green, the seat is in the right range for the operator. Further adjustment can be made as long as the indicator stays green.

Pull upward on seat fore and aft lever (6) to release the cushion lock. Adjust the seat cushion forward or backward to the desired position and then release the lock to lock the cushion in place.

i07092308

Seat Belt

SMCS Code: 7327

Note: This machine was equipped with a seat belt when the machine was shipped from Caterpillar. At the time of installation, the seat belt and the instructions for installation of the seat belt meet the SAE J386 and ISO 6683 standards. Consult your Cat dealer for all replacement parts.

Always check the condition of the seat belt and the condition of the mounting hardware before you operate the machine.

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt



Illustration 133

g06223891

Pull seat belt (2) out of retractor (1) in a continuous motion.

Fasten seat belt catch (3) into buckle (4). 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 134

g06223894

Push the release button on the buckle to release the seat belt. The seat belt will automatically retract into the retractor.

Extension of the Seat Belt

WARNING

When using retractable seat belts, do not use seat belt extensions, or personal injury or death can result.

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

Longer, non-retractable seat belts and extensions for the non-retractable seat belts are available.

Caterpillar requires only non-retractable seat belts to be used with a seat belt extension.

Consult your Cat dealer for longer seat belts and for information on extending the seat belts.

i09683042

Operator Controls

SMCS Code: 7300; 7301; 7451

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

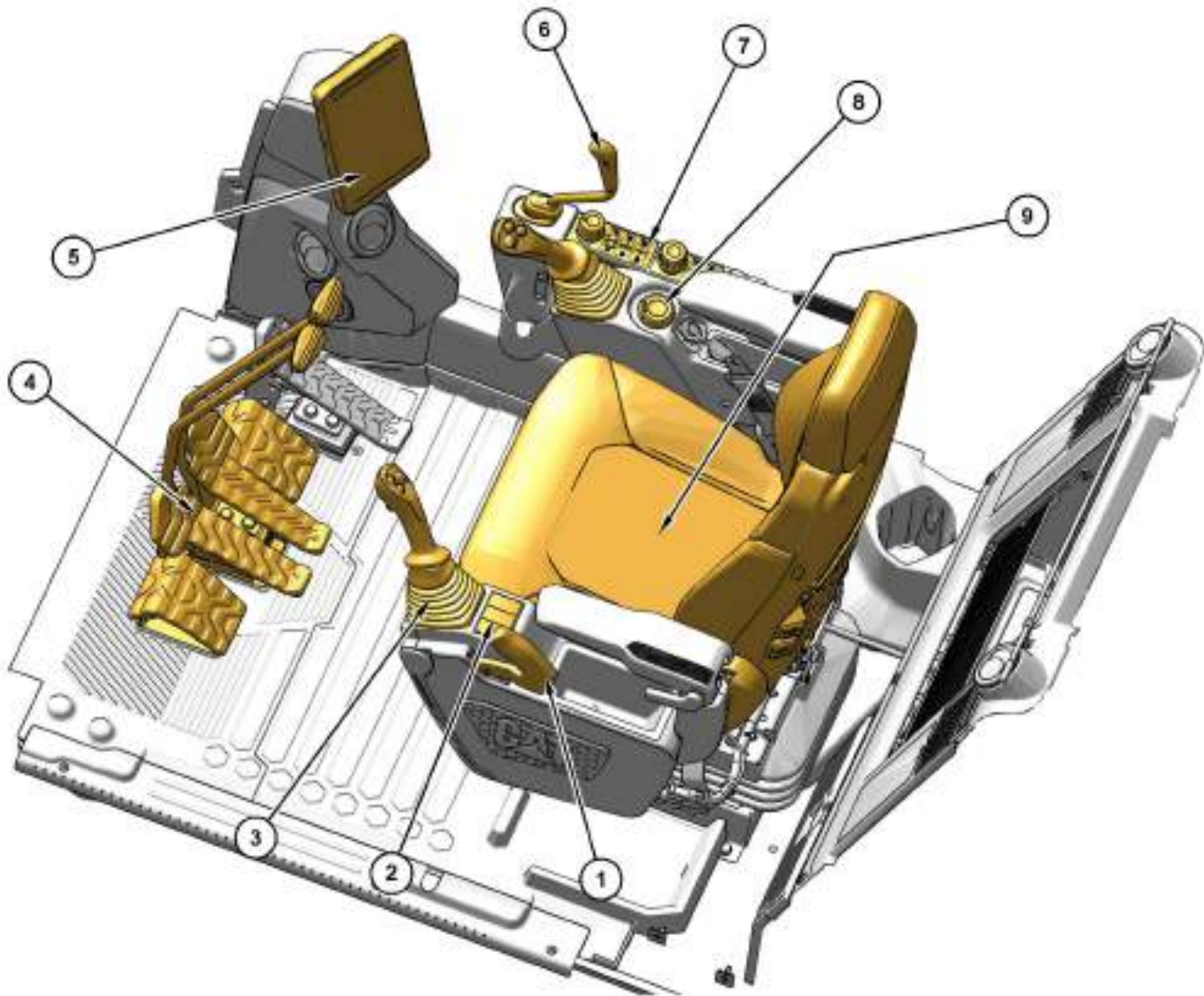


Illustration 135

g06510137

(1) Hydraulic lockout control
(2) Left side switch panel
(3) Joystick controls

(4) Travel controls
(5) Monitor
(6) Blade Control

(7) Right side switch panel
(8) Engine start switch
(9) Operator seat

Hydraulic Lockout Control (1)

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



Locked – Move the travel levers/pedals and move the joysticks to the HOLD (center) position. Move the lever for the hydraulic lockout control backward to the LOCKED position. All the factory installed hydraulic controls will become inoperable.



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

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



Tilt – For machines equipped with the tilt-up console, pull the lever to the rear most position to release the console lock and tilt the console upward for easier exit and entry.

Left Side Switch Panel (2)



Illustration 136

g06219690

Beacon Light Switch (2A) (If equipped)



Beacon Light Switch – Push the top of the switch to turn on the beacon light. Push the bottom of the switch to turn off the beacon light.

Quick Coupler Control (2B) (If equipped)



Quick Coupler Control

If equipped, the switch for the quick coupler control is on the left console. The switch is equipped with a spring loaded lock button. To operate the switch, the lock button must be pushed forward to release the switch. With the lock held forward, press the rear of the switch downward to uncouple the bucket or work tool. Press the button again to attach the bucket or work tool.

Note: An alarm will sound whenever the switch has been activated to lock or unlock a work tool.

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

Joystick Controls (3)

The joystick control is used to control the functions of the machine implements. For more information on the individual functions of the joysticks, refer to “Joystick Controls”.

Travel Control (4)



Illustration 137

g06178249

Position for normal travel

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

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

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

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

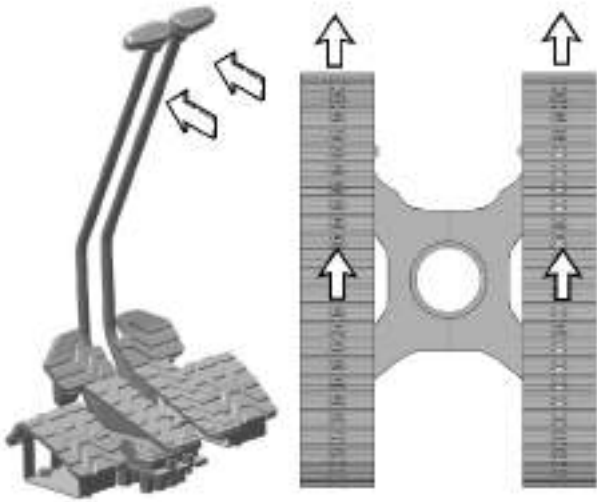


Illustration 138
FORWARD travel

g06178269

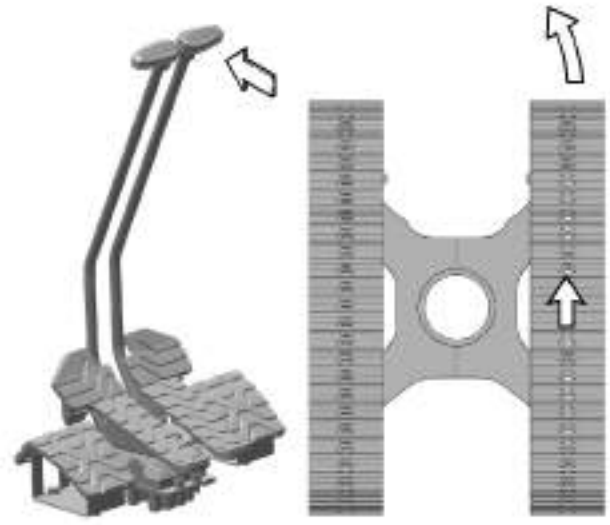


Illustration 140
Pivot left turn (FORWARD)

g06178288

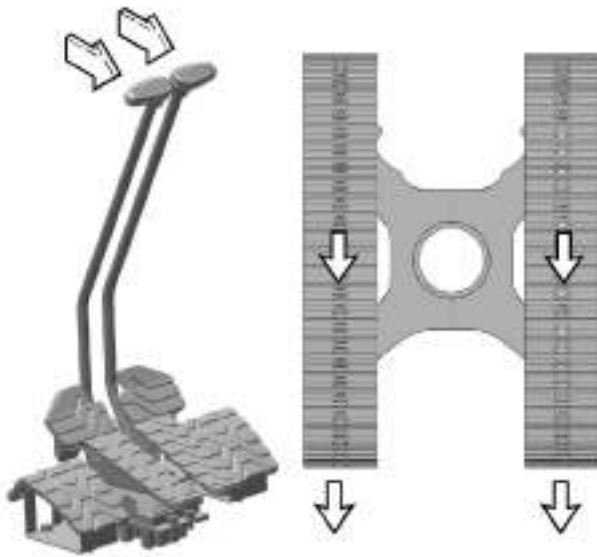


Illustration 139
REVERSE travel

g06178283

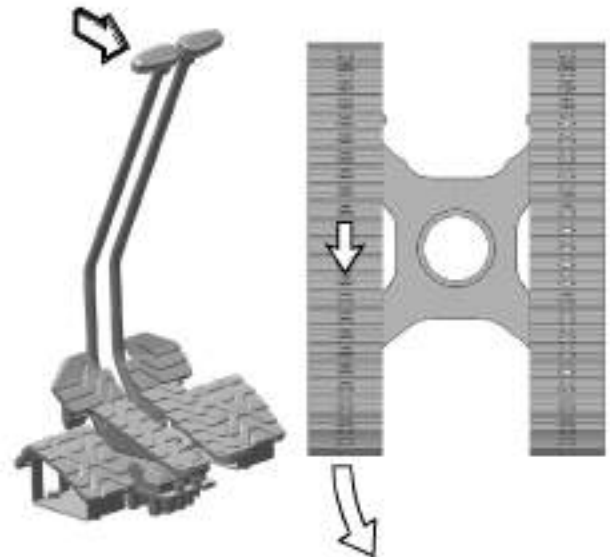


Illustration 141
Pivot Left Turn (REVERSE)

g06178294

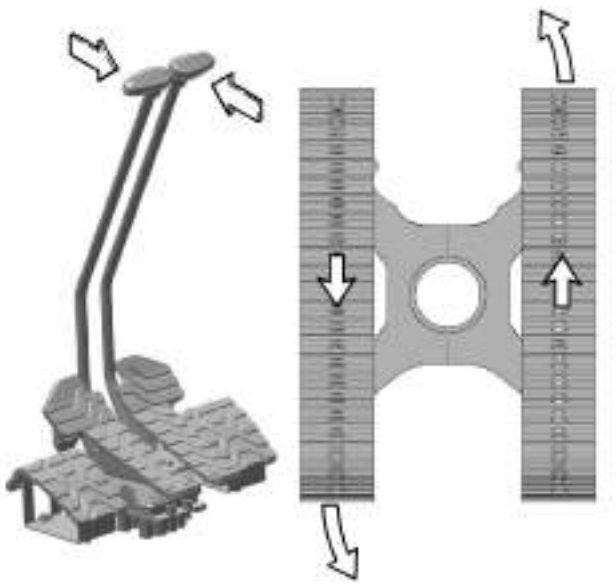


Illustration 142
Counterrotate turn (LEFT)

g06178300

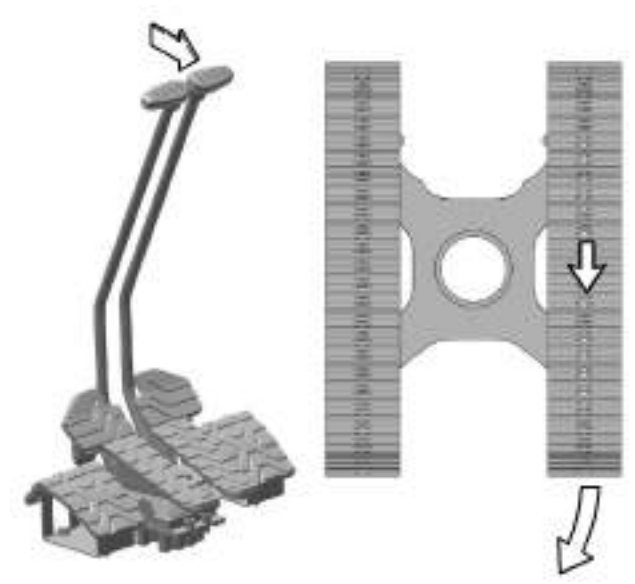


Illustration 144
Pivot right turn (REVERSE)

g06178308

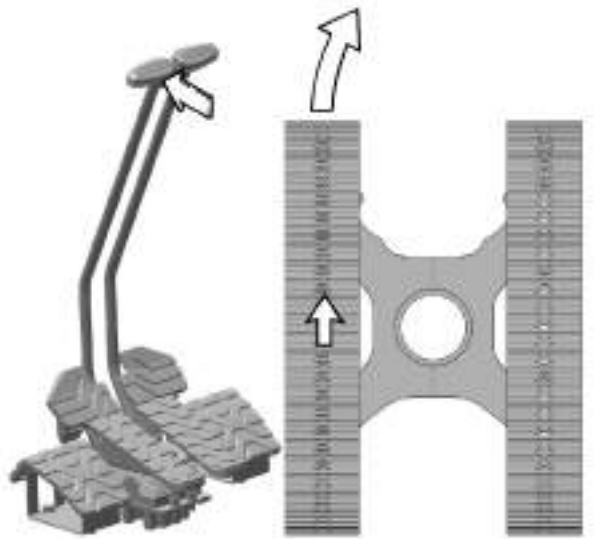


Illustration 143
Pivot right turn (FORWARD)

g06178305

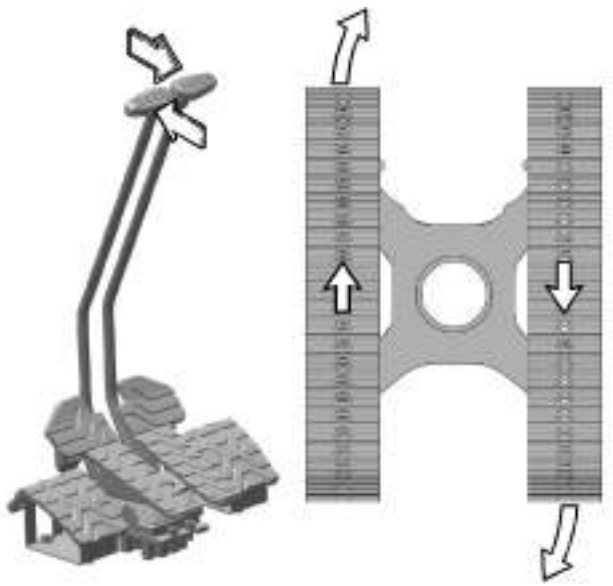


Illustration 145

g06178313

Counterrotate turn (RIGHT)

Monitor (5)

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

Blade Control (6)

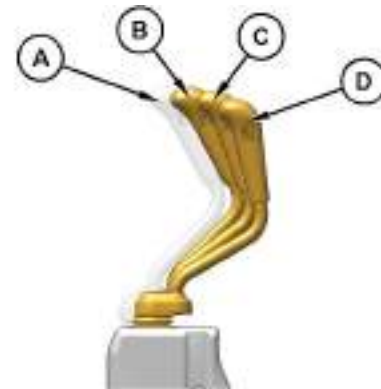


Illustration 146

g06571650

NOTICE

Avoid hitting or moving rocks using the blade. Blade and cylinder damage could occur.

When curling the front attachment, do not allow the bucket to hit the blade.

The blade is not intended to be used for machine stabilization. Do not use the blade as an outrigger or stabilizer.

During digging operation, do not allow the boom cylinder to contact the blade edge. When no blade operation is needed, operate with the bucket on the opposite side of the machine from the blade.

Do not swing the upper structure with cab door and/or upper structure covers opened. An opened door and/or cover can hit the blade when the blade is in the raised position while the machine is swinging.



Float (A) – Push the lever forward past the detent to activate the blade float function. The float function is not deactivated when the lever is released into the NEUTRAL position. When in float, the blade moves up and down with the ground contour. Display indicates that float is active. Float will be deactivated if the lever is moved through the HOLD position to the RAISE or the LOWER position at least 6° degrees from the HOLD position.

Note: 6° degree should be evaluated by operator



Lower (B) – Push the lever forward to lower the blade. Blade lower movement speed can be controlled by how far the lever is pushed forward. Releasing the lever will return to the HOLD position.

Hold (C) – The lever will return to the HOLD position when you release the lever from the RAISE position,

or from the LOWER position. The movement of the bulldozer blade stops in the up and down direction. If the lever is released from the float position, the float function remains active.



Raise (D) – Pull back on the lever to raise blade. Blade raise movement speed can be controlled by how far the lever is pulled back. Releasing the lever will return to the HOLD position.

Engine Start Switch (8)

NOTICE

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

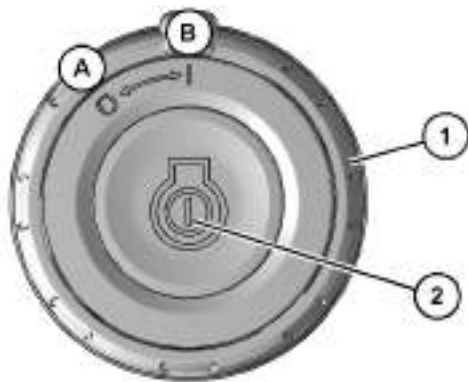


Illustration 147

g06180554

- (A) Off
- (B) On
- (1) Engine start ring
- (2) Start button



OFF – Turn the engine start ring (1) to the OFF position (A) to stop the engine.



ON – To activate the electrical circuits in the cab and enable engine starting, turn the engine start ring (1) clockwise to the ON position (B).



START – To start the engine, enter the code on the monitor. Press start button (2). After the engine starts, release the button.

Note: Pressing the start button with the engine on will also turn off the engine.

Operator's Seat (9)

There are different options for operators seats. Each operator seat and console have various adjustments to meet a wide range of operators. For more information, refer to "Seat".

Tilt-Up Console (9A)

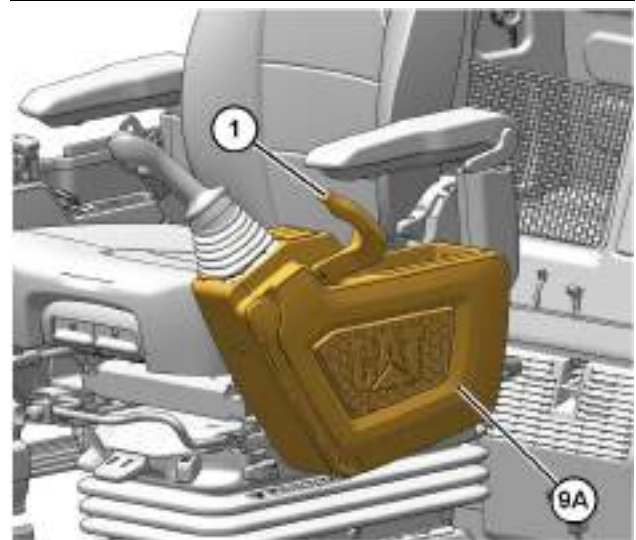


Illustration 148

g06226523

- (1) Hydraulic lockout control
- (9A) Tilt-up console

Some optional seats are equipped with a tilt-up console. The console can be tilted upward for easier exit and entry. The console is unlocked by pulling the hydraulic lockout control (1) to the rear-most position. The console will then tilt upward. Simply push the console downward until the console locks into place when ready for use.

Right Side Switch Panel (7)

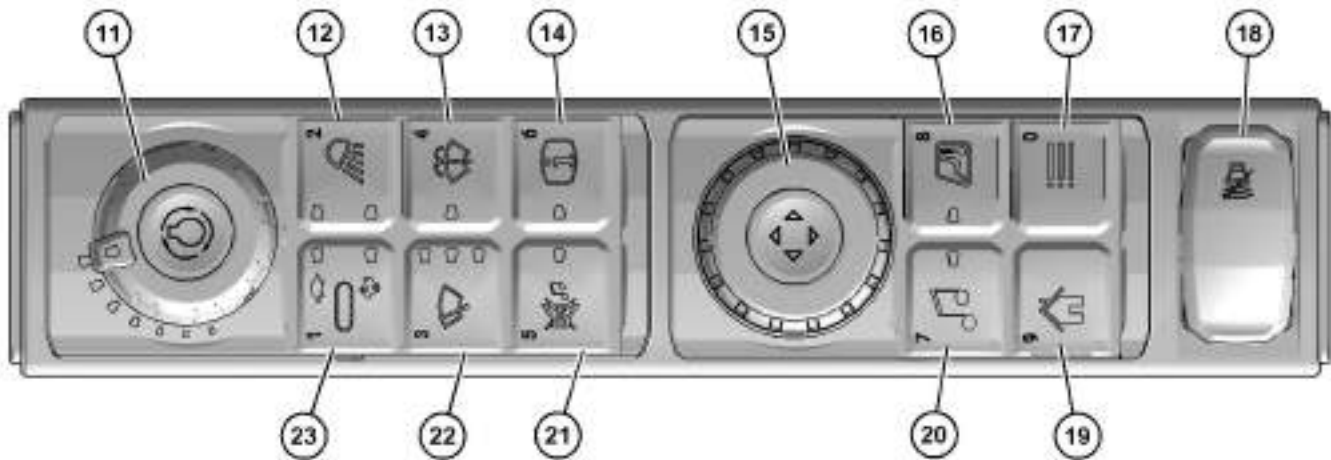


Illustration 149

g06495724

Right side switch panel

- | | | |
|--|--------------------------------------|---------------------------|
| (11) Engine speed / power mode control | (16) Heating and air conditioning | (21) Radio mute switch |
| (12) Light switch | (17) Next menu | (22) Window wiper |
| (13) Window washer | (18) Travel alarm mute (If Equipped) | (23) Travel speed control |
| (14) Operator Information | (19) Home | |
| (15) Jog dial | (20) Radio control | |

Note: In addition to the intended functions, the buttons on the switch panel are numbered from 0-9. The numbered buttons can be used to enter numbers into the monitor for screens such as the passcode screen.

Engine Speed / Power Mode Control (11)

Engine Speed Control – Turn the dial to control the engine speed (engine rpm). Select the desired position from the seven available positions. Turn the dial counterclockwise to decrease the engine speed (engine rpm). Turn the dial clockwise to increase the engine speed (engine rpm).



Power Mode Control – Push in the dial to change the power mode settings. The Power Mode Control allows the operator to choose what power mode to operate the engine. The modes that can be selected are: “ECONOMY”, “SMART”, and “POWER”.

Note: The default power mode setting can be set within the monitor. For more information, refer to Operation and Maintenance Manual, “Monitoring System”.

Note: “ECONOMY” mode is **not** available on GC models.

Light Switch (12)

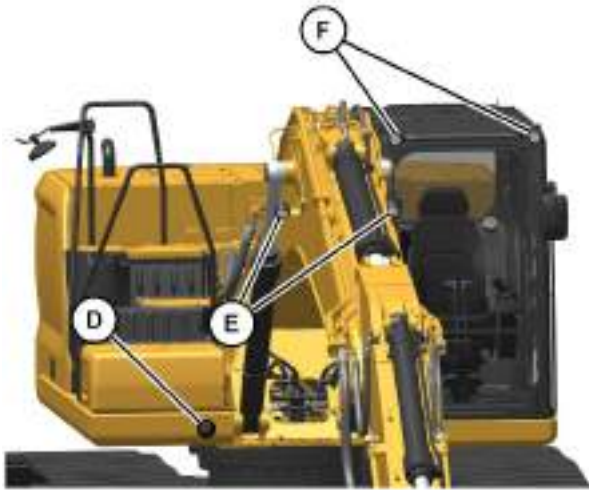


Illustration 150

g06178337



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

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

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

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

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

Note: Your machine may be equipped with a premium surrounding lighting package with left side, right side and rear lights. Refer to “Monitoring System” for more information on work light control.

Note: Your machine may be equipped with a lighting system that has a time delay. When this system is installed, the exterior lights will not turn off for a predetermined amount of time after the engine start switch has been turned to the OFF position. Refer to M0109053, “Next Generation Hydraulic Excavator Monitoring System Supplement”, Application Menu, Lighting Shutdown Timer for more information.

Window Washer (13)



Window Washer (13) – Push the switch to activate the window washer. While the switch is depressed, the indicator light will come on and washer fluid will spray from the nozzle. The window wiper will also operate while the switch is depressed. After the switch is released for approximately 3 seconds, the window wiper will stop.

NOTICE

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

NOTICE

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

Operator Information (14)



Operator Information Button (14) – Press and hold this button to view the operator information screen. The indicator light will illuminate when the button is pressed.

Jog Dial (15)

The jog dial can be used to select items displayed on the monitor screen. The dial can be rotated 360 degrees. The dial can also be moved left, right, up, and down. The dial can be pushed in to make a selection.

Air Conditioning and Heating (16)



Air Conditioning and Heating (16) – Press this button to bring up the air conditioning and heating menu. The indicator light will illuminate when the heating and cooling system is active. The jog dial (15) can be used to make selections. If equipped with a touch screen, the selections can be made by touching the monitor.

Refer to “Air Conditioning and Heating Control” for more information.

Next Menu (17)



Next Menu (17) – Press the next menu button to access the next higher menu. If there is not a menu above the current screen being viewed, the button will not do anything.

Refer to “Monitoring System” for more information.

Travel Alarm Mute Switch (18) (If Equipped)



Travel Alarm Mute Switch (18) – Press travel alarm mute switch (18) to mute the travel alarm.

Note: The travel alarm will sound when the travel levers or the travel pedals are activated.

Home (19)



Home Key (19) – Press the home key to return to the default display at any time.

Refer to “Monitoring System” for more information.

Radio Control (20)



Radio Control (20) – Press this button to display the radio controls on the monitor. The indicator light on the button will illuminate when the radio is turned on. Use jog dial (15) to make selections. If equipped with a touch screen display, touch the icons on the screens to make a selection.

Refer to “Radio” for more information.

Radio Mute (21)



Radio Mute (21) – Press radio mute switch (21) to mute the radio. The indicator light will illuminate when mute is activated. Press the button again to unmute the radio.

Window Wiper (22)



Window Wiper (22) – Push the switch to activate the window wiper. Whenever the switch is depressed, the mode of the window wiper will change according to the indicator light that is illuminated.

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

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

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

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

Travel Speed Control (23)



WARNING

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

Personal injury can result from sudden changes in machine stability.



Travel Speed Control Switch (23) – Press the travel speed control switch to select automatic travel speed or low travel speed. When the engine start switch is on, the travel speed control switch is always set at the LOW SPEED position. Whenever the travel speed control switch is pressed, the travel speed changes. The indicator lights illuminate to show which speed selection is active.



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



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

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

USB/Aux Ports (If Equipped) (24)

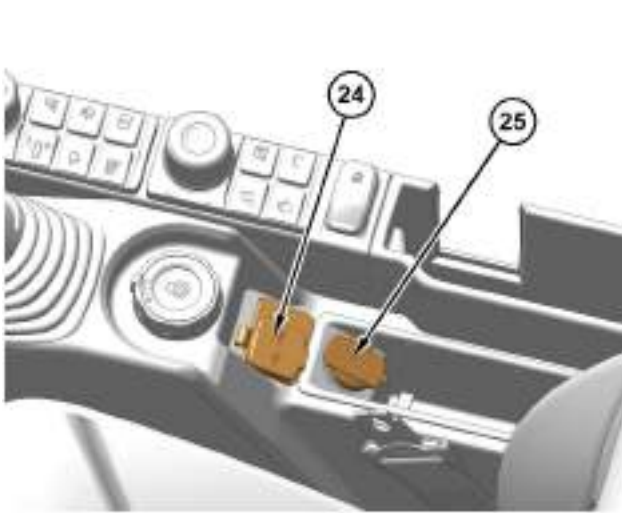


Illustration 151

g06495726

(24) USB/AUX/MIC port
(25) 12 V socket



USB – The USB port is used to play music from a portable device. The USB symbol on the radio screen on the monitor must be selected.

AUX – The AUX port is used to play music from a portable device. AUX must be selected on the radio screen on the monitor.

12V Power Receptacle (25) & (26)

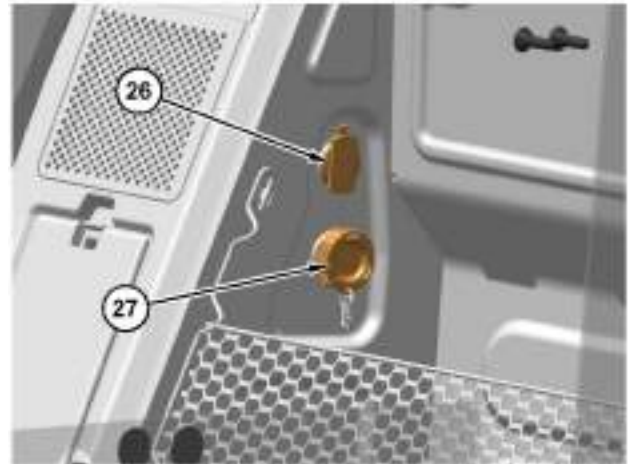


Illustration 152

g06495727

Electronic Technician service port



12V Power Receptacle – The power receptacles can be used to power automotive electrical equipment or accessories. The power receptacle only operates when the engine start switch is in the ON position.

Service Port (27)

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

Contact your Cat® dealer for additional information.

Dome Light (28)

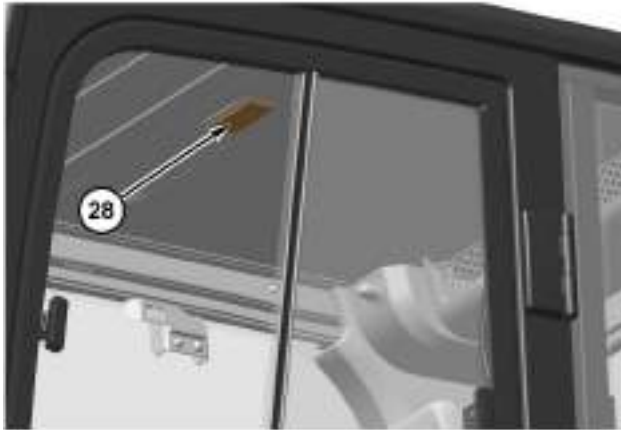


Illustration 153

g06495730

The dome light has three different positions. When the dome light is in the center position (horizontal), the light will come on when the door is open and shut off when the door is closed.

When the left side of the light is pressed, the lamp will be inoperable.

When the right side of the light is pressed, the lamp will be illuminated until the lamp is switched to another position.

i08019814

Battery Disconnect Switch

SMCS Code: 1411-B11



Illustration 154

g06496674

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

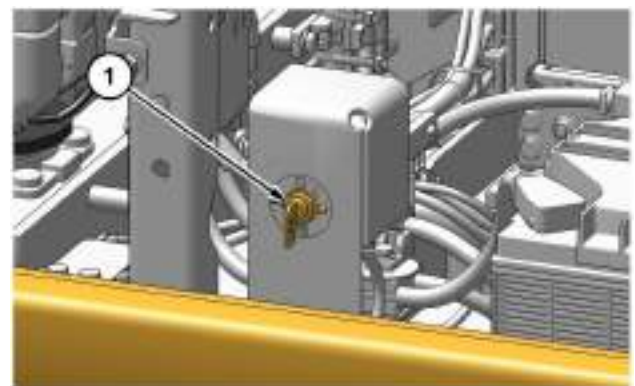


Illustration 155

g06510155

(1) Battery disconnect switch



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



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



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

position.

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

Turn the battery disconnect switch to the OFF position and remove the key when you service the electrical system or any other machine components. If installed with a cover lock, close the cover and install a padlock.

Turn the battery disconnect switch to the OFF position and remove the key if you do not operate the machine for extended periods of a month or more. Turning off the disconnect switch will prevent the battery from being discharged.

A good practice is to use the disconnect switch after you operate the machine. Turning off the disconnect switch will prevent the battery from being discharged. The following problems can cause battery discharge:

- short circuits
- current draw via some components
- vandalism

i09603786

Product Link

SMCS Code: 7490; 7606

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

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

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

Data Broadcasts

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

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

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

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

Operation in a Blast Site for Product Link Radios

WARNING

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

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

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

- Operation and Maintenance Manual, SEBU8142, “Product Link - PL121, PL321, PL522, and PL523”
- Operation and Maintenance Manual, SEBU8832, “Product Link PLE702, PLE602, PLE601, PL641, PL631, PL542, PL240, PL241, PL243, PL141, PL131, PL161, PL083 and PL042 Systems”

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

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

- Special Instruction, REHS9111, “Installation Procedure for the Pro Product Link PL641 and PL631 Systems”
- Special Instruction, M0098124, “Installation Procedure for Pro Product Link PL243 Cellular Radio Systems”
- Special Instruction, M0109130, “Installation Procedure for the Elite Product Link PLE602, PLE602p, PLE702, PLE643, PLE643p, and PL743 Systems”
- Special Instruction, M011437, “Installation Procedure for the Elite Product Link PLE602, PLE602p, PLE702, PLE683, PLE683p, and PL783 Systems”

i09607754

Machine Security System

SMCS Code: 7631

General Information

NOTICE

This machine may be equipped with a Cat® Machine Security System (MSS) and may not start under certain conditions.



Illustration 156

g06223917

Machines that are equipped with Cat® MSS can be identified by a decal in the operator station. Read the following information and know your machines settings. Your Cat® dealer can identify your machine settings.

The Cat® Machine Security System (MSS) discourages unwanted operation of a machine. When armed, the MSS requires operator login to start the engine. The following methods of operator login to disarm the security system are available:

- Cat® Bluetooth key fob
- Cat® App: Fleet management
- Passcode

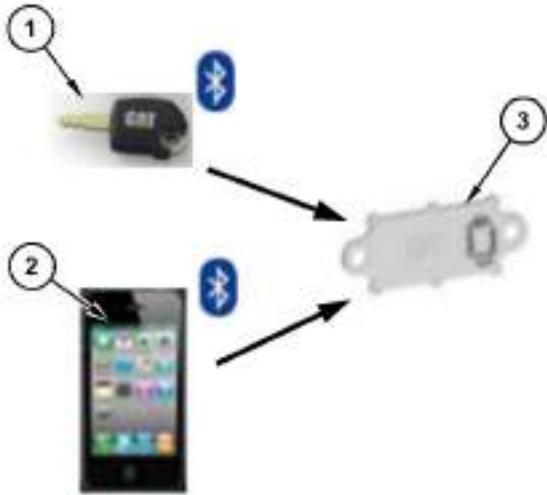


Illustration 157

g06212167

Bluetooth Connections

- (1) Cat[®] Bluetooth key fob (CATBTFOB)
- (2) Cat[®] App: Fleet Management mobile application
- (3) Cat[®] Bluetooth transceiver (CATBTNT)

Cat[®] Bluetooth key fob (1) contains an electronic chip. The electronic chip has a unique identification number (ID). A Bluetooth transceiver is mounted in the cab to read the ID of the key. The Bluetooth transceiver module translates the information received from the key fob into a J1939 message. This message is sent to the Electronic Control Module (ECM) that is connected to the MSS. The ECM is typically the Machine ECM. The ECM is set up with the ID of the keys of the intended users.

When the MSS is armed, the ECM validates the ID of the key fob. If the key ID is on the list of authorized keys in the ECM and the key is valid, the machine will operate normally. If the key ID is not on the list of authorized keys in the ECM or is not valid, the MSS will keep the critical machine functions disabled.

Note: A Bluetooth enabled phone can disarm MSS if the phone is on the list. Operator Management System (OMS) is necessary to be able to add phones to the vehicle ID list. After the phone is added, OMS is no longer needed for the Cat[®] App: Fleet management mobile application to function as a valid key.

If the MSS is not installed, the operator can skip the login and the machine will operate normally.

Components

The Machine Security System (MSS) consists of the following components:

- Electronic Control Module (ECM)

- Cat[®] Bluetooth key fob (CATBTFOB)
- Machine display
- Bluetooth transceiver module (CATBTNT)
- Engine start switch

System Overview

The Machine Security System (MSS) is designed to restrict operation of a machine. A list of the authorized electronic keys and passcodes for a machine is contained in the ECM for the MSS. A valid bluetooth key fob, mobile application, or passcode can disarm the MSS. If the MSS is disabled or not installed, any operator may access critical machine functions.

The Cat[®] Electronic Technician (Cat[®] ET) service tool can be used to program the ECM with the authorized keys and passcodes. Bluetooth devices and passcodes can be registered using the in-cab display if the operator is logged in to the system using a master access account.

When the engine start switch is turned to the ON position, the display boots up. If Bluetooth detection is enabled, the transceiver will receive a signal from any bluetooth key that is present or from the mobile application. The ECM will then compare this ID to the list of authorized keys.

Note: If multiple devices are present, the first valid device detected by the transceiver will be read.

If the ID of the key matches an authorized key, the status indicator on the engine start switch will turn a green color and the MSS will disarm. This disarming will allow the operator access to critical functions of the machine.

If the ID of the key that is read does not match the list in the ECM, the status indicator will remain a red color. The MSS remains in the "armed" state and the machine will remain disabled.

If the MSS is disabled and the ID of the key matches an authorized key, the operator will be identified and allowed access to the critical machine functions. The operator will be able to save configurations and start the machine.

If the MSS is disabled and the ID of the key that is read does not match an authorized key, the operator must log in as a guest. The operator will not be able to save custom configurations but will have access to start the engine.

Activating Bluetooth Functionality

For shipping purposes, bluetooth functionality is deactivated. Ensure that bluetooth functionality is active on your machine using the following procedure:

1. Ensure that the function is active from the radio screen:

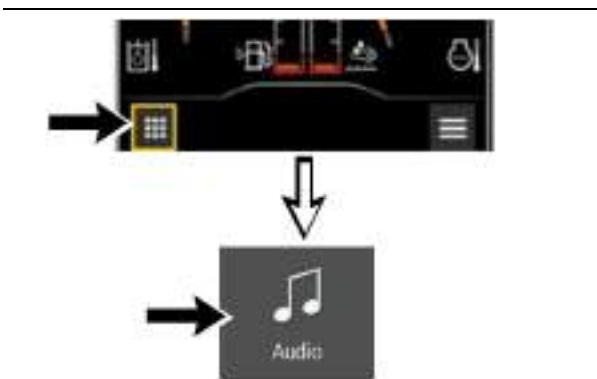


Illustration 158

g07512348

- a. From the home screen, press the navigation button in the lower left corner, then select "Audio" .

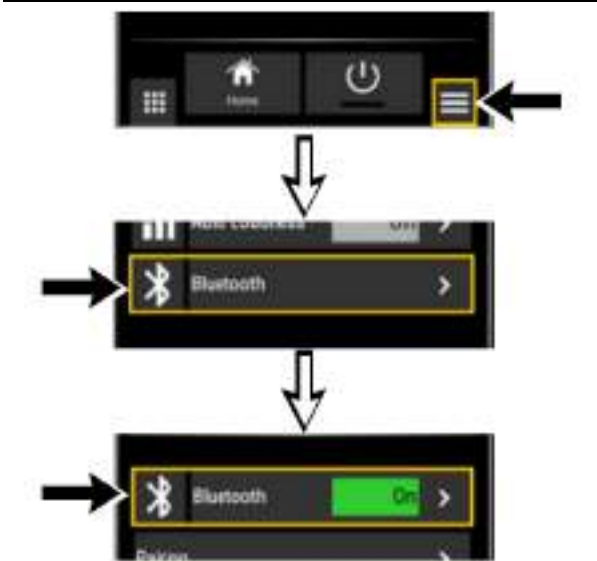


Illustration 159

g06319667

- b. Press the radio function list menu button in the lower right corner, then select "Bluetooth" . Ensure that "Bluetooth" is set to "ON" .

Pairing Your Device to the Machine

Use to following procedure to pair your device to the machine:

1. From the home screen, press the navigation button in the lower left corner, then select "Audio" .
2. Press the radio function list menu button in the lower right corner, then select "Bluetooth" .

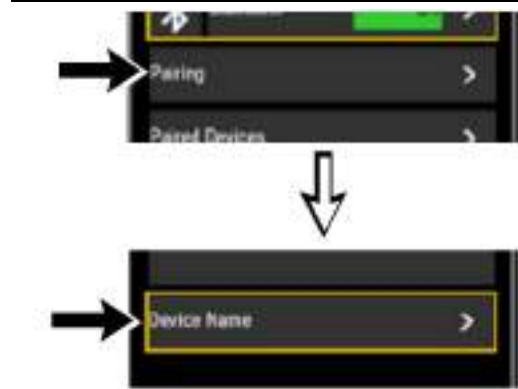


Illustration 160

g06319676

3. Select "Pairing" , then "Device Name" .



Illustration 161

g06319681

Machine name on monitoring system and operator device

4. Find your device on the list and pair the devices. Ensure that the devices are paired on your phone as well.

Note: The device name on your phone should be "## CAT RADIO" , with the number being from "00" to "99" .

Reading the ID of a Key

The Machine Security System (MSS) must identify a valid passcode, bluetooth key fob ID, or Cat ® App: Fleet management mobile application ID.

When the engine start switch ring is turned to the ON position, the MSS will check the ID of any key fob or mobile application. If the ID matches a key ID stored in the machine ECM, the critical ECM functions are enabled. An enable message is also sent via the Cat[®] data link or J1939 data link to the other ECMs on the machine. The machine will operate normally.

Note: If the machine ECM has failed or has been removed, the critical machine operations controlled by the other electronic control modules will not operate.

Armed

When the MSS is armed, critical machine functions are disabled. The MSS disables the power that is supplied to each component that is powered by the output drivers. The machine will not be able to operate normally.

There are two states of operation within the armed mode:

Engine Start Switch Ring Position OFF – When no power is applied to the MSS, the MSS will default to armed state. When power is applied to the MSS and the grace period has expired, the MSS will return to the MSS armed.

Engine Start Ring Switch Position ON – When the engine start switch ring is first moved to the ON position, the display boots up and the system attempts to detect a bluetooth key ID or mobile application ID. The ECM will continue reading until a valid key ID is read or a passcode is entered. If a valid key ID or passcode is not read, the MSS status indicator will remain red and the MSS remains armed.

Disarmed

When the MSS is disarmed, normal machine operation is allowed. A message is sent to the other machine ECMs over the Cat[®] data link. or J1939 data link. The machine will be able to start. The green LED on the status indicator will illuminate.

There are multiple ways to disarm the machine:

- Use a valid passcode
- Use a valid bluetooth key fob
- Use the Cat App: Fleet management mobile application

- Use the Cat[®] Electronic Technician (ET) Service Tool to configure the MSS bypass schedule to allow machine operations during scheduled periods of time during the week.

Grace Period

After a machine has been started successfully, the operator will have a grace period after the machine is turned off before the MSS is automatically armed. The operator is not required to arm the system manually.

During the grace period an operator can start the machine without a key ID or passcode. When the grace period expires, the MSS will rearm automatically.

If the MSS is unable to read a key ID, the system will remain armed. When the MSS identifies a key with an invalid key ID, the system will remain armed.

The grace period for a machine can be configured with Cat[®]ET if a factory password or master level account is available.

Navigating the User Interface Touchscreen Display



Illustration 162

g06210561

Startup sequence screens

The display will start up automatically after turning the battery disconnect switch to the ON position. The screen will prompt the operator to turn the engine start ring to the ON position. When the engine start ring is turned to the ON position, the display will navigate to the passcode entry screen.

If the operator has not turned the engine start ring to the ON position, the display will time out after 1 minute.

If the battery disconnect switch is already on and the display is off, the display will startup automatically after the engine start ring is powered on. The Cat[®] screen will appear for a short time and then login keypad will appear.

Note: Avoid touching the screen with sharp objects.

The access level assigned to the operator can limit or expand the amount of freedom the user has to manage the system. The following paragraphs explain access levels.

There are three levels of operator access recognized by the touchscreen display. The following levels are available:

- Guest
- Standard
- Master

Guest – If an operator does not have an authenticated key or passcode, the user is able to bypass log in as a guest. Some menu features will not be available such as the options for saving configurations and operator management. If the Machine Security System (MSS) is enabled, guest operators cannot start the machine.

Standard – A standard operator is a registered user of the machine. Operators with this access level can start the engine whether or not the MSS is installed. This user may save a control configuration for future application.

Master – Master accounts can perform operator management in addition to all standard level functions.

Any standard or master account may be created or removed by a master level operator.

Table 29

Selections and Access for the Touchscreen Display	
Access Level	Operator Setting
Guest	Operator input configuration Response Change operator
Standard	Operator input configuration Response Controls setup Change operator
Master	Operator input configuration Response Controls setup Change operator Manage operator

Operation of Status Indicator



Illustration 163

g06215426

Engine start switch with integrated MSS indicator

The Machine Security System (MSS) uses a status indicator that is integrated into the engine start switch in the cab. This indicator provides a visible alert for the security system.

The operator can use the status indicator to determine the status of the system or for troubleshooting.



Illustration 164

g06226442

Status indicator when the MSS is armed

When the MSS is armed, the status indicator will be red. The red light warns the operator that the machine is armed with the security system and that an operator login is required. The red LED will remain ON until a valid key is read while the key switch or engine start switch ring is in the ON position.



Illustration 165

g06226444

Status indicator when the MSS is disarmed or uninstalled

When the MSS is disarmed, the status indicator will be green. The green light notifies the operator that an operator is logged on the machine and the security system has been disarmed. The status indicator will be green if the MSS is not installed on the machine. Also, the green LED will remain ON after power down for the duration of the grace period. After the grace period, the MSS automatically returns to the armed mode.

For machines with a standard key switch, a separate status indicator will be available.

Operator Login

Any user may start the engine if the Machine Security System (MSS) is disabled.

If the MSS is active, only a standard or master account can start the machine engine. Before starting the machine engine, the security system must identify a registered operator. An operator can access the machine display using one of the following methods:

- Passcode
- Cat[®] Bluetooth key
- Cat[®] App: Fleet management mobile application

Passcode Entry

To log in using a passcode, refer to the following steps:

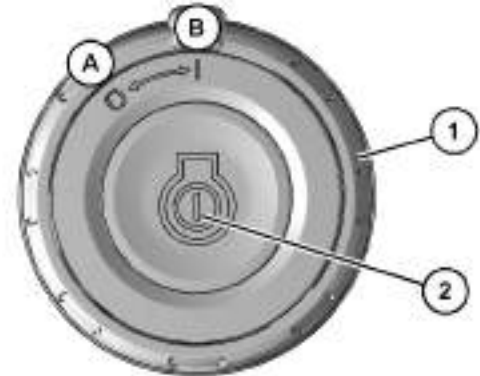


Illustration 166

g06180554

- (A) Off
(B) On
(1) Engine start switch ring
(2) Engine start button

1. Turn engine start switch ring (1) to ON position (B).



Illustration 167

g06209470

2. Enter a registered passcode using the monitor keypad and then press "Enter" .

Note: The jog dial or the numbered buttons on the right-side switch panel can also be used to enter the code.



Illustration 168

g06211194

3. Select "Enter" to confirm the passcode. If a registered passcode is recognized, the operator information screen will appear on the display. If the MSS is not installed, the passcode screen will be bypassed automatically after 10 seconds. The operator will be logged in to the system as a guest. Refer to Illustration 168 .
4. Select "OK" to continue to the display homescreen.



Illustration 169

g06209482

5. After an operator logs in to the system successfully, an “Engine Start Allowed” message will appear across the top of the monitor. Refer to “Engine Starting” for instructions on starting the engine.

Invalid Passcode



Illustration 170

g06209472

Invalid passcode screen

If a passcode is not recognized, the display will notify the user with an “Invalid code” message. Refer to Illustration 170 .

The operator has five tries to enter a valid passcode successfully. After a fifth unsuccessful attempt, a lockout screen will appear and remain on the display for a duration of 5 minutes.

Note: If the Machine Security System (MSS) is not active, the user can select the “Skip Login” button to avoid the lockout period. Refer to the “Bypass login” section for further information.

Bypass login

Operator login can be bypassed if the user selects the “Skip Login” button on the display. The operator will be logged in to the machine with “Guest” level access.

If the MSS is inactive, the operator will be able to start the engine as normal and view all display screens.

If the MSS is active on the machine, the operator is able to view all display screens but will not have access to start the engine.

Bluetooth Entry

Alternatively, a bluetooth operator ID can be used to log in to the machine. For a bluetooth key to be detected by the system, ensure that the following qualifications are met:

- The key must be registered with the machine
- The key must be within the cab
- Bluetooth setting must be enabled on the display

Refer to the following steps when logging in to a machine using the bluetooth key:

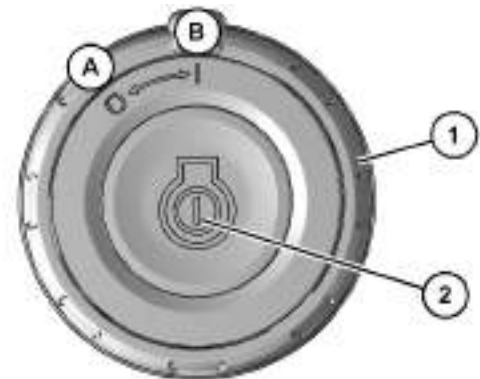


Illustration 171

g06180554

- (A) Off
(B) On
(1) Engine start switch ring
(2) Engine start button

1. Turn engine start switch ring (1) to the ON position (B).

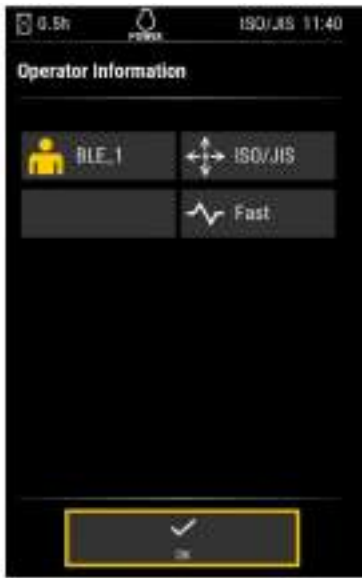


Illustration 172

g06209615

Bluetooth "Operator Information" screen

2. Wait several seconds for the system to detect the key when the passcode dialog appears. Once the key is detected, the "Operator Information" screen will display.
3. Select the "OK" button if the proper operator has been displayed.



Illustration 173

g06209482

4. After an operator logs in to the system successfully, an "Engine Start Allowed" message will appear across the top of the monitor. Refer to "Engine Starting" for instructions on starting the engine.

NOTICE

The access level will change to a "Guest" account automatically if the key is removed from the cab at any time. If the MSS is enabled and the engine is on when the key is removed from the cab, the operator will not be able to start the engine if turned off. To turn on the engine again without the bluetooth key, the operator will need to log in a registered account using either the smart phone application or passcode.

Note: If multiple bluetooth devices are within the cab, the system will select the first device detected by the bluetooth transceiver as the active operator.

Cat® Fleet Management Mobile Application

Operators can also log in to a machine using the Cat® App: Fleet management mobile application. For the application to be detected by the system, ensure that the following qualifications are met:

- The Mobile Device ID (MDID) of the mobile application must be assigned to the machine in the Operator Management System (OMS)

Note: It is not possible to assign mobile devices through the MSS interface.

- The mobile device must be within the cab

- “Operator Management Bluetooth Device Enabled Status” is enabled (Cat® ET Configuration)

Note: For adding an operator, adding MDID to the machine key list, and pushing the machine key list from the OMS to the machine refer to the OMS documentation at:

<https://myoperators.cat.com/>

Mobile Device / Operating Software Compatibility

Table 30

Mobile Device / Operating Software Compatibility		
Make	Model	Operating Software
Android	Varies	Android 8.x Oreo and up (Preferably Android 9.x Pie)
Apple	iPhone 6/ iPhone 6 Plus and up	iOS 11.0 and up (Preferably 12)

Note: Android mobile hardware support for Bluetooth 4.1 can vary, so it is possible that a mobile device running Android 8.x software or higher could have hardware that does not support Bluetooth 4.1.

Mobile Application Entry (Android Devices)

To log in using the Cat® App: Fleet management mobile application, refer to the following steps:

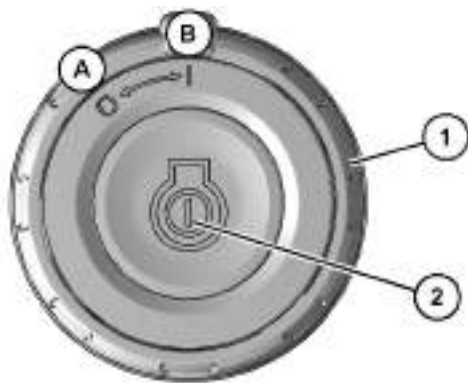


Illustration 174 g06180554

- (A) Off
- (B) On
- (1) Engine start switch ring
- (2) Engine start button

1. Turn engine start switch ring(1) to the ON position (B).



Illustration 175 g06400799
Cat® App: Fleet management mobile application icon

2. Open the Cat®Bluetooth 4.1 App: Fleet management mobile application on the mobile device.



Illustration 176 g06433500

3. Click “I Agree” to agree with the End-User License Agreement and sign in with Cat® eCustomer account credentials.

Note: If you do not have a Cat® eCustomer account, click “Get Started” to create one.

4. Select “Login” .



Illustration 177 g06214518
 CWS login screen

5. Enter Cat[®] eCustomer account credentials.



Illustration 179 g06433507
 (1) Menu Icon
 (2) Map Icon
 (3) Add Equipment Icon

7. Upon login, the Cat[®] App: Fleet management mobile application will open onto the equipment tab.

Note: The “Equipment” tab will be empty on the first login.

Menu Icon (1) includes “Preferences”, “Notifications and Alerts”, along with various documents covering the end-user license agreement, and privacy notice.

By tapping map icon (2), the operator will be able to see the location of each vehicle on their “Equipment” tab on a map.

If a vehicle is not equipped with a telematics device, or the vehicle is a non-Caterpillar machine it may be necessary to add it manually using the add equipment icon (3).



Illustration 178 g06400826

6. Click “Allow” to enable the Cat[®] App: Fleet management mobile application to work as designed.

Note: Cat[®] App: Fleet management requires access to the mobile device location to use bluetooth radio to connect to Cat machines.



Illustration 180

g06433513

8. Go to the keys tab.

Keys are necessary to connect to vehicles. If no keys are given, the screen in Illustration 180 will be displayed. The MDID is necessary to assign keys to the user account. The MDID of Android devices is linked to the app.

Note: Uninstalling the Cat[®] App: Fleet management mobile application will result in the MDID and keys being deleted. The Sim card of the phone contains the MDID information, damage to the Sim card may result in keys being lost, if the phone is replaced transfer the sim card to avoid key loss.

- 9.** Pull the “Equipment Keys” down to refresh the list once the Fleet/Key configuration process has finished. Wait up to 30 seconds until the keys populate. If the keys do not populate, check that the MDID is correct and that the list was pushed properly through OMS.



Illustration 181

g06433520

- 10.** Ensure that the machine is ON to connect to a machine.

The machine display should prompt the operator for a password. In the “Keys” tab in the Cat[®] App: Fleet management mobile application and tap the key that matches the machine. If a vehicle is OFF, currently occupied, or too far away the key will be grayed out and say “Out of range”.

Note: If the machine has a user signed in that is not in the cab and it has become necessary for a different user to operate the machine, change the operator in operator setting.



Illustration 182

g06433521

11. Access the “Equipment” tab by tapping it. The machines associated with the keys should have populated. To learn more about a machine, tap it.



Illustration 184

g06209482

13. After an operator logs in to the system successfully, an “Engine Start Allowed” message will appear across the top of the monitor. Refer to “Engine Starting” for instructions on starting the engine.

Mobile Application Entry (iOS Devices)

To log in using the Cat® App: Fleet management mobile application, refer to the following steps:



Illustration 183

g06433525

12. Press the “Disconnect” button if the user wishes to disconnect. If the user wants to switch machines, tap the arrow in the upper left then tap the machine the operator wants to be switched to.

Note: Disconnect from vehicles if the user is not going to be using a vehicle again within a short time.

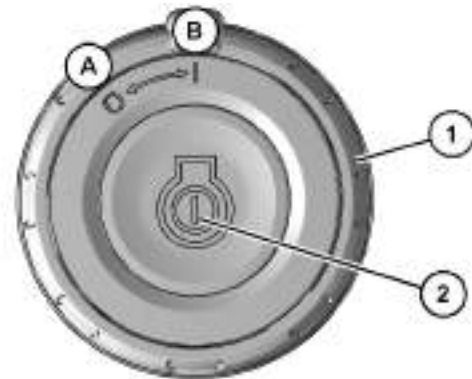


Illustration 185

g06180554

- (A) Off
- (B) On
- (1) Engine start switch ring
- (2) Engine start button

1. Turn engine start switch ring (1) to the ON position (B).
2. Ensure that bluetooth detection is enabled on the in-cab display.



Illustration 186 g06400799
Cat[®] App: Fleet management mobile application icon

3. Open the Cat[®] App: Fleet management mobile application on the mobile device.



Illustration 187 g06433528

4. Click "I Agree" to agree with the End-User License Agreement and sign in with Cat[®] eCustomer account credentials.

Note: If you do not have a Cat[®] eCustomer account, click "Get Started" to create one.

5. Select "Login".



Illustration 188 g06214875

6. Enter eCustomer account credentials to log in.



Illustration 189 g06433533

- (1) Menu Icon
- (2) Map Icon
- (3) Add Equipment Icon

7. Upon login the Cat[®] App: Fleet management mobile application will open onto the equipment tab.

Note: The equipment tab will be empty on the first login.

Menu Icon (1) includes “Preferences”, “Notifications and Alerts”, along with various documents covering the end-user license agreement, and privacy notice.

By tapping map icon (2), the operator will be able to see the location of each vehicle on the equipment tab on a map.

When using this for the first time, the Cat® App: Fleet management mobile application will ask if it can use the location feature. Allow the location feature to use the map.

If a vehicle is not equipped with a telematics device, or the vehicle is a non-Caterpillar machine it may be necessary to add it manually using add equipment button (3).



Illustration 190

g06433536

8. Access the “Key” tab. Keys are necessary to connect to vehicles. If no keys are given, the screen in Illustration 190 will be displayed. The MDID is necessary to assign keys to the user account. The MDID of IOS devices is linked to the user account.
9. Once the Fleet/Key configuration process has finished, tap the refresh button in the Cat® App: Fleet management mobile application top right. Wait up to 30 seconds until the keys populate. If the keys do not populate, check that the MDID is correct and that the list was pushed properly in OMS.



Illustration 191

g06433538

10. To connect to a machine, ensure that the machine is ON. The machine display should prompt the operator for a password. At this point on the Cat® App: Fleet management mobile application go to the “Keys” tab and tap the key that matches the machine. If a vehicle is OFF, currently occupied, or too far away the key will be grayed out and say “Out of range”.



Illustration 192

g06433540

11. Press the “Disconnect Button” if the user wishes to disconnect. If the user wants to switch machines tap the arrow in the upper left, then tap the key of the machine to switch to.

Note: Disconnect from vehicle if the user will not be using the vehicle again within a short time.



Illustration 193

g06209482

12. After an operator logs in to the system successfully, an “Engine Start Allowed” message will appear across the top of the monitor. Refer to “Engine Starting” for instructions on starting the engine.

Engine Start Switch Troubleshooting

Table 31

Switch Status	Possible Cause	Resolution
Engine start switch is not illuminated	Engine start accessory power not on	Turn engine start switch ring to ON position
	Power management triggered	Cycle engine start switch ring and try to restart
Engine start switch is green	Starting component failure	Contact your Cat [®] dealer
Engine start switch is red	Machine interlock conditions not met	Hydraulic lock in LOCKED position
	Engine shut down without cycling start switch ring	Cycle engine start switch ring and try restart
	Operator not authenticated (Passcode login)	Add operator to machine authorized user list
		Switch operator from guest mode using display
Operator not authenticated (Bluetooth key)	Add operator to machine authorized user list	
	Replace key fob battery	
	Ensure more than 4.5 m (15.2 ft) from other bluetooth equipped machine	

(continued)

(Table 31, contd)

Switch Status	Possible Cause	Resolution
		Alternately login with display passcode or contact local Cat® dealer
	Operator not authenticated (Cat®Fleet management app)	Add operator to machine authorized user list
		Ensure more than 4.5 m (15.2 ft) from other bluetooth equipped machine
		Enable phone bluetooth and connect Cat®Fleet management app
		Change bluetooth system enable status to enabled
		Contact local Cat® dealer if unable to see machine bluetooth device

i07992014

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

Camera

SMCS Code: 7347; 7348

Rear View Camera



Illustration 194

g06396304

The rear view camera system consists of a camera that is located in the middle of the top of the counterweight.

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

Right Side View Camera



Illustration 195

g06396305

The side view camera system consists of a camera mounted on the panel next to the pump compartment.

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

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

i09597816

Monitoring System

SMCS Code: 7451; 7490

WARNING

Do not operate the machine if the monitor is not functioning (for example, monitor has a black screen or is not responding) when the key switch is in the ON position.

The monitor provides images from the camera system and other information for safe machine operation. Operating the machine without a properly functioning monitor may result in injury or death. If the monitor is not functioning, place the machine in a safe state by following the procedures for stopping and parking the machine. Determine the cause of the monitor malfunction and correct before returning the machine to service.

NOTICE

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

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

General Information

Reference: For complete monitoring system information, refer to Operation and Maintenance Manual, M0109053, “Next Generation Hydraulic Excavator”.

The monitoring system is an input and an output of the Machine Control System. The monitor has a multi-touch 8 inch or 10 inch display. The Machine Control System communicates back and forth on the data link. The monitoring system consists of the following components:

- Display (with numerous screens and menus)
- Indicators

- Gauges
- Soft Switch Panel
- Jog Dial



Illustration 196

g06720205

- (1) Action Lamps
- (2) Status Information Area
- (3) Notification Center Icon
- (4) Camera View Area
- (5) Gauge Area
- (6) Navigation Area
- (7) Function List
- (8) Shortcuts

The monitoring system displays various warnings and information about the condition of the machine, and the machines surrounding with various camera views. There are gauges and several alert indicators included on monitoring system display. Each gauge is dedicated to a parameter within a machine system. The monitoring system will allow the user to do the following:

- View Surroundings
- Interpret status information
- Interpret parameters
- View “Operation and Maintenance Manual”
- View service intervals
- Perform calibrations

- Troubleshoot machine systems

Action Lamps (1)

The action lamps illuminate to show that a problem has occurred with the machine.

Status Information Area (2)

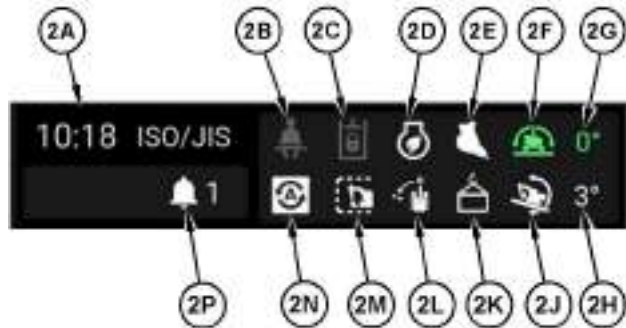


Illustration 197

g06720245

- (2A) Multi Status Information
- (2B) Seatbelt Switch Status (if equipped)
- (2C) Hydraulic Lockout Control
- (2D) Eco Mode
- (2E) Work Tool
- (2F) XX
- (2G) XX
- (2H) XX
- (2J) XX
- (2K) Heavy Lift / Cat[®] Dig Boost (if equipped)
- (2L) XX
- (2M) XX
- (2N) XX
- (2P) XX

Reference: For complete status information, refer to Operation and Maintenance Manual, M0109053, “Next Generation Hydraulic Excavator Monitoring System Supplement”.

Notification Center Icon (3)



Illustration 198

g06720210

- (3A) Event Description
- (3B) Event Symbol
- (3C) Event ID

Event Description (3A) – This area will display the description of pop-up message of the impending problem.

- Line 1 : System
- Line 2 : Condition
- Line 3 : Action to be taken

Event Symbol (3B) – This area will display the symbol of the problem

Event ID (3C) – The identification number for the event will be shown here.

Camera View (4)

This area on the monitor displays the view of the cameras. A rear view camera mounted on top of the counterweight and an optional side view camera mounted in the side panel next to the hydraulic tank.

If both rear view camera and side view camera are equipped, the monitor screen can be toggled to show:

- Rear only
- Side only
- Split vertically

- Split horizontally

The camera view can be toggled when the cursor is on the camera view area and the area is touched or the jog dial is turned.

Gauge Area (5)



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



Hydraulic Oil Temperature – This gauge indicates the temperature of the hydraulic oil. The normal operating range is the green range. If the gauge is in the white range, the engine and machine warm-up is required. Refer to Operation and Maintenance Manual, “Engine and Machine Warm-up”. If the gauge reaches the red range, reduce the load on the system. If the gauge stays in the red range, stop the machine and investigate the cause of the problem.



Engine Coolant Temperature – This gauge indicates the temperature of the engine coolant. The normal operating range is the green range. If the gauge is in the white range, the engine and machine warm-up is required. Refer to Operation and Maintenance Manual, “Engine and Machine Warm-up”. If the gauge reaches the red range, stop the machine and investigate the cause of the problem.



Diesel Exhaust Fluid (DEF) Gauge (If Equipped) – This gauge indicates the level of DEF fluid in the DEF tank. When the DEF gauge is in the red range, add DEF immediately.

Navigation Bar (6)



Apps Key – Allows you to display different information in the gauge area related to operation. Also contains air conditioner and audio controls. This key includes the settings screen allowing change of a multitude of parameters, some password protected.



Function List Key – Allows you to turn on and off various functions related to the active screen. This icon only appears in certain screens where additional settings are necessary.

Shortcuts – Allows you to set certain shortcuts on the navigation bar.

Machine Warnings



Illustration 199

g06720213

Notification Center

- (1) Notification Center Icon
(2) Notification Center Dashboard

The Monitor will display warnings, and log events for machine conditions that are not within normal operating parameters.

The event warnings are classified into three warning levels. Warning Level 1 represents the least severe problem and Warning Level 3 represents the most severe problem. The warning levels, monitor response, and the required operator actions are given below.

Warning Level 1 (Gray) – Requires operator awareness. The icon and pop-up message will both appear gray.

Warning Level 2 (Amber) – Requires a change in the operation of the machine or a change in the maintenance of the machine to correct the condition. The icon and pop-up message will both appear amber and the action lamp will blink.

Warning Level 3 (Red) – Requires immediate shutdown of the machine to prevent damage to the machine or personnel. The icon and pop-up message will both appear red, the action lamp will blink, and the buzzer will sound.

When multiple warnings are present in the system, the highest warning is shown first. Swipe the message up or down to view all the logged warnings.

Reference: For complete machine warning information, refer to Operation and Maintenance Manual, M0109053, "Next Generation Hydraulic Excavator Monitoring System Supplement".

Logging In



Illustration 200

g06242074

There are different ways to access the monitor which include:

- Guest access
- Passcode access
- Bluetooth access
- Cat[®] Fleet Management app

For more information on logging in, refer to Operation and Maintenance Manual, Machine Security System - Operator Login.

Navigation

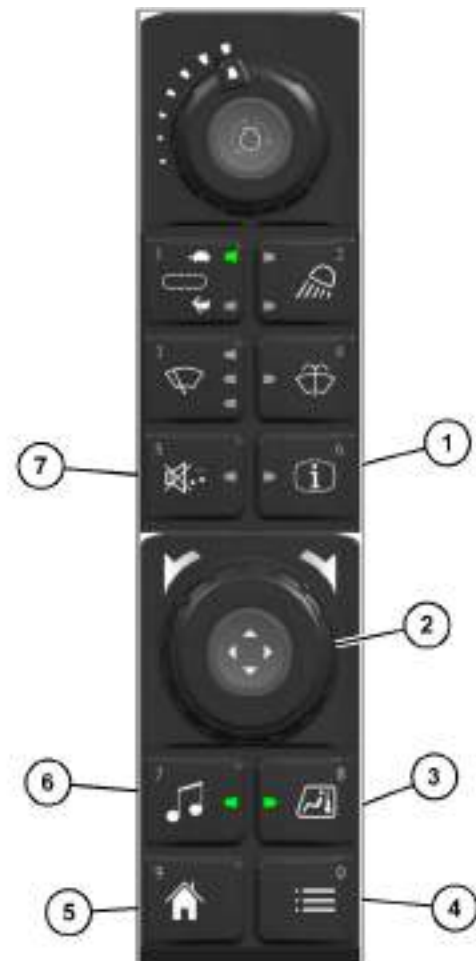


Illustration 201

g06464384

Right side switch panel

- (1) Operator information button
- (2) Jog dial
- (3) Air conditioner button
- (4) Next menu button
- (5) Home button
- (6) Audio button
- (7) Mute button

The monitor can be navigated by touch screen or the switch panel. Switch panel components can be used to interface with the monitor in the following ways:

Operator information button (1) – Press and hold this button to access the operator information screen. This screen shows information such as operator settings.

Jog dial (2) (if equipped) – Rotate the jog dial to highlight menu items in the monitor. Push the jog dial down to select the highlighted item.

Operation Section
Fuel Transfer Pump (Refueling)

Air conditioner button (3) (if equipped) – Press the button to access the air conditioner controls.

Next menu button (4) (if equipped) – This button is equivalent to the function list key on the monitor. This button can only be used on screens where the function list key is shown.

Home button (5) (if equipped) – Press this button to return to the main screen.

Audio button (6) (if equipped) – Press this button to access the audio controls.

Mute button (7) – Press this button to mute the audio. Press the button again to unmute the audio.

Each of the buttons is also assigned a number which is imprinted in the top corner of the button. These buttons can be used to enter the numerical passcodes used to log in to the monitor.

i07966439

Fuel Transfer Pump (Refueling) (If Equipped)

SMCS Code: 1256

Use the following procedure to pump fuel and store the hose.

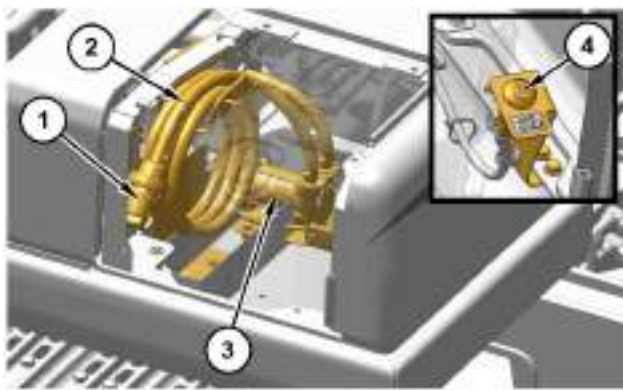


Illustration 202

g06496707

- (1) Suction valve
- (2) Suction hose
- (3) Electric refueling pump
- (4) ON/OFF switch



ON/OFF Switch – Push the ON/OFF switch to activate or deactivate the fuel transfer pump. A red indicator on the switch will illuminate when the fuel transfer pump is activated.

If one of the following conditions occur, the fuel transfer pump will not activate and/or stop operating:

- Battery disconnect switch is in the OFF position
- Engine is operating
- Engine start switch is moved to the START position.
- Engine start switch is in the OFF position
- Hydraulic lockout control is not in the LOCKED position
- Fuel tank level is full
- Fuel is not detected at the suction valve.
- 30 seconds following a detection of no fuel at the suction valve.

Use the following procedure to pump fuel and store the hose.

1. Park the machine on a level surface. Move the hydraulic lockout control to the LOCKED position. Stop the engine
2. Turn the engine start switch to the ON position without starting the engine.
3. Remove the fuel tank cap from the fuel tank.
4. Open the access that is on the right side of the machine.



Illustration 203

g06180748

Suction valve (1) is at the end of hose (2).

Turn the end of the suction valve clockwise to open the valve

5. Uncoil the hose and turn the end of the suction valve clockwise to open the suction valve.
6. Properly insert the end of the suction valve into a container of fuel.
7. Push switch (4) to activate the fuel transfer pump and supply the fuel to the tank. A red indicator on the switch will illuminate when the fuel transfer pump is activated.

When the fuel tank is full, the fuel transfer pump will automatically stop.

When the fuel container is empty, push the switch again to stop refueling. If additional fuel is needed, wait 30 seconds and return to step 6.

Note: The red indicator on the switch will no longer illuminate when the fuel transfer pump has stopped refueling.

Note: The fuel transfer pump will not activate for 30 seconds following a detection of no fuel at the suction valve.

8. Push the switch at any time to deactivate the fuel transfer pump.

Note: The red indicator on the switch will no longer illuminate when the fuel transfer pump has stopped refueling.

9. Drain excess fuel from the hose and turn the end of the suction valve counter-clockwise to close the suction valve.

10. Wind the hose and store in the hose container.

NOTICE

To prevent hose damage, do not coil the hose in a tight radius.

11. Close the access door.

12. Install the fuel tank cap onto the fuel tank.

13. Turn the engine start switch to the OFF position.

i09613511

Radio

SMCS Code: 7338

The radio is integrated into the monitoring system. All the radio controls are adjusted using the monitor. The actual radio is mounted in the right rear console behind the operator seat. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

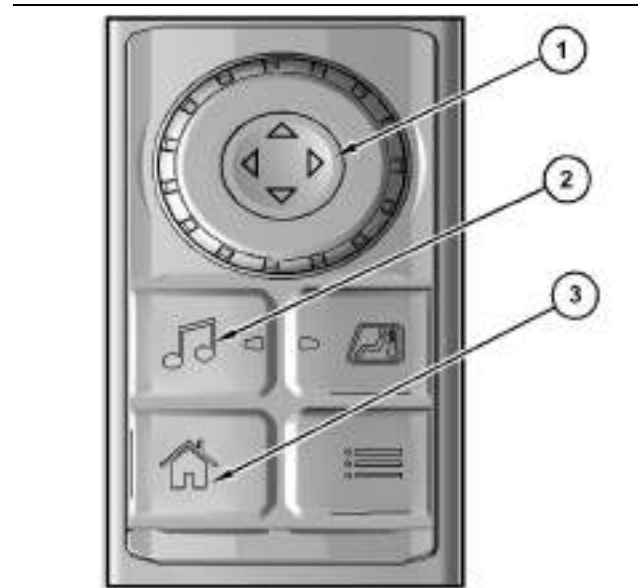


Illustration 204

g07515652

- (1) Jog dial
- (2) Radio button
- (3) Home button

The audio menu can be directly accessed by pressing radio button (2) on the right side switch panel. Input selections can be made using jog dial (1) or using the monitor touch screen. Home button (3) can be used to return to the main screen.

Refer to Operation and Maintenance Manual, "Operator Controls" for location of jog dial.

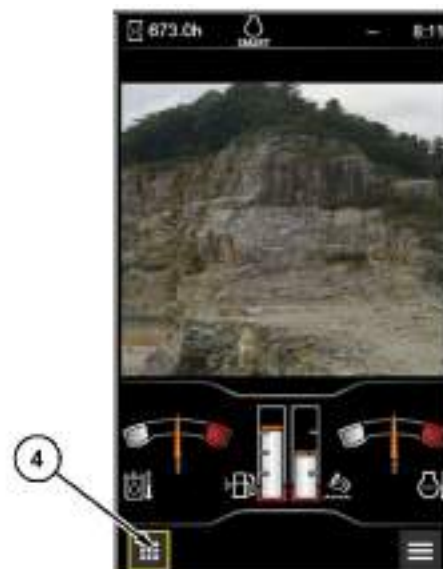


Illustration 205

g07512863

- (4) Application menu button

Operation Section Radio

Press radio button (2) to go directly to the radio screen. To navigate to the radio screen from the main screen in monitor, press application menu button (4) in monitor display.

Refer to Operation and Maintenance Manual, "Operator Controls" and Operation and Maintenance Manual, "Monitoring System" for more information.



Illustration 206

g07513280

"Audio" menu in monitor

Use jog dial (1) to highlight "Audio" and then press jog dial (1) downward to select the entry. You can also access the screen by simply touching the "Audio" box in monitor display.

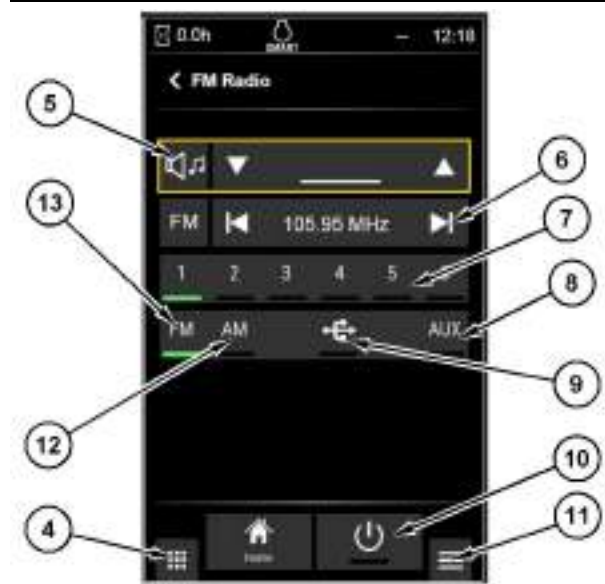


Illustration 207

g07512389

Radio screen

- (4) Application menu button
- (5) Volume control
- (6) Tuner
- (7) Preset stations
- (8) Auxiliary ("AUX") button
- (9) Universal Serial Bus (USB) button
- (10) Power button
- (11) Radio function list menu
- (12) Amplitude Modulation ("AM") button
- (13) Frequency Modulation ("FM") button

Application menu button (4) – Use application menu button (4) to return to the application menu.

Volume control (5) – Volume control (5) is used to raise or lower the audio volume.

Tuner (6) – Tuner (6) is used to tune the radio to the desired station.

Preset stations (7) – Preset stations (7) store favorite radio stations for the operator. To set a station, tune to the desired station. Press and hold the preset number you want to assign to that station. Once a beep is heard, release the button. The indicator light for the active preset station will illuminate.

"Aux" button (8) – When a device is plugged into the auxiliary port, press "Aux" button (8) to connect the device to the radio. The indicator light will illuminate when this mode is active.

USB button (9) – When a device is plugged into the USB port, press USB button (9) to connect the device to the radio. The indicator light will illuminate when this mode is active.

Power button (10) – Pressing power button (10) turns the radio on and off. The indicator light on the monitor and on power button (10) will illuminate when the power is on.

Radio function list menu button (11) – Pressing radio function list menu button (11) leads to the radio function list menu.

“AM” button (12) – Press “AM” button (12) to access AM radio. The indicator light will illuminate when this mode is active.

“FM” button (13) – Press “FM” button (13) to access FM radio. The indicator light will illuminate when this mode is active.

Radio Function List

To access the radio function list, press radio function list menu button (11) in the lower right corner of the radio screen.

The function list menu consists of the following items:

Treble – Allows the user to adjust the treble.

Bass – Allows the user to adjust the bass.

Balance – Allows the user to adjust the balance between speakers.

Auto Loudness – When on, this feature automatically adjusts treble and bass levels when reducing the volume setting. This effect allows the user to hear more clearly at a lower volume.

Bluetooth – Allows the user to pair a phone, view paired devices, and edit device names.

Refer to Operation and Maintenance Manual, “Monitoring System” for more information.

Selection Method

All settings can be made using the touch screen in monitor display or by using jog dial (1). The method depends on the preference of the operator. When using the touch screen, simply touch the icon you want to select. When using jog dial (1), rotate jog dial (1) to switch to different selections within the screen. Press jog dial (1) downward to choose a selection.

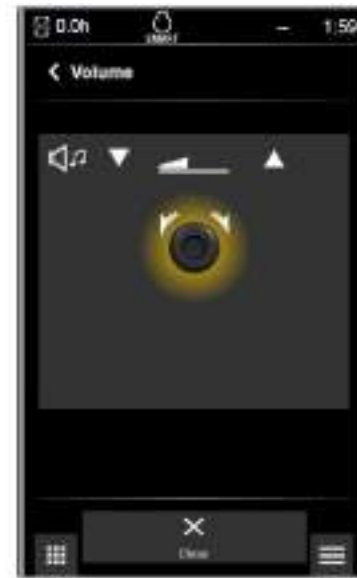


Illustration 208

g06213233

“Volume” display screen

When using jog dial (1) to set the volume or tuner (6), rotate jog dial (1) clockwise to increase and counter-clockwise to decrease. Press downward on jog dial (1) to enter the desired setting.

Radio Operation

1. To operate the system, press power button (10).
2. Select between “AM” button (12) for “AM” stations or select “FM” button (13) for “FM” stations.
3. Use tuner (6) to adjust to the desired station. If presets stations (7) are set, press the desired preset station.
4. Use volume control (5) to adjust the volume.

5. When the machine is in operation turn down the volume of the radio using volume control (5).

USB/AUX Operation (If Equipped)

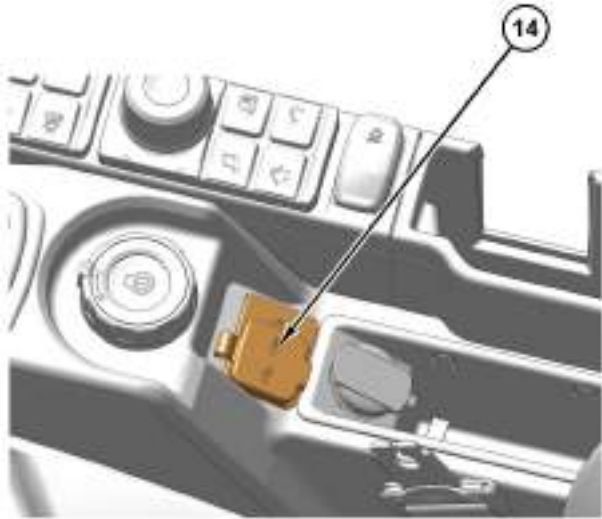


Illustration 209

g07512401

(14) USB/AUX port

1. To play music from device such as MPEG Audio Player3 (MP3) player or phone, connect the device using an auxiliary cable or USB cable. Depending on cable being used, plug the cable into the USB/AUX port (14) on the console.
2. Select either USB or AUX depending on which type of cable was used. Play the music from the device. The music should be playing over the radio speakers if properly connected. Adjust the volume using volume control (5).

Refer to Operation and Maintenance Manual, "Operator Controls" for location of USB / AUX port in the machine.

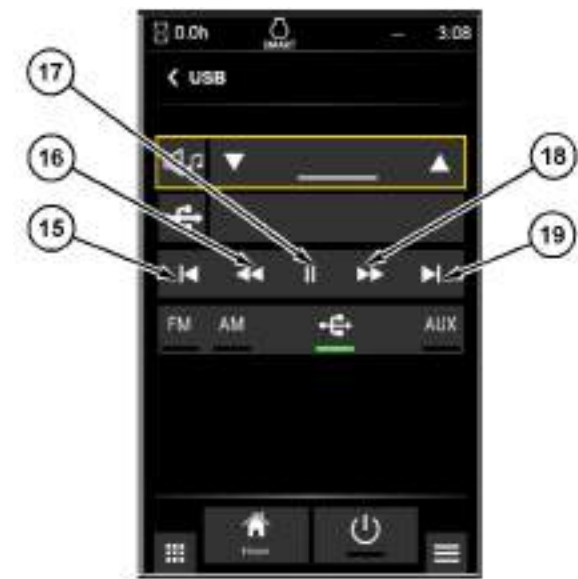


Illustration 210

g07512406

- (15) Skip to the beginning of the track
(16) Rewind the track
(17) Pause/Play the track
(18) Fast forward the track
(19) Skip to the end of the track

Note: If USB is selected, extra controls appear on the screen for playing music.

- 15** – Skip to the beginning of the track.
16 – Rewind the track.
17 – Pause/Play the track.
18 – Fast forward the track.
19 – Skip to the end of the track.

i09613503

Air Conditioning and Heating Control

SMCS Code: 7304; 7320; 7337

Consult with your Cat[®] dealer for periodic maintenance of the air conditioning and heating system.

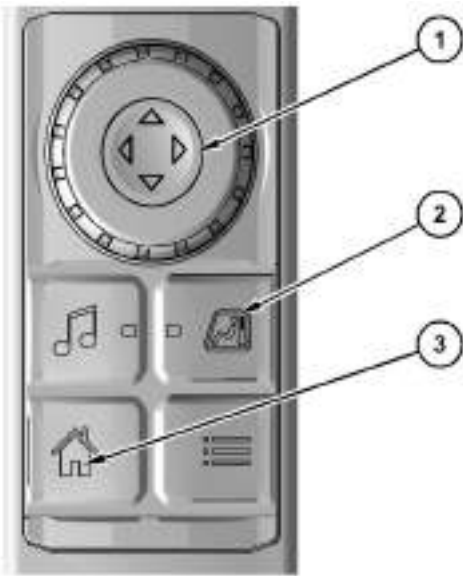


Illustration 211 g07515651
 (1) Jog dial
 (2) Heating and air conditioning button
 (3) Home button

Air conditioning and heating functions are controlled through the monitor. The heating and cooling menu can be directly accessed by pressing heating and air conditioning button (2) on the right side switch panel. Input selections can be made using jog dial (1) or using the monitor touch screen. Home button (3) can be used to return to the main screen in the monitor. Refer to "Monitoring System" for more information.



Illustration 213 g07513291
 "Air Conditioner" option in monitor

Press the "Air Conditioner" menu on the touch screen.

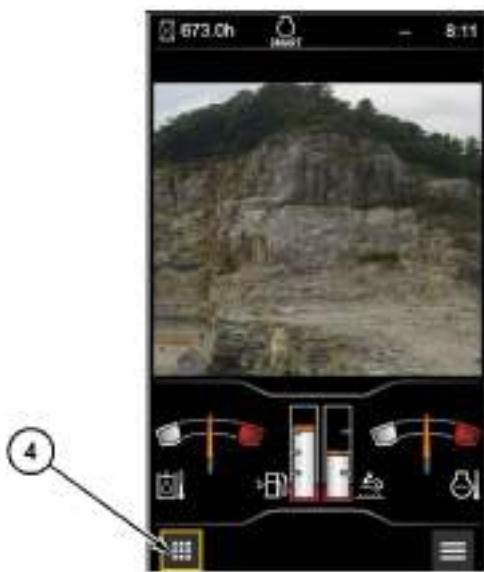


Illustration 212 g07512843
 Location of monitor in the machine
 (4) Application menu

Click application menu (4) from the main screen to navigate to the air conditioner screen.

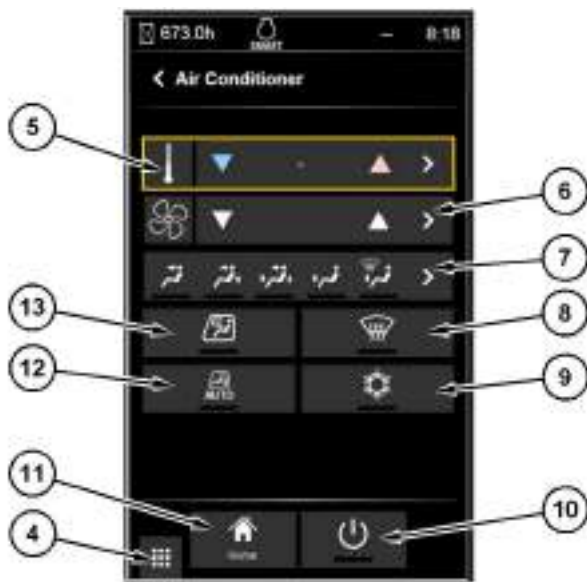


Illustration 214

g07512847

“Air conditioner” screen

- (4) Application menu
- (5) Temperature control
- (6) Fan blower speed control
- (7) Air outlet setting
- (8) Defroster control
- (9) Compressor control
- (10) Power mode
- (11) Home menu
- (12) Auto mode
- (13) Recirculation mode

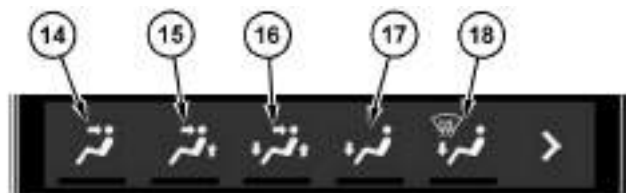


Illustration 215

g07512856

Air outlet setting (8)

- (14) Front vent mode
- (15) Front and rear vent mode
- (16) Front, foot, and rear vent mode
- (17) Foot vent mode
- (18) Defrost and foot mode

Application menu (4) – Click the icon to return to the main application menu in the monitor.

Temperature control (5) – Use temperature control (5) to raise or lower the desired temperature inside the cab.

Fan blower speed control (6) – Use fan blower speed control (6) to increase or decrease the fan blower speed.

Air outlet setting (7) – Use air outlet setting (7) to control the air outlets available inside the cab. The

indicator light illuminates to show the active air outlet setting (7).

Defroster control (8) – Use defroster control (8) to activate and deactivate the defroster. Use the defroster to remove steam and frost from the windows. The indicator light illuminates when defroster control (8) is active.

Compressor control (9) – Use compressor control (9) icon to activate and deactivate the air conditioner.

Power mode (10) – Press power mode (10) icon to activate and deactivate the Heating Ventilation and Air Conditioning (HVAC) system. Click and hold power mode (10) icon for 3 seconds to turn off the HVAC system. The indicator light on the monitor turns green when power mode (10) is on.

Home menu (11) – Click home menu (11) icon to return to the main screen in the monitor.

Auto mode (12) – Use auto mode (12) option to regulate the temperature inside the cab automatically based on the temperature outside the cab. The indicator light illuminates when auto mode (12) is active.

Recirculation mode (13) – Use recirculation mode (13) to recirculate air available inside the cab instead of pulling air from the outside. Recirculation mode (13) is more efficient because the HVAC system recycles conditioned air from the cab. The indicator light illuminates when recirculation mode (13) is active.

Front vent mode (14) – In front vent mode (14), air circulates from the front vents.

Front and rear vent mode (15) – In front and rear vent mode (15), air circulates from the front vents and rear vents.

Front, foot, and rear vent mode (16) – In front, foot, and rear vent mode (16), air circulates from the front vents, rear vents, and foot vents.

Foot vent mode (17) – In foot vent mode (17), air circulates from the foot vents.

Defrost and foot mode (18) – In defrost and foot mode (18), air circulates from the defrost vents and foot vents.

Selection Method

All settings can be made using the touch screen. When using the touch screen, simply touch the icon you want to select. Refer to “Monitoring System” for more information.



Illustration 216

“Temperature” display screen

g06213141

Operation

1. To operate the HVAC system, press power mode (10) icon.
2. Use temperature control (5) to increase or decrease the desired temperature inside the cab.
3. Select the desired mode and outlet vents.
4. Use fan blower speed control (6) to adjust the fan blower speed. If the HVAC system is in “Auto” mode, the blower fan speed and air outlet setting are automatically adjusted by the HVAC system.

Note: In cold ambient temperature condition, fan speed is stopped or restricted based on the coolant temperature.

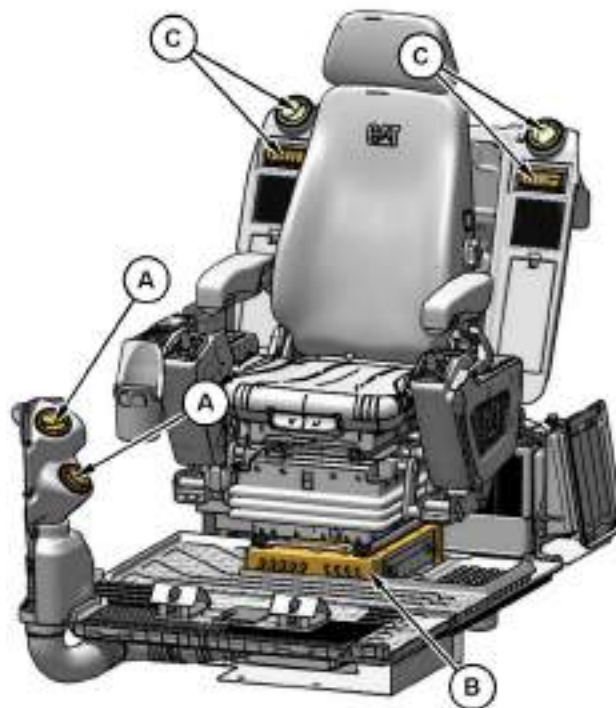


Illustration 217

g06735050

- (A) Defrost vent for front window
(B) Foot air vent
(C) Rear air vent

5. Redirect the louvers of four rear air vents (C) and two defrost vents for front window (A) by hand to the desired direction. Foot air vent (B) cannot be redirected by hand.

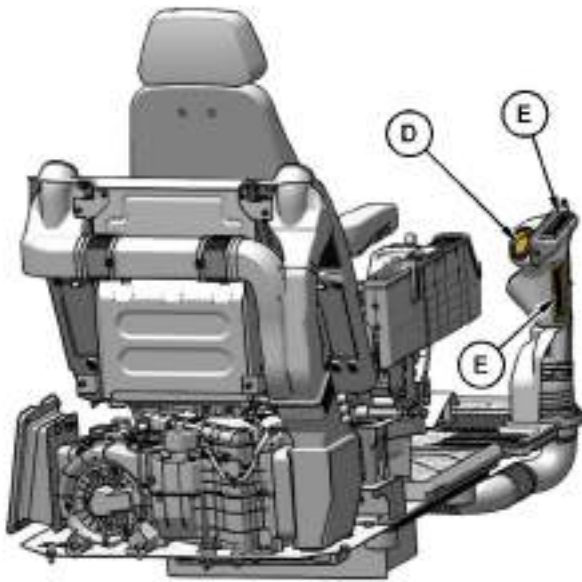


Illustration 218

g06735054

(D) Front air vent

(E) Defrost vent for right side window

6. Redirect the louvers of front air vent (D) by hand to the desired direction. Two defrost vents for right side window (E) cannot be redirected by hand.

i08286952

Mirror

SMCS Code: 7319

WARNING

Adjust all mirrors as specified in the Operation and Maintenance Manual. Failure to heed this warning can lead to personal injury or death.

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



Illustration 219

g06501098

(1) Left side view mirror on the cab

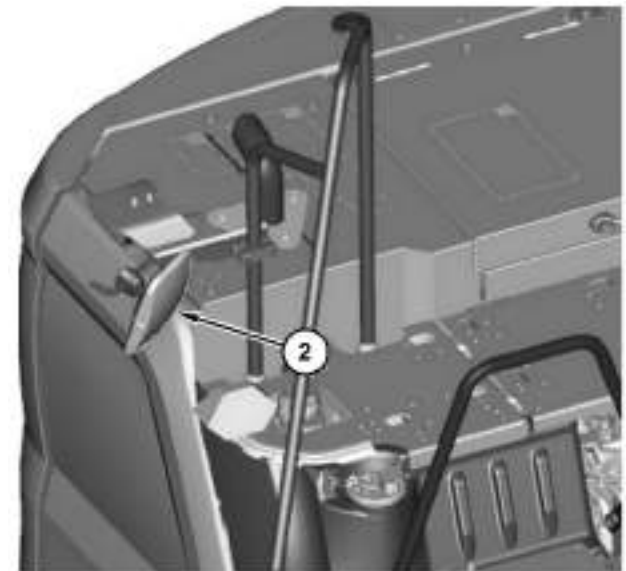


Illustration 220

g06611953

(2) Tank mirror

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

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

Mirror Adjustment

- Park the machine on a level surface.
- Lower the work tool to the ground.

- Move the hydraulic lockout control to the LOCKED position. For further details on this procedure, refer to “Operator Controls”.
- Stop the engine.
- Adjust rear view mirrors to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.



Illustration 221

g06220634

Tightening sequence

After adjustment of the mirror angle, make sure that the Cat[®] logo is at the top.

Periodically tightening the mirror mounting bolts may be necessary. If the bolts are loose, tighten the bolts in the sequence shown in Illustration 221. Tighten bolts (1) and (2) to 11 ± 2 N·m (97 ± 18 lb in).

Tighten bolts (3) through (6) to 2.0 ± 0.4 N·m (17.7 ± 3.5 lb in).

Left Side View Mirror on the Cab (1)



Illustration 222

g06591787

Adjust the left side view mirror on the cab (4) so the left side of the cab, access door, and rear of left track can be seen as the Illustration 222 from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat. Additionally, provide as much visibility to the rear as possible.

Tank Mirror (2)



Illustration 223

g06591788

Adjust the tank mirror so the fuel tank and the hydraulic tank can be seen as the Illustration 223 from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat.

i09662761

Window (Front)

SMCS Code: 7310-FR

To provide full ventilation inside the cab, the upper window and the lower window can be fully opened.

WARNING

When opening or closing the windows, be extra careful to prevent any personal injury. The hydraulic lockout control must be in the LOCKED position in order to prevent any possibility of sudden movement of the machine due to inadvertent contact with the hydraulic control(s).

Do not change the position of the window until the following items have been done:

- Park the machine on a level surface. Refer to “Prepare the Machine for Maintenance” for more information.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position. Refer to “Operator Controls” for more information.

- Stop the engine. Refer to “Stopping the Engine” for more information.

Perform Step 1 through Step 3 to open the upper window.

Note: If equipped, the Cat[®] grade control monitor may interfere with the window when opening. Ensure that the monitor is adjusted out of the way before opening the window.

Note: Do not open the front window when using the sun screen to prevent the failure of the sun screen.

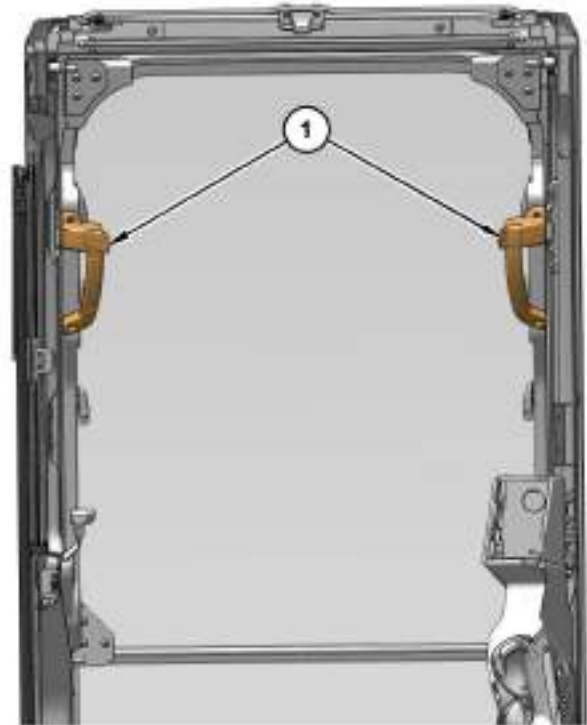


Illustration 224

g07538585

(1) Release lever

1. Release the auto-lock latches by pressing release levers (1) on the window handles.
2. Holding both handles on the window frame, pull the window upward.
3. Hold both grips that are provided on the window frame and move the window into the storage position until the auto-lock latches near the ceiling are engaged.

Perform Steps 4 through 5 to close the upper window.

i09662765

Note: If equipped, the Cat[®] grade control monitor may interfere with the window when closing. Ensure that the monitor is adjusted out of the way before closing the window.

4. Release the auto-lock latches by pressing release levers (1) on the window handles.
5. Reverse Steps 1 through 3 to close the upper window.

Perform Steps 6 through 8 to open the lower window and close the lower window.

6. Raise the lower window out of the window frame.

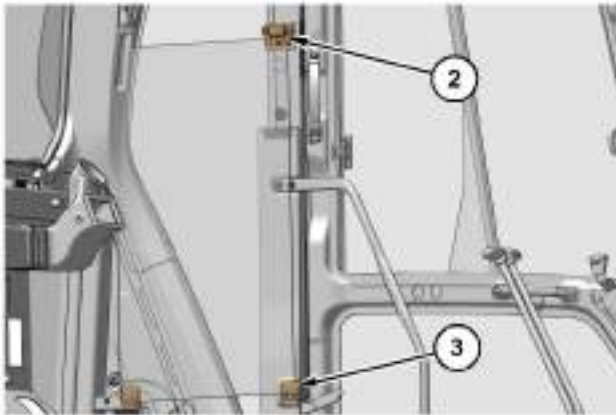


Illustration 225

g07538588

- (2) Catch
(3) Brackets

7. Store the lower window in the holder that is located in the rear of the left side cab frame. To store the lower window, locate one end of the lower window into brackets (3). Secure the opposite end of the lower window with catch (2).

8. To close the lower window, reverse the procedure that is used for opening the lower window.

Note: The lower window is curved. The lower window can only be positioned one way in the holders.

Sun Screen

SMCS Code: 7165-ZZ

WARNING

When opening or closing the windows, be extra careful to prevent any personal injury. The hydraulic lockout control must be in the LOCKED position in order to prevent any possibility of sudden movement of the machine due to inadvertent contact with the hydraulic control(s).

Do not change the position of the window until the following items have been done:

- Park the machine on a level surface. Refer to "Prepare the Machine for Maintenance" for more information.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position. Refer to "Operator Controls" for more information.
- Stop the engine. Refer to "Stopping the Engine" for more information.

Note: Do not use the sun screen when opening the front window.



Illustration 226

g07538612

- (1) Sun screen
(2) Bracket

Pull sun screen (1) down from the ceiling. Hook sun screen (1) to brackets (2) at both sides of the front window. Sun screen (1) may be positioned at two different heights.

i07538807

Roof Hatch

SMCS Code: 7303

WARNING

When opening or closing the windows, be extra careful to prevent any personal injury. The hydraulic lockout control must be in the LOCKED position in order to prevent any possibility of sudden movement of the machine due to inadvertent contact with the hydraulic control(s).

NOTICE

Do not change the position of the roof hatch without performing the following actions:

- Park the machine on a level surface.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position.
- Stop the engine.

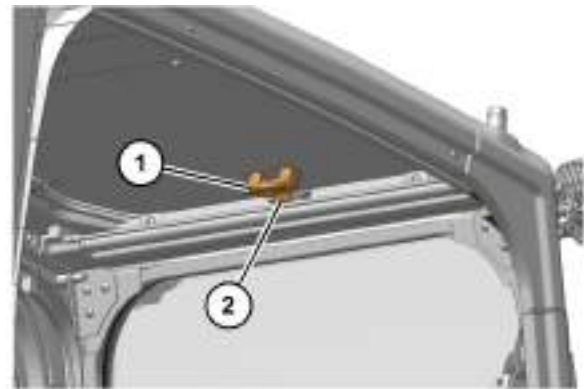


Illustration 227

g06179871

- (1) Grip
(2) Lock

To open the roof hatch, release lock (2). Hold grip (1) and push the roof hatch upward.

To close the roof hatch, hold grip (1) and pull the roof hatch downward. Engage lock (2) securely.

NOTICE

Do not stand or walk on the hatch or the roof of the cab. Serious damage may occur.

i06949447

Cab Door

SMCS Code: 7308



Illustration 228

g06180275

To open the cab door from the outside of the cab, pull outward on the door handle.



Illustration 229

g06179959

To open the cab door while inside the cab, push forward on the lever for the cab door latch.

For additional ventilation, open the cab door all the way to engage the catch on the exterior wall of the cab.

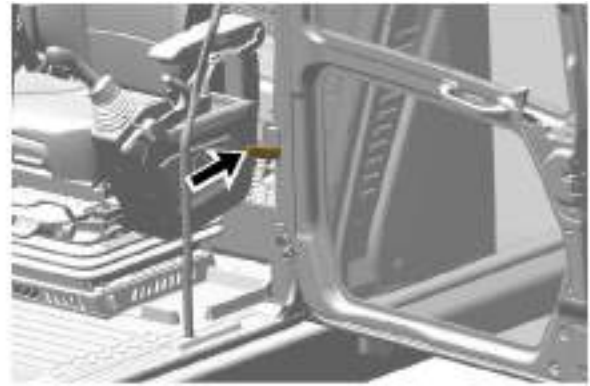


Illustration 230

g06180267

To release the cab door from the catch, pull downward on the cab door release lever.

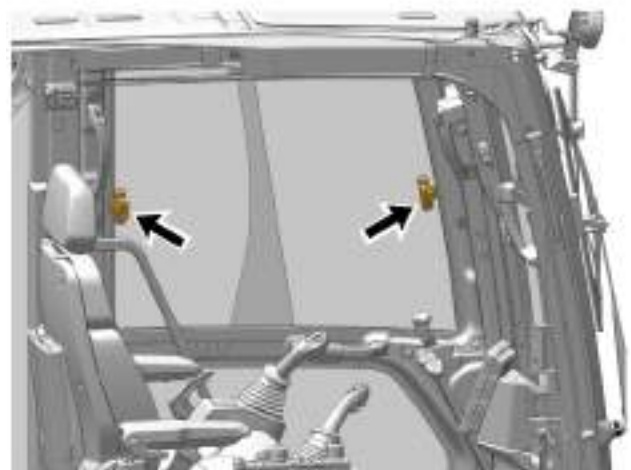


Illustration 231

g06179957

To open a window, release the window latch, and then slide the window to the desired position.

i06946782

Travel Control (Straight Travel Pedal (If Equipped))

SMCS Code: 5462

WARNING

With certain attachment combinations, the third pedal can have different functions. Always check for third pedal function before using the third pedal. Improper operation of the third pedal could result in serious injury or death.



Illustration 232

g06178249

Position for normal travel

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

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

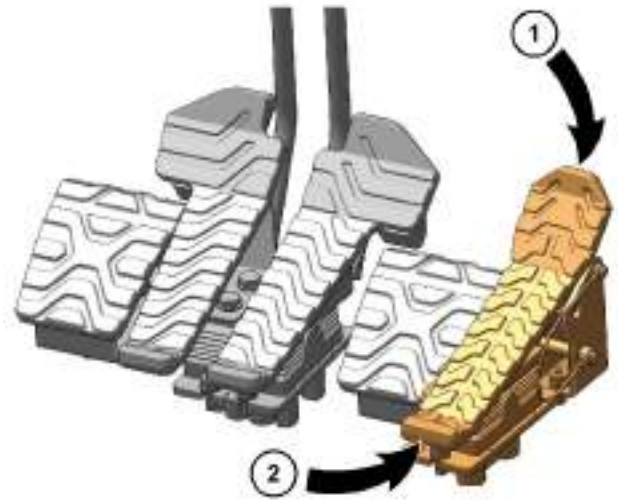


Illustration 233

g06178758

- (1) Forward Travel
- (2) Reverse Travel

The third pedal is to the right of the right travel pedal. The third pedal controls the forward and backward movement of the machine.

Note: If the third pedal is depressed and a travel pedal or a travel lever is operated, the machine will turn accordingly.

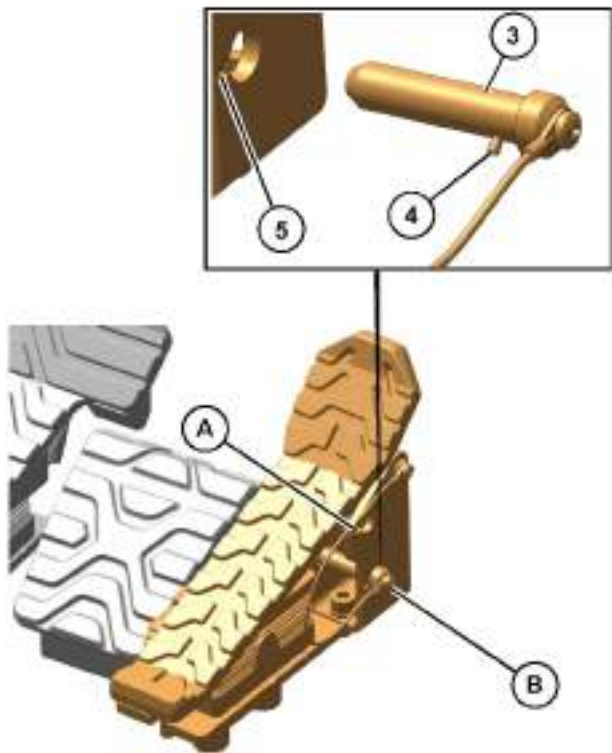


Illustration 234

g06178798

- (3) Lock pin
- (4) Pin
- (5) Notch
- (A) LOCKED position
- (B) UNLOCKED position

When the machine is not operated with the third pedal, install lock pin (3) at the LOCKED position to prevent accidental operation.

Note: To prevent lock pin (3) from being pulled out, insert pin (4) through notch (5) and turn lock pin (3) counterclockwise by 1/4 turn.

i08696057

Shovel Crane Control (If Equipped)

SMCS Code: 7451

WARNING

Do not perform a lifting operation with the shovel crane on a slope greater than 5 degrees. Lifting on a slope greater than 5 degrees may cause the machine to become unstable or roll over. Lifting with the shovel crane on a slope greater than 5 degrees may result in property damage, personal injury, or death.

WARNING

Do not operate the shovel crane with a hook that has cracks or deformities. Failure to follow these instructions may cause the load to fall and result in injury or death. Replace the shovel crane hook if there are any signs of cracks or deformities.

WARNING

Do not operate the bucket without securing the shovel crane hook. Operating the bucket without properly securing the hook may result in personal injury or machine damage.

NOTICE

Do not perform a lifting operation if the monitors external display light does not come on. Do not perform a lifting operation if the monitor does not display the suspended load information.

NOTICE

Lifting capacities are different than rated load capacities. Lifting capacities should not be used to determine the rated load of the shovel crane function. Only use the rated load capacities found in Operation and Maintenance Manual, "Specifications" to determine the rated load capacity for the shovel crane function.

NOTICE

Do not operate the shovel crane if the beacon light does not function properly. Before operation, check that the beacon light is flashing/rotating properly.

In some regions, regulations require a shovel crane configuration to lift certain objects. Always obey the local regulations in your region.

Refer to this "Shovel Crane Operation" for additional information regarding the operation of the shovel crane.

Operate the machine according to the rated load table for your machine. Refer to "Specifications" for more information.

Activating the Shovel Crane



Illustration 235

g06741261

- (1) Pitch indicator
(2) Roll indicator

1. Use pitch indicator (1) and roll indicator (2) on the monitor to position the machine on a level surface.
2. Once the machine is in position on firm level ground, retract the bucket and lower the bucket to the ground.
3. Move the hydraulic lockout control to the LOCKED position. Refer to Operation and Maintenance Manual, Operator Controls for more information.
4. Stop the engine. Refer to Operation and Maintenance Manual, Stopping the Engine for more information.

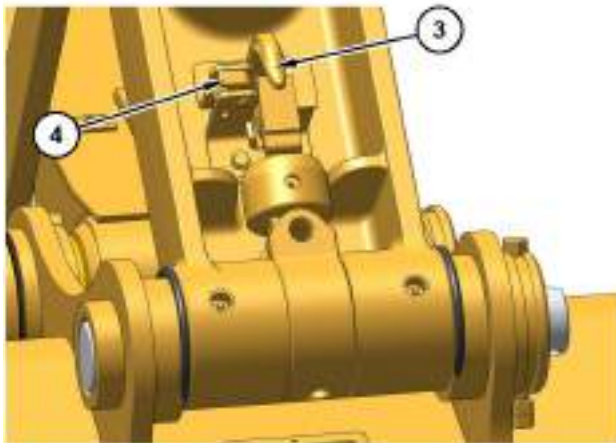


Illustration 236

g06741262

- (3) Shovel crane hook
(4) Shovel crane latch

Release shovel crane latch (4). Lower shovel crane hook (3) into operating position.

Inspect the shovel crane hook for damage. Refer to "Shovel Crane - Inspect".



Illustration 237

g06224672

Press the function list button on the home screen.



Illustration 238

g06210063

Tap the crane option or if using the jog dial highlight the crane option and press down on the jog dial. The crane option should now say "ON"

Note: Tool Control should be turned OFF before the shovel crane can be activated. Select "Bucket" instead of any other tools. If any other work tool is selected, the shovel crane mode cannot be activated.



Illustration 239

g06741263

(5) Shovel crane indicator

Once the crane option is enabled, press the home button.

The monitor will display the following on the home page:

- Height
- Radius
- Actual Load
- Rated Load (not traveling)
- Rated Load (traveling)

Note: The rated load icon will turn yellow and a track will appear when the machine is traveling.

Shovel crane indicator (5) will display at the top of the monitor to indicate that the shovel crane feature is active.

Fully retract the bucket to activate the shovel crane mode. The bucket will lock into place and will not move, and the engine speed will then be reduced.

Note: If the hydraulic lockout control is moved to the LOCKED position, the shovel crane will become inoperable.

Refer to “Shovel Crane Operation” for additional information regarding the operation of the shovel crane.

Deactivating the Shovel Crane



Illustration 240

g06191883

Return to the function list screen. Tap the crane option or if using the jog dial highlight the crane option and press down on the jog dial. The crane option should now say “OFF”.

Position the stick so that it is perpendicular to the ground and slowly lower the boom until the bucket contacts the ground.

Return the hook to the stored position and latch the hook.

Indicators and Warnings

Below is a list of indicators and warnings that may appear on the monitor during the shovel crane operation.

Travel With Lift Out of Work Area – If the radius is over 70% of maximum radius when traveling, the monitor will display this warning. If this warning occurs, stop traveling until the machine center of gravity becomes stable or reduce the suspended load.

Crane 90% Load – If the suspended load is 90% of the rated load, the monitor will display this warning and an alarm will sound intermittently. If this warning occurs, stop operation until the machine center of gravity becomes stable or reduce the suspended load.

Crane 100% Load – If the suspended load is 100% of the rated load, the monitor will display this warning

and an alarm will sound continuously. If this warning occurs, stop operation until the machine center of gravity becomes stable or reduce the suspended load.

Crane Hook Interference – When the lifting height is too high, the monitor will display this warning. If this warning is present, stop lifting and lower the boom or retract the stick.

Boom Out of Work Area – When the boom cylinder is extended to the point near stroke end, the monitor will display this warning. If this warning is present, lower the boom.

Stick Out of Work Area – When the stick is retracted from the vertical position, the monitor will display this warning. If this warning occurs, return the stick to vertical.

Crane Malfunction – When an abnormality occurs with a shovel crane-related component, the monitor will display this warning. If this warning occurs, stop lifting and contact your Cat® dealer.

Crane Mode Off – When the crane system has been stopped or disabled, the monitor will display this indicator.

i08015281

Joystick Controls

SMCS Code: 5705

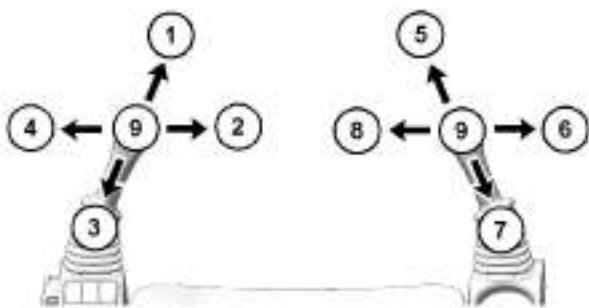


Illustration 241

g06180324

- (1) STICK OUT
- (2) SWING RIGHT
- (3) STICK IN
- (4) SWING LEFT
- (5) BOOM LOWER
- (6) BUCKET DUMP
- (7) BOOM RAISE
- (8) BUCKET CLOSE
- (9) HOLD

WARNING

The joystick and controls on the joystick can be configured with different functions. Always make sure to check the joystick configuration on the monitor before using the machine to avoid unexpected machine movement. These unexpected machine movements could cause a hazard resulting in serious injury or death.

WARNING

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

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

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

When you release the joysticks from any position, the joysticks will return to HOLD position (9). Movement of the upper structure will stop unless the fine swing control (if equipped) is ON. When the fine swing control is ON, the swing parking brake will not activate until 6.5 seconds after the joystick control for the swing function returns to the HOLD position.

Two functions may be performed at the same time by moving a joystick diagonally.

The machine control pattern is initially set at the factory to the SAE system, as shown. The pattern on the left pertains to the left joystick and the pattern on the right pertains to the right joystick.

The machine control pattern can be varied. Refer to Operation and Maintenance Manual, “Joystick Controls Alternate Patterns” for more information.

Manual Low Idle – Activate the manual low idle to reduce the engine speed to approximately 1000 rpm. Pressing the switch again will allow the engine speed to return to the original setting of the engine speed dial.

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

3 Button Joystick Controls

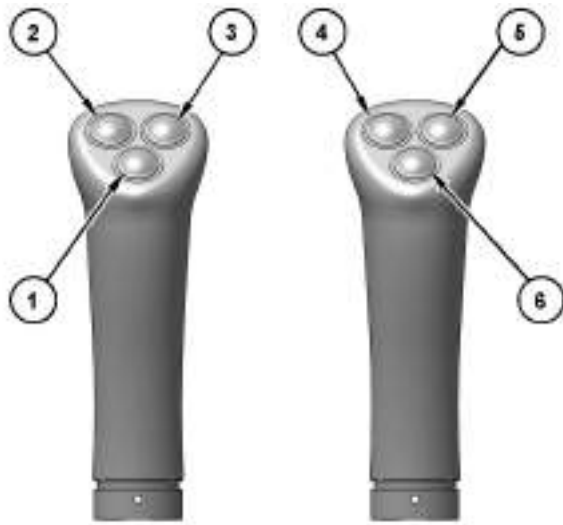


Illustration 242

g06223512

3 Button Joystick Controls

- (1) Left joystick switch 1
- (2) Left joystick switch 2
- (3) Left joystick switch 3
- (4) Right joystick switch 2
- (5) Right joystick switch 3
- (6) Right joystick switch 1

Table 32

Joystick Configurations	
Switch Location	3 Button Joystick
1	Horn
2	Configurable
3	Configurable
4	Configurable
5	Configurable
6	Configurable

Vertical Slider Joystick Controls (If Equipped)

Note: The following functions can be assigned to the configurable buttons: radio mute, one-touch low idle, work tool select, and HVAC.



Illustration 243

g06225116

Vertical Slider Joystick Controls

- (7) Left joystick switch 3
- (8) Left joystick switch 4
- (9) Left joystick switch 1
- (10) Left joystick switch 2

- (11) Left joystick thumbwheel
- (12) Right joystick thumbwheel
- (13) Right joystick switch 2
- (14) Right joystick switch 1

- (15) Right joystick switch 4
- (16) Right joystick switch 3

Table 33

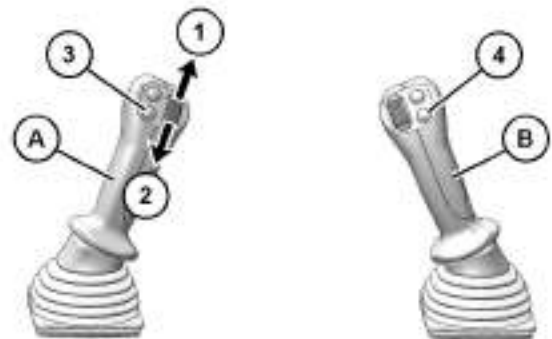
Joystick Configurations	
Switch Location	Joystick With Tool Control Sliders
7 ⁽¹⁾	Hammer
8	Configurable
9	Horn
10	Configurable
11 ⁽¹⁾	Work Tool Rotation
12 ⁽¹⁾	Work Tool Open / Close
13	Configurable
14	Configurable
15	Configurable
16	Configurable

(Table 33, contd)

(1) Button is configurable on machines without tool control.

Medium Pressure (If Equipped)

Rotating Tool Control



(continued)

Illustration 244

g06260903

- (A) Left joystick
- (B) Right joystick
- (1) Thumb wheel (Clockwise)
- (2) Thumb wheel (Counterclockwise)
- (3) Horn switch
- (4) AEC switch



(1) **ROTATE CLOCKWISE** – Move the thumb wheel upward to rotate the work tool clockwise.



(2) **ROTATE COUNTERCLOCKWISE** – Move the thumb wheel downward to rotate the work tool counterclockwise.



(3) **HORN** – Press the horn switch on the left joystick to activate the horn.



(4) **AEC SWITCH** – Press the AEC switch on the right joystick to activate low engine speed. Press the switch again to activate high engine speed.

i08796529

Joystick Controls (Joystick Steering)

SMCS Code: 5705



Verify the joystick control pattern before operating the machine.

Refer to Operation and Maintenance Manual.

Failure to understand control functions could result in injury or death.

Ensure that the joystick control film on the cab window matches the control functions of your machine. Consult your Cat® dealer for additional information regarding the joystick control film.

Become familiar with the joystick controls before operating the machine.

Note: Joystick steering cannot be used with shovel crane mode.

Joystick Steering

Enable the joystick steering function using the monitor screen. Once the function is enabled, joystick will be activated by pressing the configured joystick button. Refer to Operation and Maintenance Manual, M0109053, “Next Generation Hydraulic Excavator Monitoring System Supplement” for more information.

The following three modes are available in joystick steering function:

- Joystick steering mode
- Cruise control mode
- Blade control mode (normal and float)

Left Joystick Control Patterns

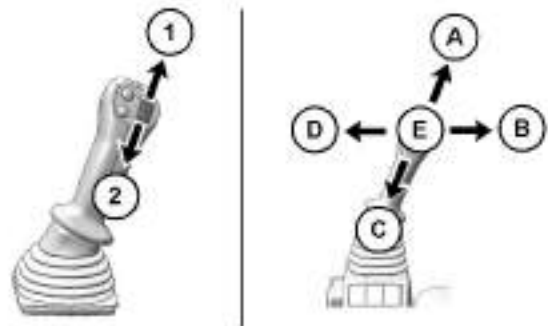


Illustration 245

g06720799

Left Joystick

Table 34

Joystick Control	Left Joystick Patterns		
	Standard Mode (ISO)	Joystick Steer Mode	Cruise Control Mode
E	Hold		
A	Stick Out	Travel Forward	Cancel Cruise
B	Right Swing	Turn Right	Turn Right
C	Stick In	Travel Backward	Cancel Cruise
D	Left Swing	Turn Left	Turn Left
1 ⁽¹⁾	Right Swing		
2 ⁽¹⁾	Left Swing		

⁽¹⁾ Thumb wheel is configured with swing or stick operation only when the joystick steer mode is on.

Refer to Operation and Maintenance Manual, M0109053, “Next Generation Hydraulic Excavator Monitoring System Supplement” for more information.

Right Joystick Control Patterns

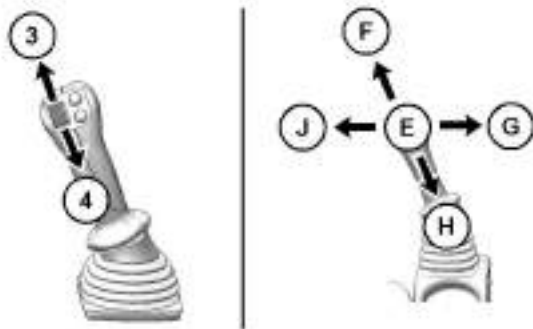


Illustration 246 g06720802

Right Joystick

Table 35

Joystick Control	Right Joystick Patterns		
	Standard Mode (ISO)	Joystick Steer Mode	Cruise Control Mode
E	Hold		
F	Boom Down		
G	Bucket Dump / Heel Down		
H	Boom Up		
J	Bucket Close / Heel Up		
3 ⁽¹⁾	Stick Out		
4 ⁽¹⁾	Stick In		

(1) Thumb wheel is configured with swing or stick operation only when the joystick steer mode is on.

Refer to Operation and Maintenance Manual, M0109053, “Next Generation Hydraulic Excavator Monitoring System Supplement” for more information.

i08222281

Work Tool Control (One-Way Flow) (If Equipped)

SMCS Code: 6700

The following information pertains to work tools that require hydraulic oil flow in one direction. Hydraulic hammers are an example of work tools that require hydraulic oil flow in one direction.

Note: For information that pertains to work tools that require hydraulic oil flow in two directions, refer to Operation and Maintenance Manual, “Work Tool Control (Two-Way Flow)”.

Joystick

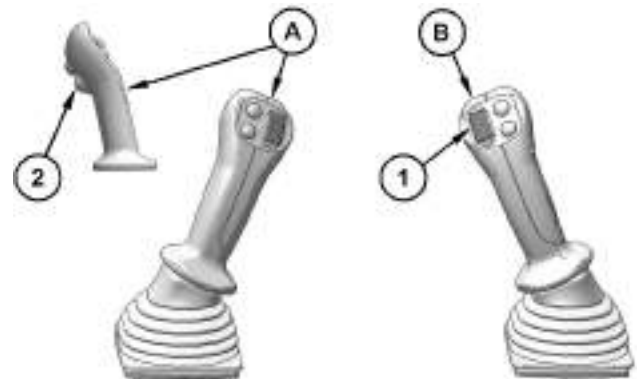


Illustration 247 g06588792



Illustration 248 g06588793

(A) Left joystick
(B) Right joystick



(1) Variable Speed – Move the thumb wheel downward to activate the work tool. Move the thumb wheel further to increase the speed of the work tool.



(2-1) On/Off (Momentary) – While pressing this switch, the work tool will remain activate at a constant rate. Release the switch to turn off the work tool.



(2-2) On/Off (Toggled) – Press the switch once to activate the work tool. Press the switch again to turn off the work tool.

Work Tool Pedal



With certain attachment combinations, the work tool pedal can have different functions. Always check for work tool pedal function before using the work tool pedal. Improper operation of the work tool pedal could result in serious injury or death.

The work tool pedal can be installed on either side of the travel pedals. The work tool pedal allows the operator to modulate the speed of the work tool.

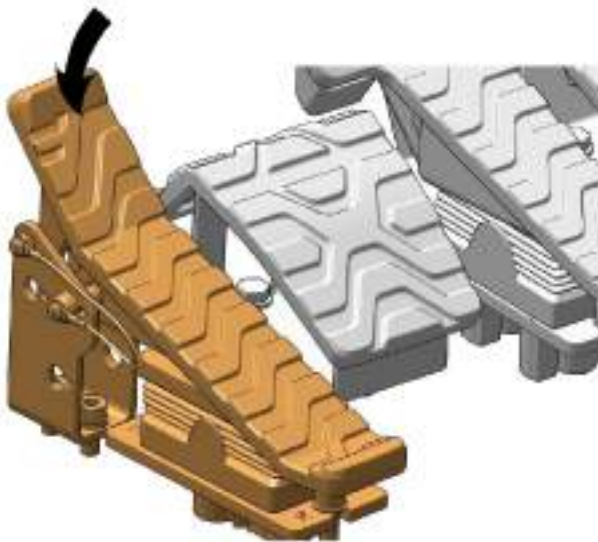


Illustration 249

g06180447



Variable Speed – Push down on the front of the pedal to activate the work tool. Move the pedal further to increase the speed of the work tool. Release the pedal to turn off the work tool.

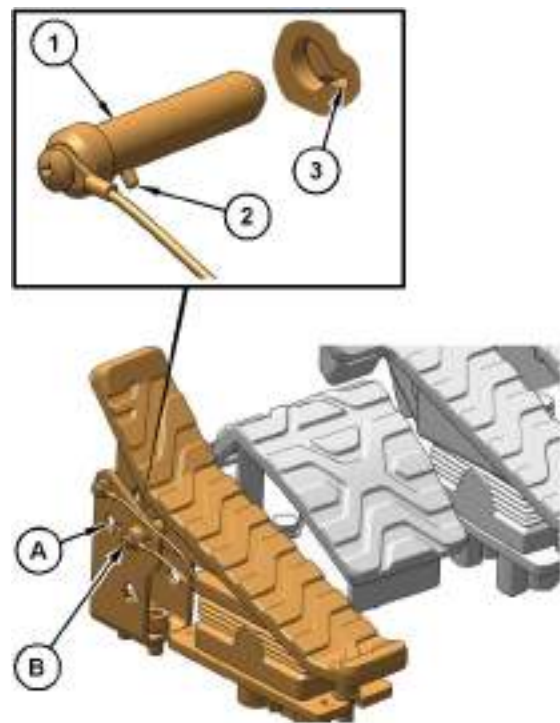


Illustration 250

g06591307

- (1) Lock pin
- (2) Pin
- (3) Notch
- (A) UNLOCKED position
- (B) LOCKED position

When you are not using the work tool, put the lock pin (1) in LOCKED position (B). This will lock the work tool pedal to prevent any unexpected operation of the work tool.

Note: To prevent lock pin (1) from being accidentally pulled out, insert pin (2) through notch (3) and turn lock pin (1) counterclockwise by 1/4 turn.

i07243676

Work Tool Control (Two-Way Flow)

(If Equipped)

SMCS Code: 6700

WARNING

The joystick and controls on the joystick can be configured with different functions. Always make sure to check the joystick configuration on the monitor before using the machine to avoid unexpected machine movement. These unexpected machine movements could cause a hazard resulting in serious injury or death.

The following information pertains to work tools that require hydraulic oil flow in two directions. These work tools can also be equipped with a rotate circuit. Hydraulic shears, pulverizers, crushers, and grapples are examples of work tools that require hydraulic oil flow in two directions.

Note: For information that pertains to hydraulic hammers, refer to Operation and Maintenance Manual, "Work Tool Control (One-Way)".

Joystick

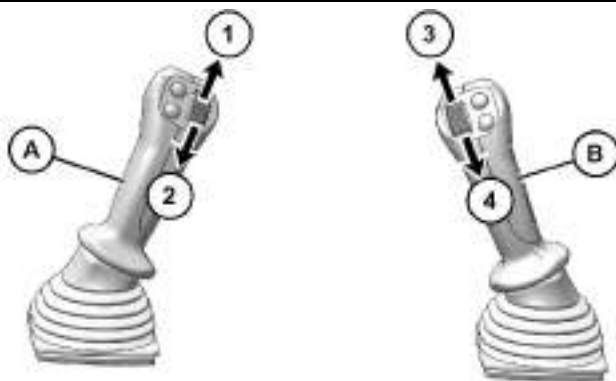


Illustration 251

g06180488

(A) Left joystick
(B) Right joystick



(1) ROTATE CLOCKWISE – Move the thumb wheel upward to rotate the work tool clockwise.



(2) ROTATE COUNTERCLOCKWISE – Move the thumb wheel downward to rotate the work tool counterclockwise.



(3) CLOSE – Move the thumb wheel upward to close the work tool.



(4) OPEN – Move the thumb wheel downward to open the work tool.

Work Tool Pedal

WARNING

With certain attachment combinations, the work tool pedal can have different functions. Always check for work tool pedal function before using the work tool pedal. Improper operation of the work tool pedal could result in serious injury or death.

The work tool pedal can be installed on either side of the travel pedals. The work tool pedal allows the operator to vary the speed of the work tool.

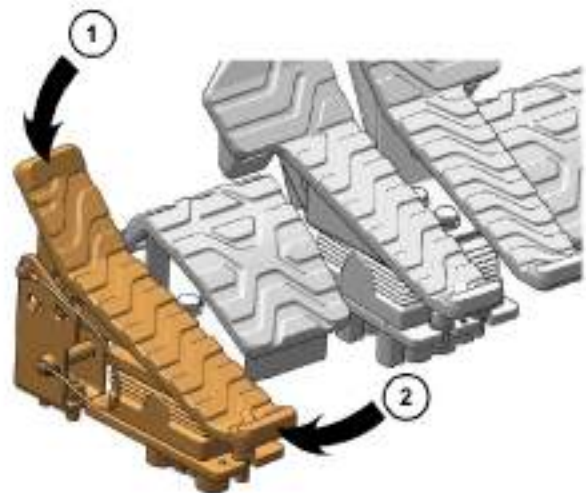


Illustration 252

g06180510



(1) CLOSE – Push down on the front of the pedal to close the work tool.



(2) OPEN – Push down on the rear of the pedal to open the work tool.

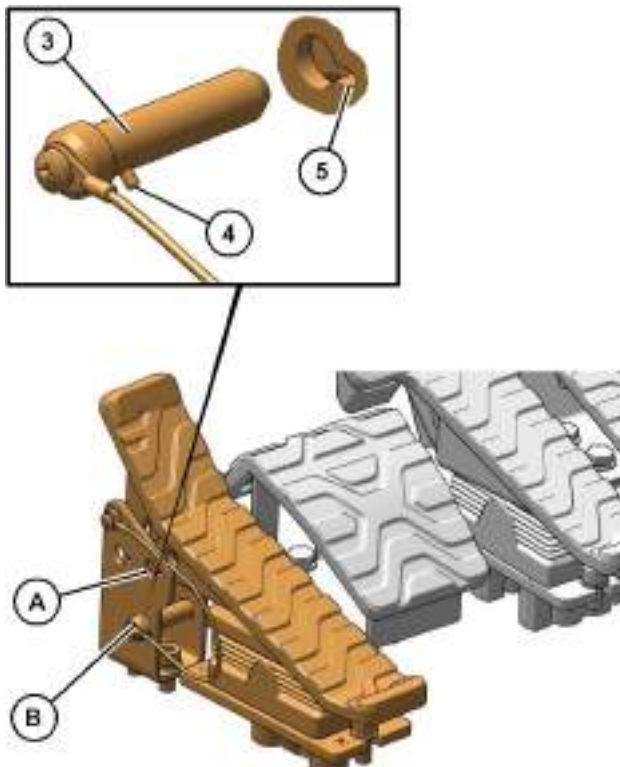


Illustration 253

g06180514

- (3) Lock pin
- (4) Pin
- (5) Notch
- (A) LOCKED position
- (B) UNLOCKED position

When you are not using the work tool, put the lock pin (3) in LOCKED position (A). This will lock the work tool pedal to prevent any unexpected operation of the work tool.

Note: To prevent lock pin (3) from being accidentally pulled out, insert pin (4) through notch (5) and turn lock pin (3) by 1/4 turn.

i08209549

Joystick Controls Alternate Patterns

SMCS Code: 5059; 5137

Changing Machine Control Pattern (If Equipped)

WARNING

Whenever a change is made to the machine control pattern, also exchange the pattern card in the cab to match the new pattern.

Check the machine control pattern for conformance to the pattern on the card in the cab. If the pattern does not match, change the card to match the machine control pattern before you operate the machine. Failure to do so could result in personal injury.

The machine control pattern can be changed to the ISO/JIS pattern, BHL pattern, MHI pattern, KOBE pattern, or the former SCM pattern. To change the joystick controls between the patterns, refer to Operation and Maintenance Manual, Monitoring System for more information.

Operation Section
Joystick Controls Alternate Patterns

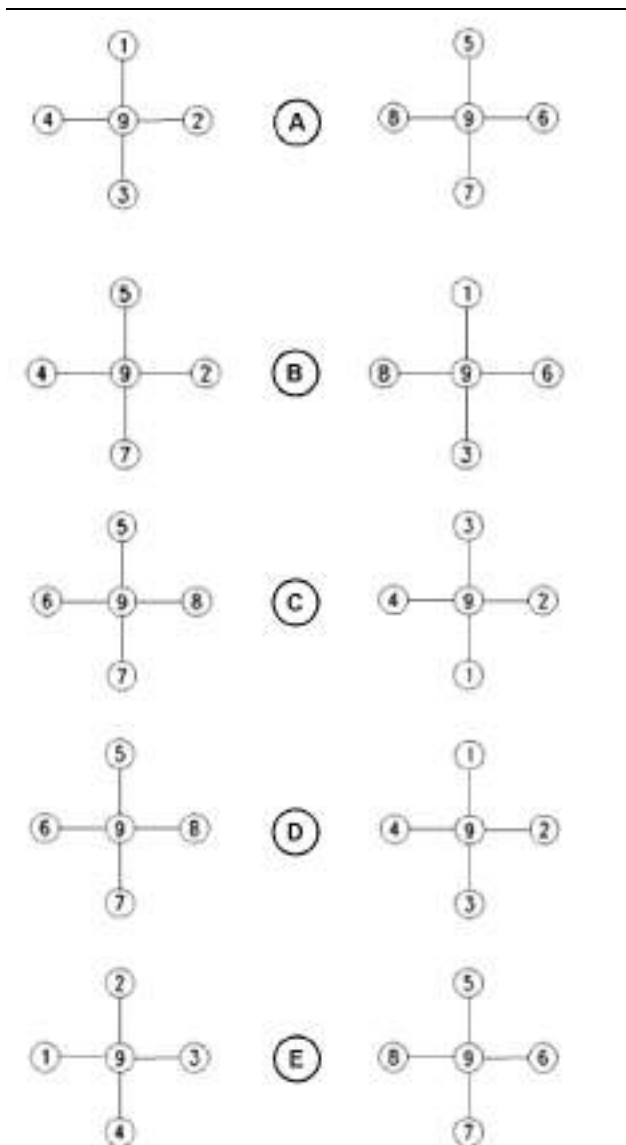


Illustration 254

g06136699

- (A) ISO/JIS machine control pattern
(B) BHL machine control pattern
(C) MHI machine control pattern
(D) KOBE machine control pattern
(E) Former SCM machine control pattern

The patterns on the left side of the Illustration show the possible configurations for the left control lever. The patterns on the right side of the Illustration show the possible configurations for the right control lever.



STICK OUT (1) – Move the control lever to this position to move the stick outward.



SWING RIGHT (2) – Move the control lever to this position to swing the upper structure to the right.



STICK IN (3) – Move the control lever to this position to move the stick inward.



SWING LEFT (4) – Move the control lever to this position to swing the upper structure to the left.



BOOM LOWER (5) – Move the control lever to this position to lower the boom.



BUCKET DUMP (6) – Move the control lever to this position to dump the bucket.



BOOM RAISE (7) – Move the control lever to this position to raise the boom.



BUCKET CLOSE (8) – Move the control lever to this position to close the bucket.

HOLD (9) – When the control lever is released from any position, the control lever will return to the HOLD position. Movement of the upper structure will stop.

Two functions may be performed at the same time by moving a control lever diagonally.

If the machine is equipped with a hydraulic hammer, the function of position (6) and of position (8) is different.

HYDRAULIC HAMMER RAISE (6) – Move the control lever to this position to raise the hydraulic hammer.

HYDRAULIC HAMMER LOWER (8) – Move the control lever to this position to lower the hydraulic hammer.

If the machine is equipped with a grapple, the function of position (6) and of position (8) is different.

GRAPPLE OPEN (6) – Move the control lever to this position to open the grapple arms.

GRAPPLE CLOSE (8) – Move the control lever to this position to close the grapple arms.

If the machine is equipped with a clamshell, the function of position (6) and of position (8) is different when in “Clamshell” mode.

Note: When in “Clamshell” mode, the work tool can only be operated if Work Tool Select also has clamshell selected.

CLAMSHELL OPEN (6) – Move the control lever to this position to open the clamshell.

CLAMSHELL CLOSE (8) – Move the control lever to this position to close the clamshell.

i09682615

i07966648

Fuel Tank Shutoff and Drain Control

SMCS Code: 1273

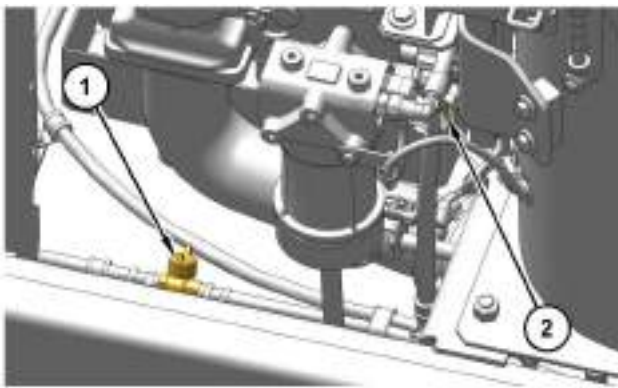


Illustration 255

g06497059

Fuel tank drain valve

Fuel Tank Drain Valve (1) – The drain valve for the fuel tank is located behind the right side access door. To drain the water and sediment from the fuel tank, turn the fuel drain valve counterclockwise. To close the fuel tank drain valve, turn the drain valve clockwise.

Fuel Shutoff Valve (2) – The fuel shutoff valve is located behind right side access door. To shut off the fuel supply, pull out the fuel shutoff valve, the red tab, and turn clockwise. To turn on the fuel supply, turn the fuel shutoff valve counterclockwise.

Note: For more detailed information that pertains to draining the water and sediment from the fuel tank, refer to Operation and Maintenance Manual, “Fuel Tank Water and Sediment - Drain”.

Compartment Light (If Equipped)

SMCS Code: 1429

 **WARNING**
Crush Hazard!

Machine access doors can pinch, trap, or crush personnel when being closed.

Use caution while closing machine access doors. Ensure that all personnel are clear of the machine before closing the access doors.

The compartment lights in the various compartments can be activated by turning on the compartment light switch.



Illustration 256

g07546721

(1) Left access door

1. Open left access door (1). Refer to “Access Door and Cover Locations” for more information.

Operation Section
If Equipped

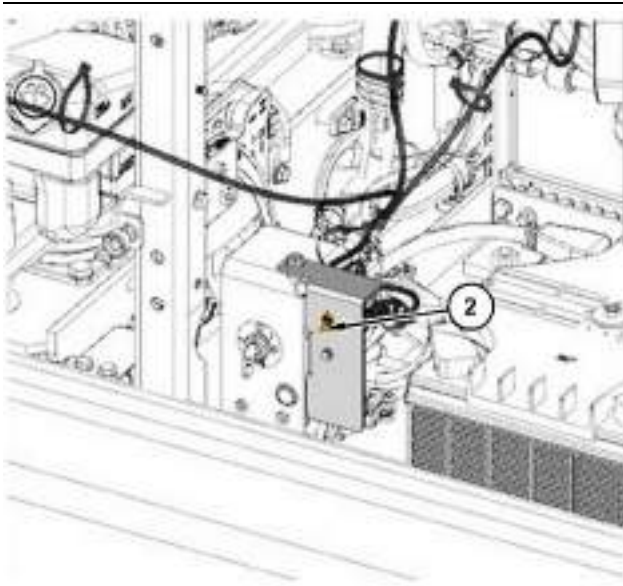


Illustration 257

g07546777

(2) Compartment light switch

2. Compartment light switch (2) is located near the battery disconnect switch. Move compartment light switch (2) upward in order to illuminate the lights in following compartments.

- Battery compartment
- Engine compartment
- Pump compartment

3. Move compartment light switch (2) upward again to turn off the lights in each compartment.

Note: Compartment lights are equipped with timer relay function. Compartment lights will turn off automatically in 30 minutes, if not manually turned off.

Engine Starting

i09728506

Engine Starting

SMCS Code: 1000; 1090; 1456; 7000

WARNING

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

NOTICE

Do not crank the engine for more than 10 seconds. If the engine does not start, allow the starter to cool for 2 minutes before cranking again. The engine start switch must be turned to the OFF position before trying to restart.

NOTICE

This machine is equipped with a Cat[®] Machine Security System (MSS) and may not start under certain conditions.

NOTICE

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

Note: The engine can start in areas that have temperatures as low as -18°C (0°F). For areas that are colder, a starting kit for cold weather is available. Refer to Operation and Maintenance Manual, SEBU5898, "Cold-Weather Recommendations for All Caterpillar Machines" for more information.

1. Move the hydraulic lockout control to the LOCKED position. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

This machine is equipped with an engine neutral start system. The system only allows the engine to start when the lever for the hydraulic lockout control is in the LOCKED position. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

2. Ensure that the joysticks and travel controls are in the HOLD position. Refer to Operation and Maintenance Manual, "Joystick Controls" for more information.



Illustration 258

g07512980

"Engine Start Allowed" indication in monitor display

3. The operator passcode, Bluetooth[®] key, or Cat[®] App: Fleet management application must be authenticated before starting the engine. Refer to Operation and Maintenance Manual, "Machine Security System" for more information. Once authenticated, an "Engine Start Allowed" message will appear across the top of the monitor and the start switch Light Emission Diode (LED) will turn green.
4. Bluetooth[®] devices and passcodes can be registered using the in-cab display if the operator is logged in to the system using a master access account. Contact your Cat[®] dealer for additional information.

Reference: Refer to Operation and Maintenance Manual, Machine Security System for instructions.

5. Before you start the engine, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the horn before you start the engine. Refer to Operation and Maintenance Manual, "Joystick Controls" for the location of horn switch.

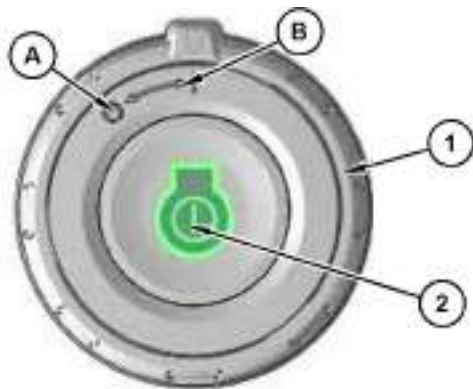


Illustration 259

g07513815

- (A) OFF
 (B) ON
 (1) Engine start ring
 (2) Engine start button

- Turn the engine start ring (1) to ON position (B) from OFF position (A). Refer to Operation and Maintenance Manual, "Operator Controls" for location of engine start button. Press and hold engine start button (2) to start the engine. Release engine start button (2) after the engine has started.

If the engine is having trouble starting, do not crank the engine for more than 30 seconds. Cranking the engine for more than 30 seconds can damage starting system components.

Engine Oil Level Monitoring System

Your machine may be equipped with an automated function for checking Engine Oil level.

- Turn the engine start ring (1) to ON position (B).

If fluid level is low, certain event codes will appear on the display. The system will skip the level check if the machine is parked on a slope, or the duration from the last engine shutdown is not enough. The display will show a message in the case that the level check is skipped.

i08021390

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

NOTICE

Keep engine speed low and do not operate until the message "Warm-Up Mode Power Derate" on the monitor goes out. If it does not go out within thirty seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

NOTICE

Always run the engine at low idle for at least ten minutes before performing any other operations in cold conditions or each time the engine oil and oil filter are changed in order to protect your engine and hydraulic components.

NOTICE

Depending on the ambient temperature, in order to prevent the machine operation with high speed without sufficient lubrication at the turbo bearing, the engine speed may be set to low speed and the hydraulic power minimized for a pre-determined time after the engine starts. Refer to turbo protection feature.

The engine may automatically change speeds when the machine is stationary and idling in cold ambient temperature for an extended time. This is to:

- Maintain desired coolant temperature.
- Maintain desired operation of engine systems.

During extended idling in cold ambient conditions, engine speed may operate between 900 rpm and 1000 rpm. Operation at 1000 rpm is minimal and will only last for up to 20 minutes.

Hydraulic System

Automatic Warm-Up

This machine comes with an automatic warm-up feature that can be enabled or disabled. If the feature is enabled, and the hydraulic oil temperature is below the threshold that has been set, a prompt will appear on the monitor after starting the machine. Follow the prompts on the monitor. If this feature is disabled or you would like to change the temperature setting, refer to Operation and Maintenance Manual, Monitoring System.



Illustration 260

g06219830

Manual Warm-Up

WARNING

When you cycle the machine controls, the machine can move suddenly. Contact between the machine and external objects or ground personnel can result in serious injury or death. Before you cycle the machine controls, the machine should be located in an unobstructed, hazard-free work area that is away from external objects and ground personnel.

1. Make sure that the area is clear of personnel and equipment.

Note: The hydraulic lockout control must be in the UNLOCKED position before the hydraulic controls will function.

2. Allow the engine to warm up at low idle for at least 5 minutes. Engage the work tool controls and disengage the work tool controls. This will speed up the warm-up of the hydraulic components.

When you idle the machine for warm-up, observe the following recommendations:

- If the temperature is greater than 0°C (32°F), warm up the engine for approximately 15 minutes.
- If the temperature is less than 0°C (32°F), warm up the engine for approximately 30 minutes.
- If the temperature is less than – 18°C (0°F) or if hydraulic functions are sluggish, additional time may be required.

NOTICE

The hydraulic oil temperature should be higher than 25 °C (77 °F) before performing work with the machine. Make sure that the warm-up procedure is performed.

If the hydraulic oil temperature is less than 25 °C (77 °F) and the machine is operated abruptly, serious damage to the hydraulic components may occur.

Note: The recommended operating temperature of the hydraulic fluid for this machine is 55 °C (131 °F).

3. To warm up the hydraulic oil, turn the engine speed dial to the medium engine speed. Run the engine for approximately 5 minutes and move the joystick intermittently from the BUCKET DUMP position to the HOLD position. Do not hold the joystick in the BUCKET DUMP position with the bucket cylinder fully extended for more than 10 seconds.

This allows the oil to attain relief pressure, which causes the oil to warm up more rapidly.

4. Turn the engine speed dial to the maximum engine speed and repeat Step 3.
5. Cycle all controls to circulate warm oil through all hydraulic cylinders and all hydraulic lines, and through the swing motor and travel motors.
6. Observe the gauges and the indicators frequently during the operation.

TW **Turbo Protection Power Derate – After an engine start, the engine speed will be set to low speed and the hydraulic power limited for a time period . During this period, the monitor displays the message "Warm-Up Mode Power Derate". (Maximum is around 30 seconds). After the turbo bearing lubrication is sufficient, the engine speed goes to the setting dial speed and the monitor stops to display the message.**

Improve Cold-Weather Performance

Covers installed over the vents in the radiator compartment door will help to control overcooling in ambient temperatures below -15°C (5°F).

The materials used for the covers and the method used to install the covers is at the installers discretion.

Install the covers if overcooling is observed while the machine is idling in ambient temperatures below -15°C (5°F).

Stop the machine, and remove the covers under the following conditions:

- The ambient temperature is above -15°C (5°F).
- The engine temperature gauge indicates overheating.
- The hydraulic oil temperature gauge indicates overheating.

Installation



Illustration 261

g06424044

Vent locations on the radiator compartment door.

1. Clean the surface of the radiator compartment door.
2. Install the covers in the locations shown in Illustration 261 . The covers should fully cover the door vents.

Operation

i08484651

Operation Information

SMCS Code: 7000

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

Make sure that no personnel are on the machine or near the machine to prevent any personal injury. Keep the machine under control always to prevent injury.

Sound the horn and allow adequate time for bystanders to clear the area before moving the machine into a restricted visibility area. Follow local practices for your machine application. For more information refer to Operation and Maintenance Manual, "Restricted Visibility".

Reduce the engine speed when you maneuver the machine in tight quarters and when you drive over an incline.

Select the necessary travel speed range before you drive downgrade. Do not change the travel speed range while you drive downhill.

Use the same travel speed on a downgrade and on an upgrade.

When you travel for any distance, keep the stick inward and carry the boom in a low position.

When you drive up a steep grade, keep the boom as close to the ground as possible.

When you travel uphill or you travel downhill, keep the boom on the uphill side of the machine.

1. Adjust the operator seat. Refer to Operation and Maintenance Manual, "Seat" for more information.
2. Fasten the seat belt. Refer to Operation and Maintenance Manual, "Seat Belt" for more information.

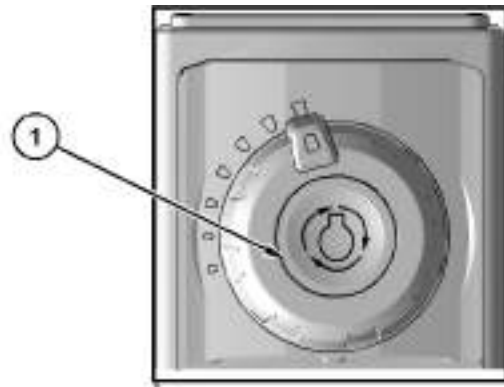


Illustration 262

g06685022

(1) Engine speed dial

3. Turn the engine speed dial (1) to the desired operating range. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.
4. Move the hydraulic lockout control to the UNLOCKED position. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.



Illustration 263

g06181525

Typical example

5. Raise the boom enough to provide sufficient ground clearance.



Illustration 264

g06685024

(2) Travel speed control switch

6. Select the desired travel speed by operating the travel speed control switch (2). The indicator will light to display the active mode. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.
7. Make sure that the position of the upper structure and of the undercarriage is known before you move the machine. The drive sprockets should be at the rear of the machine.

Note: The directional steering controls will operate normally if the drive sprockets are at the rear of the machine and the idlers are at the front of the machine and under the cab. When the sprockets are under the cab, the travel controls will operate backward.

8. Turn the engine speed dial to increase the engine speed (rpm) to the desired speed.
9. Push both travel levers forward at the same time to travel forward. If both travel levers are pushed farther, the travel speed at the selected engine speed (rpm) will be faster.

Note: If the machine does not operate or if the machine does not travel in a straight line, consult your Cat® dealer.

10. Refer to Operation and Maintenance Manual, "Operator Controls" for information about spot turning and about pivot turns.
11. When you make turns in soft material, travel in a forward direction occasionally to clear the tracks.
12. Slowly move both of the travel levers or both of the travel pedals to the CENTER position to stop the machine. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

Lifting Objects

Regional regulations may require the use of an overload warning device and boom and stick lowering control valves when used to lift objects.

The overload warning device (if equipped) must be adjusted for the bucket linkage and bucket size that is installed on the machine. Adjust the overload warning device for proper operation.

The setting for the overload warning device (if equipped) should be checked by an authorized dealer.

Contact your Cat® dealer for additional information.

i06981624

Frozen Ground Conditions

SMCS Code: 7000



Illustration 265

g06185895

To free the tracks from frozen ground, swing the boom to the front of the machine. Use boom down pressure to free the idler end of the machine.

Swing the boom to the rear of the machine. Use boom down pressure to free the sprocket end of the machine.

i07967066

Equipment Lowering with Engine Stopped

SMCS Code: 7000

To lower the boom, place the hydraulic lockout control in the UNLOCKED position. Move the joystick to the BOOM LOWER position. If the accumulator is still charged, the boom will lower.

If the boom does not lower, the accumulator is empty. Use one of the following procedures to lower the boom.

Machines Equipped with Boom Lowering Control Valves

WARNING

Boom load may cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing possible injury or death.

To avoid possible injury or death, be sure no one is under or near the work tool before manually lowering the boom.

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

WARNING

Be sure no one is under or near the work tools before manually lowering the boom. Keep all personnel away from the boom drop area when lowering the boom with the engine stopped in order to avoid possible personal injury.

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

If the engine or the hydraulic system is disabled and the boom is up, the boom can be lowered manually. Boom lowering control valves allow the boom to be manually lowered. The boom lowering control valves are located at the head end port on the boom cylinders.

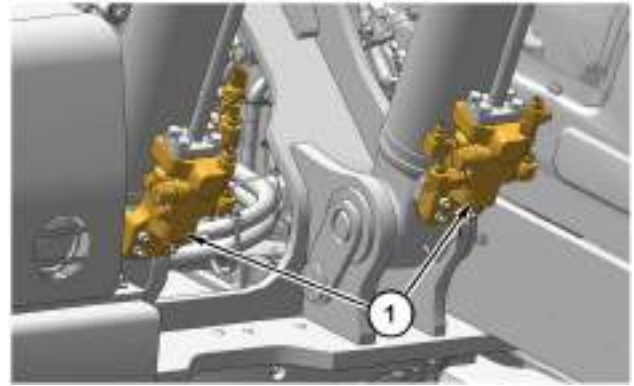


Illustration 266

g06512065

(1) Boom lowering control valve

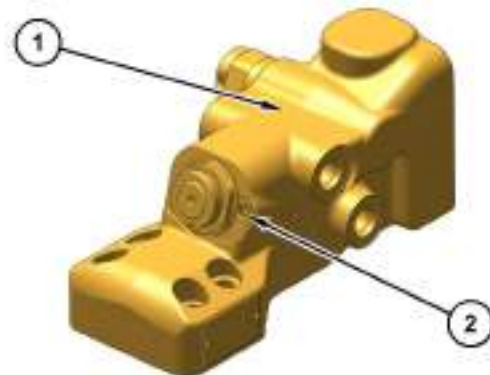


Illustration 267

g06510199

(1) Boom lowering control valve
(2) Emergency Release

Loosen the emergency release (2) at each of the boom lowering control valves to lower the boom.

Before operating the machine, make any necessary repairs.

For additional information, consult your Cat dealer.

Machines without a Boom Lowering Control Valve

WARNING

Be sure no one is under or near the work tools before manually lowering the boom. Keep all personnel away from the boom drop area when lowering the boom with the engine stopped in order to avoid possible personal injury.

Use the following procedure to manually lower the boom due to an engine malfunction.

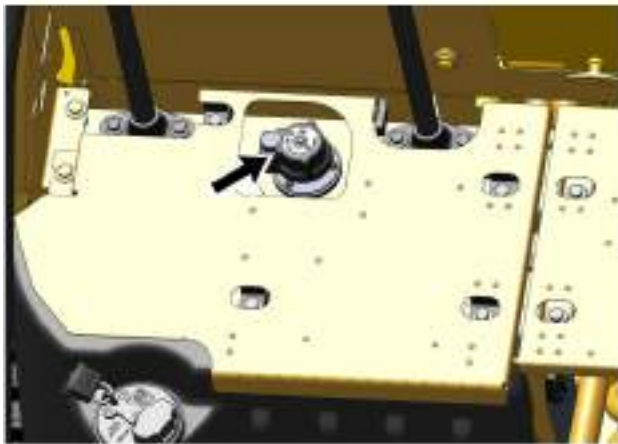


Illustration 268

g06184080

Hydraulic tank filler cap location

WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off. Relieve pressure by slowly turning the cap until the cap reaches the secondary stop.

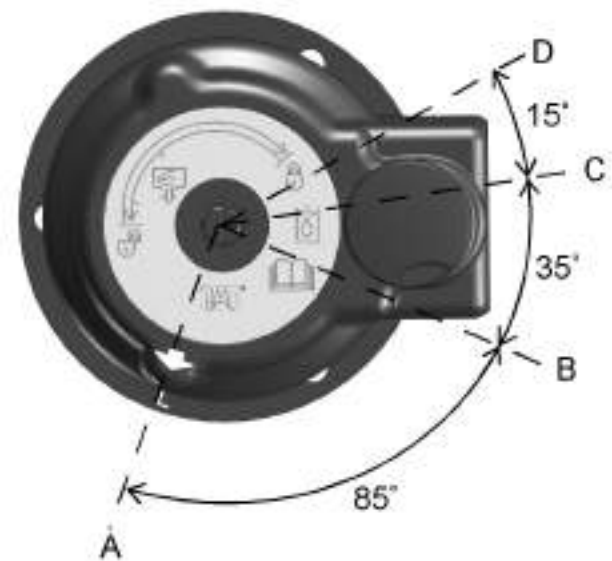


Illustration 269

g06184990

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

1. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 269 for filler cap positions.
 - a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
 - b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, remove the filler cap.

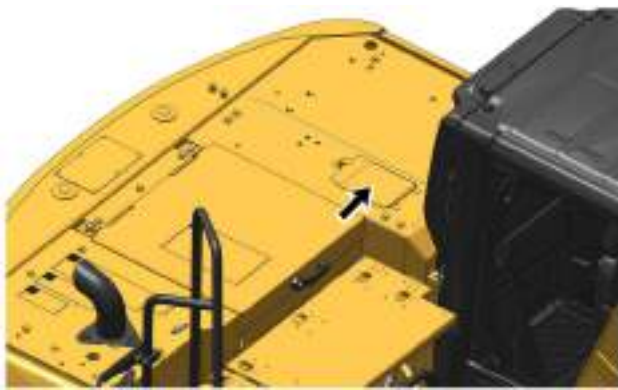


Illustration 270

g06497169

2. Open the reservoir hatch next to the engine hood.

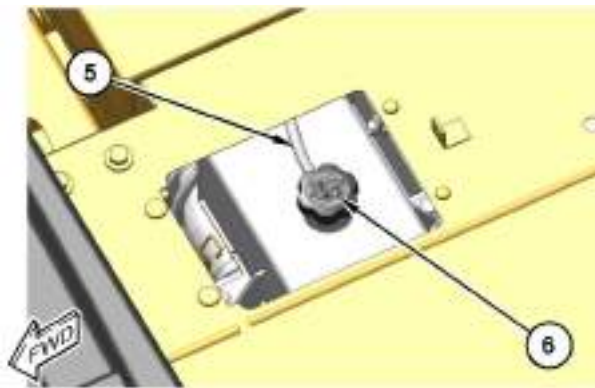


Illustration 271

g06497173

(5) Hose
(6) Cap

3. Loosen cap (6) and disconnect hose (5) from the reservoir. Remove the clamps and the cable straps that secure the hose to the machine.



Illustration 272

g06497182

Main control valve

(7) Screw

4. Connect one end of the radiator hose to screw (7). Put the other end of the hose into the hydraulic tank opening. The screw is located at the front, right side of the main control valve.
5. Slowly loosen screw (7) by a maximum of 1/2 turn. This allows the hydraulic oil in the boom circuit to drain into the hydraulic tank. The boom will now start to lower.
6. Make sure that the work tool has lowered all the way to the ground. Tighten screw (7) to $13 \pm 2 \text{ N}\cdot\text{m}$ ($9 \pm 1 \text{ lb ft}$).
7. Disconnect the hose from the screw. Do not allow the oil that is contained in the hose to spill. Drain the oil into a suitable container.
8. Connect the hose to the original position on the radiator and install the hydraulic tank filler cap.
9. Tighten the reservoir cap and close the reservoir hatch.

After completion of the manual boom lowering, make necessary repairs before you operate the machine again.

Pressure Release of Auxiliary Lines

WARNING

Personal injury can result from hot oil spray and raised work tools.

Make sure all the work tools have been lowered, the oil is cool and the pressure has been released from the hydraulic system before removing any components or lines.

Do not allow hot oil or components to contact skin.

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

Refer to the procedure below before any of the following conditions.

- The work tool is changed.
- The position of the ball valve is changed.

1. Turn the engine start switch to the OFF position.
2. Place the hydraulic lockout lever in the UNLOCKED position.

Operation Section
Equipment Lowering with Engine Stopped

3. Release the pressure in the auxiliary lines by pressing the auxiliary control buttons or the auxiliary control pedal three times.
4. Place the hydraulic lockout lever in the LOCKED position.
5. Change the work tool.

Note: There should be movement in the auxiliary hydraulic lines as the pressure is released. If there is no movement in the auxiliary hydraulic lines, start the engine and run the engine for 20 seconds. Repeat steps 1 to 5.

For additional information, consult your Cat dealer.

Operating Techniques

i08714166

Operating Technique Information

SMCS Code: 7000

WARNING

Know the maximum height and the maximum reach of your machine. Serious injury or death by electrocution can occur if the machine or the work tools are not kept a safe distance from electrical power lines. Keep a distance of at least 3000 mm (118 inch) plus an additional 10 mm (0.4 inch) for each 1000 volts over 50000 volts.

For safety, one of the following may require a greater distance:

- Local codes
- State codes
- Requirements of the job site

NOTICE

When swinging into a ditch, do not use the ditch to stop the swinging motion. Inspect the machine for damage if the boom is swung into a bank or an object.

Repeated stopping by an object can cause structural damage if the boom is swung into a bank or an object.

With certain boom-stick-bucket combinations, the bucket or worktool can hit the cab and/or the front structure of the machine. Always check for interference when first operating a new bucket or a new work tool. Keep the bucket or work tool away from the cab and away from the front structure during operation.

Whenever the tracks of the machine raise off the ground while digging, lower the machine back to the ground smoothly. DO NOT DROP OR CATCH IT WITH THE HYDRAULICS. Damage to the machine can result.

With certain combinations of work tools, the third pedal can have different functions. Always check the function of the third pedal before you use the third pedal.

Know the location of any buried cables. Mark the locations clearly before you dig.

Consult your Cat dealer for special work tool tips that are available for use in severe applications.

Move the machine whenever the position for operating the machine is not efficient. The machine can be moved forward or backward during the operating cycle.

When you operate the machine in close places, utilize the bucket or the other work tool to perform the following functions:

- Pushing the machine
- Pulling the machine
- Lifting the tracks

Use a comfortable travel speed while you operate the machine.

Operating efficiency can be increased by using more than one machine control to perform a task.

Never swing a load over a truck cab or workers.

Position the truck so that material can be loaded from the rear of the truck or from the side of the truck. Load the truck evenly so that the rear axles are not overloaded.

An oversize bucket or a bucket that is equipped with side cutters should not be used in rocky material. These types of buckets slow down the cycle. Damage to the bucket and to other machine components could result.

Coaching Tips



Illustration 273

g06223763

Digging with a stable machine increases productivity. Create a stable work platform.

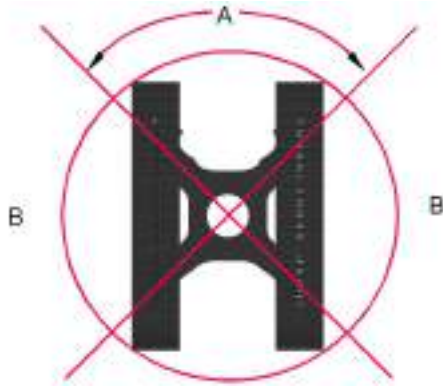


Illustration 274 g06210141

- (A) Most stable dig
- (B) Dump

For improved stability and durability: Do not dig over the drives or perpendicular to the tracks.

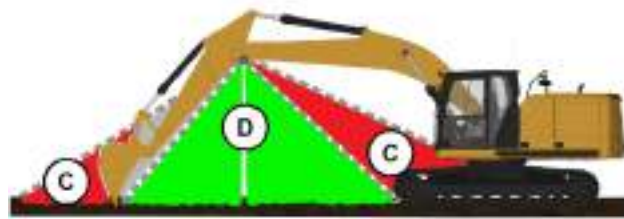


Illustration 275 g06212328

- (C) Weak crowd force
- (D) Ideal crowd force

Dig from the top down in layers. Try to have a full bucket by the time the stick is vertical, but do not reach too far with the stick. The most crowd force is generated with the stick +/- 30 degrees from vertical.

Minimize unneeded movement. Only curl/dump the bucket as much as required to hold/dump material.

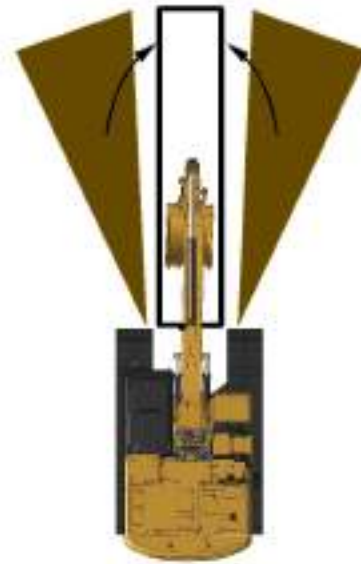


Illustration 276 g06210334

Minimize unneeded movement. During backfilling, start with the material closest to the trench.

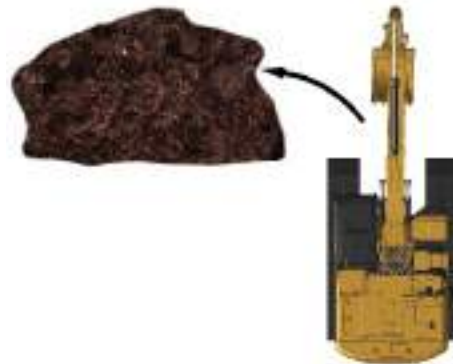


Illustration 277 g06210343

Watch your surroundings. Swing left to dump material for better visibility.

Watch the bucket. The bucket can contact the tracks or the cab.

Concentrate on being smooth, speed will come with practice.

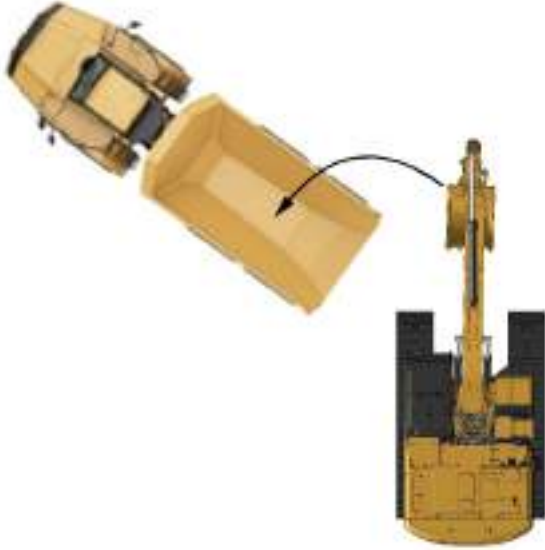


Illustration 278

g06212604

Truck placement will affect efficiency: 45 degree truck loading is more efficient than 90 degree. Spotting the truck too far from the excavator causes excessive motion.

Load from a bench when possible. Bench loading is more efficient.

Restricted Operation



Illustration 279

g06222487

Do not use the swing force to perform the following operations:

- Soil compaction
- Ground breaking
- Demolition

Do not swing the machine while the bucket tips are in the soil.

These operations will damage the boom, the stick, and the work tool and the operations will reduce the life of the equipment.



Illustration 280

g06212594

Do not use the dropping force of the bucket or work tool as a hammer. This will bring excessive force on the rear of the machine. Possible damage to the machine could result.



Illustration 281

g06222492

If the cylinder is operated at the end of the stroke during operations, excessive force will occur on the stopper on the inside of the cylinder. This will reduce the life of the cylinder and structures. To avoid this problem, always leave a small margin of play when the cylinder is operated.

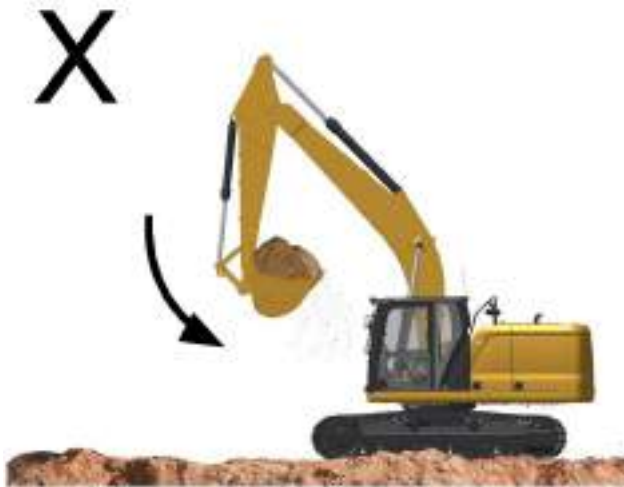


Illustration 282

g06222498

If the stick IN function is operated at full speed with a fully loaded bucket or heavy work tool attachment to the end of the cylinder stroke, excessive force will occur inside the stick cylinder. This action will reduce the life of the stick cylinder. To avoid this problem, always operate a stick IN function with moderate speed towards the end of cylinder stroke.



Illustration 284

g06222505

Do not use the dropping force of the rear of the machine for excavation. This operation will damage the machine.

Operating Precaution



Illustration 283

g06222500

While the bucket is in the ground, do not use the travel force for any excavation. This operation will cause excessive force on the rear of the machine.



Illustration 285

g06222507

NOTICE

Do not allow the machine to swing from the force of traveling when you use the bucket, the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.

Do not use the force of the bucket, the stick, or the boom to assist in turning the machine while the machine is traveling. This technique is referred to as "jump steering". This technique will damage the swing motor and the swing brake.



Illustration 286

g06222509

When deep holes are dug, do not lower the boom so that the bottom side of the boom touches the ground.

When deep holes are dug, do not allow the boom to interfere with the tracks.

Grade and Assist Operating Tips

The following image displays proper stick speeds for accurate grading. One of the factors to accuracy is the grade assist speed setting. The setting can be set to Quick, Normal, or Fine. The settings are found in the Grade Assist screen on the monitor.

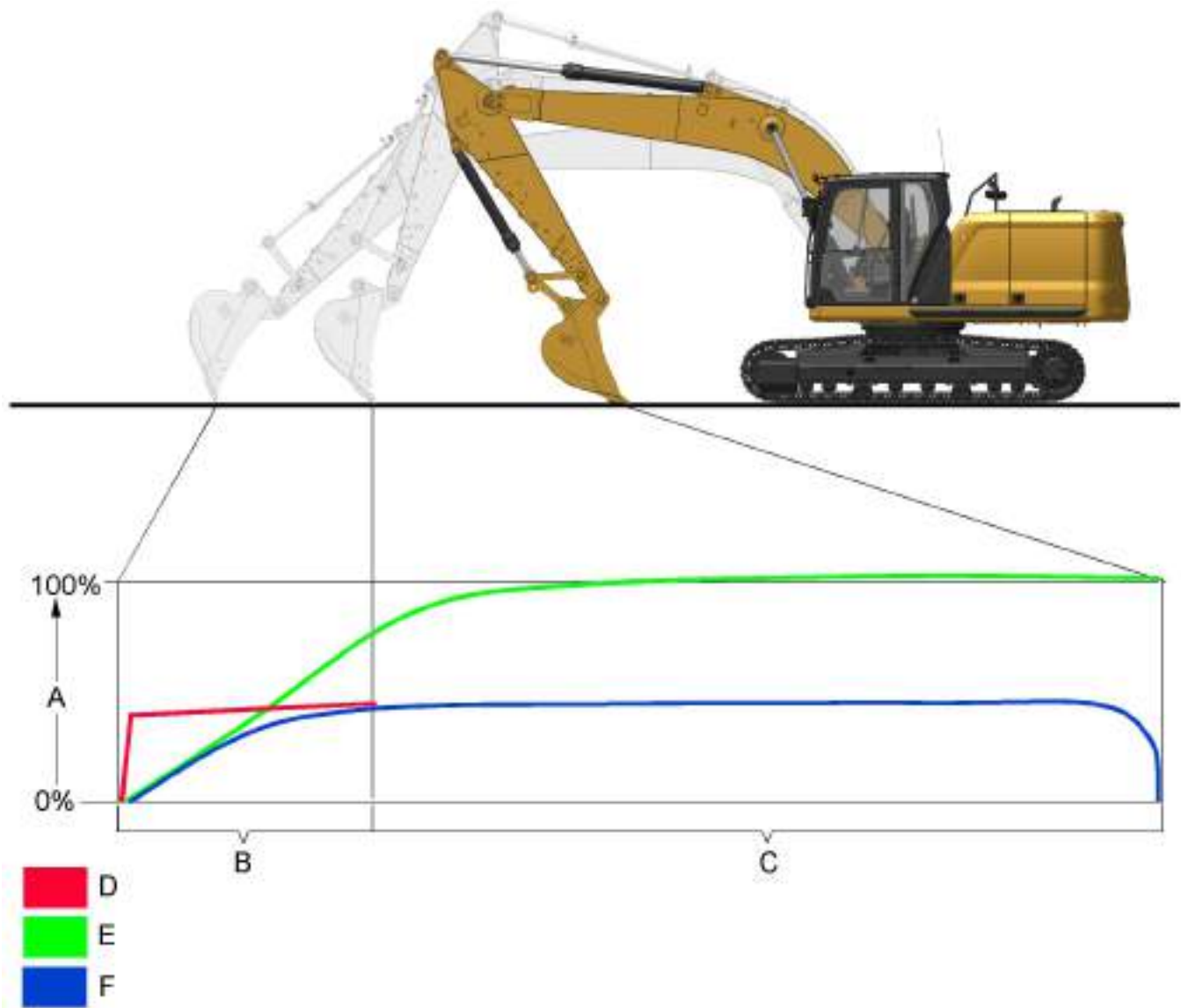


Illustration 287

g06250472

Stick speed vs. accuracy

(A) Stick joystick movement

(B) Joystick movement must be gradual

(C) In fine or normal mode, joystick input can be at 100 percent.

(D) Joystick movement too fast

(E) Good for fine or normal mode

(F) Good in any mode

For best results using Cat Grade, it is important to be cognizant of stick speed in order to obtain accurate results. When the bucket touches the ground before digging, the initial dig movement must be gradual. If operating in Fine or Normal mode, joystick speed can be increased to 100 percent after the slow initial engagement. Approximately 50 percent stick speed is necessary to maintain accuracy when in Quick mode after the slow initial engagement.

Cut/fill error can be minimized if the work tool is properly calibrated and the operator maintains a deliberate speed of operation.

Smart Boom

When using the smart boom function, it is necessary to slow down stick speed. Smart boom cannot keep up when the stick is operating at a rapid pace. This is particularly noticeable when the boom is at the raise/lower transition point and the stick is near vertical.

i07058371

Travel in Water and Mud

SMCS Code: 7000-V6

NOTICE

When working in or around any body of water, around a stream or river, or in conditions of heavy mud, be careful that the swing bearing, the swing drive gear, and the swivel joint do not dip into water, mud, sand, or gravel. If the swing bearing dips into water, mud, sand, or gravel, immediately grease the swing bearing until the used grease leaks from the outer circle of the swing bearing. Failure to carry out this procedure may cause premature wear in the swing bearing.



Illustration 288

g06223764

Depth of water to the center of the track carrier roller.

The following guidelines pertain to travel across water and travel through mud, sand, or gravel.

The machine can travel across a river only under the following conditions:

- The bed of the river is flat.
- The flow of the river is slow.
- The machine dips into the water only to the center of the track carrier roller (dimension A).

NOTICE

Do not allow the fan on the engine to contact the water while the machine travels through the water. Do not allow the fan on the engine to contact the water during a swing while the machine is in the water. Damage to the fan may occur if the fan contacts the water.

While you cross the river, carefully confirm the depth of the water with the bucket. Do not move the machine into an area that has a water depth that is greater than Dimension A.

The machine may sink gradually on soft ground. Therefore, you should frequently check the height of the undercarriage from ground level and the depth of water on the ground.

Check the swing gear by looking through the port for inspection that is on the upper frame. If there is water in the swing gear, contact your Cat dealer for the required maintenance on the swing gear.

After you travel through water, carefully clean the machine to remove any salt, sand, or other foreign matter.

Procedure for Removing the Machine from Water or Mud

NOTICE

Do not allow the machine to swing from the force of traveling when you use the bucket, the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.



Illustration 289

g06222519

1. You may not be able to move the machine by using the travel controls only. In this case use both the travel control levers/pedals and the stick to pull the machine out of the water or ground.



Illustration 290

g06222525

2. The machine may slip because of a steep slope. The procedure in Step 1 may not work. In this case, first rotate the upper structure by 180°. Then use both the travel control levers/pedals and the stick to move the machine up the slope.



Illustration 291

g06212337

3. It may be impossible to travel because the bottom of the frame comes into contact with the ground or the undercarriage is clogged with mud or gravel. In this case, operate the boom and the stick together. Raise the track and rotate the track forward and backward to remove the mud and the gravel.

i08485621

Boom, Stick and Bucket Operation

SMCS Code: 7000

Digging



Illustration 292

g06212506

1. Position the stick at a 70 degree angle to the ground.



Illustration 293

g06212513

2. Position the bucket cutting edge at a 120 degree angle to the ground. Maximum breakout force can now be exerted with the bucket.



Illustration 294

g06222533

3. Move the stick toward the cab and keep the bucket parallel to the ground.



Illustration 295

g06222535

4. If the stick stops due to the load, raise the boom and/or perform a curl to adjust the depth of the cut.

5. To apply the greatest force at the cutting edge, decrease the down pressure as you move the stick toward the cab.

6. Maintain a bucket attitude that ensures a continuous flow of material into the bucket.

7. Continue the pass in a horizontal direction so that material peels into the bucket.



Illustration 296

g06222538

8. Close the bucket and raise the boom when the pass has been completed.



Illustration 297

g06223077

9. Engage the swing control when the bucket is clear of the excavation.



Illustration 298

g06223078

10. To dump a load, move the stick outward and open the bucket in a smooth motion.

Lifting Objects

WARNING

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on level ground, load capacities will vary.

NOTICE

Damage to bucket cylinder, bucket or linkage could result if slings are placed incorrectly.

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

Regional regulations may require the use of an overload warning device and boom and stick lowering control valves when used to lift objects.

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

Contact your Cat® dealer for additional information.

Short slings will prevent excessive load swing.



Illustration 299

g06212526

Use the lifting eye that is provided on the linkage to lift objects.

If the lifting eye is used, the connection must be made with a sling or with a shackle.



Illustration 300

g06212532

An unstable condition can exist if a load exceeds the machine load rating or if a heavy load is swung over an end or over a side.



Illustration 301

g06212530

The most stable lifting position is over a corner of the machine.

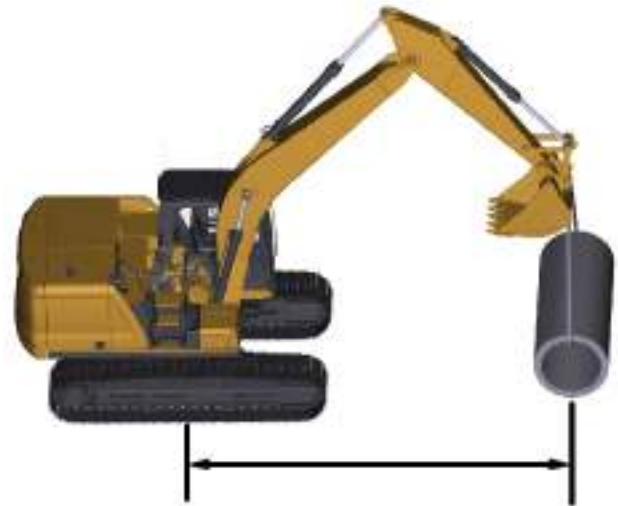


Illustration 303

g06212539

Lift capacity decreases as the distance from the swing centerline is increased.

Machines that are Equipped with a Long Reach Configuration

Machines with a long reach configuration require larger swing drift than standard machines when stopping, because inertial force in time of swing is large. So adjustments are made in timing for applying the swing brakes and speed of swinging.

Machines with a long reach configuration could be damaged and stability of the machine would be adversely affected if a control was suddenly operated, because inertial force of work tool is large.

i08036890



Illustration 302

g06212535

For the best stability, carry a load close to the machine and to the ground.

Shovel Crane Operation

SMCS Code: 6500

WARNING

Operating the machine using the correct method when performing a lifting operation is important. Incorrectly operating the machine may result in serious injury or death. Be sure to observe the following precautions.

Refer to this Operation and Maintenance Manual, "Shovel Crane Control" for additional information regarding machine controls for the shovel crane.

Operate the machine according to the rated load table of your machine. Refer to Operation and Maintenance Manual, "Specifications (Shovel Crane Specifications)" for more information.

Traveling with a Suspended Load



Illustration 304

g06222543

The rated load when traveling while suspending a load is limited to 50 percent of a stationary suspension. Make sure that the suspending load weight is within this limit before starting to move.

When traveling while suspending a load:

1. Make sure that the load is in the front of the machine, and operate within the maximum operating radius of 70° or less.
2. The height below the suspended load shall be 30 cm (12 inch) or less above ground.
3. The traveling speed shall be 3 km/h or less.
4. The traveling ground shall be level and of firm ground.

Traveling while suspending a swinging load may cause the machine to roll over. Wait until the load stops swinging before starting to move.

Dragging of load is prohibited.

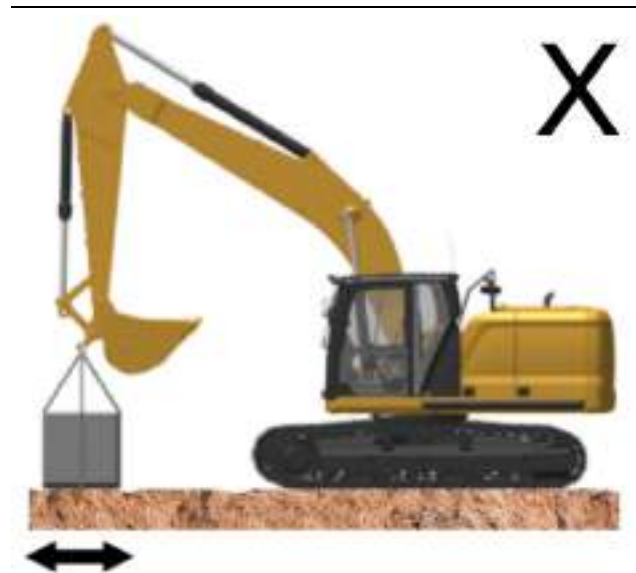


Illustration 305

g06222544

Horizontally, vertically or diagonally dragging a load may cause the machine to roll over, the wire rope to break, or the load to collapse, resulting in personal injuries.

Be sure to lift the load directly above.

Lifting operation on a slope is prohibited.



Illustration 306

g06222549

Performing an operation on a slope of 5° or more and on a soft ground may cause the machine to roll over or the load to collapse, resulting in personal injuries. Make sure that the machine is on level and firm ground before performing the operation.

Place an iron plate or other appropriate material on a soft ground.

Use in non-standard specification conditions is prohibited.



Illustration 307 g06222553

Use of the machine in non-standard specification conditions is prohibited as the lifting load and the operation range cannot be accurately displayed.

Sudden lifting operation is prohibited.



Illustration 309 g06222561

WARNING

Never perform a swinging operation suddenly while suspending a load. Doing so may cause the suspended load to be pulled with a centrifugal force, causing the machine to roll over.

Never suddenly swing, and stop or lower the hook suddenly, as doing so may cause the wire rope to come off the hook latch.

Factors that cause the wire rope to come off



Illustration 308 g06222555

WARNING

Suddenly lifting a suspended load will apply an abnormal force on the hook and cause the hook to break, resulting in serious injuries or death. Never perform such an operation.

Sudden swinging operation while suspending a load is prohibited.

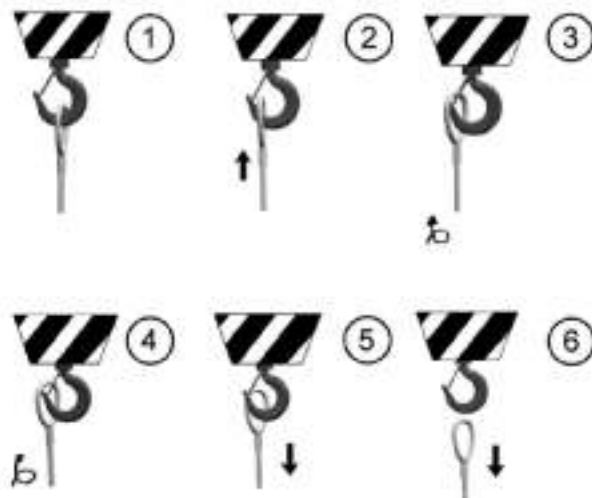


Illustration 310 g06222768

(1) Wire rope in normal condition.

Operation Section
Shovel Crane Operation

(2) The wire rope gets raised when the hook is lowered too suddenly.

(3) If the wire rope gets twisted and gets untwisted in the direction of the arrow, the wire rope will go beyond the tip of the hook.

(4) The wire rope goes around the back of the hook.

(5) The hook goes up or the wire rope goes down.

(6) The wire rope simply falls off.

Diagonal dragging operation is prohibited.



Illustration 311

g06222769

WARNING

Diagonal dragging operation applies an abnormal force on the hook and may cause the hook to break, resulting in serious injuries or death. Never perform such an operation.

Leaving the seat while suspending a load is prohibited.



Illustration 312

g06222773

Do not leave the operator seat while a load is being suspended. The load may fall, resulting in personal injuries. Do not allow a slinging operator or another worker under the load.

Temporarily stopping the lifting operation.



Illustration 313

g06191918

When there is a large area to stop the machine, fully retract the stick cylinder and slowly lower the boom until the bucket contacts the ground.

Note: Make sure that the lifting tool does not get caught under the bucket.



Illustration 314 g06191883

When there is small area to stop the machine, press the shovel crane button on the switch panel in order to disable the operation. Position the stick so that it is perpendicular to the ground and slowly lower the boom until the bucket contacts the ground.

Note: Make sure that the lifting tool does not get caught under the bucket.

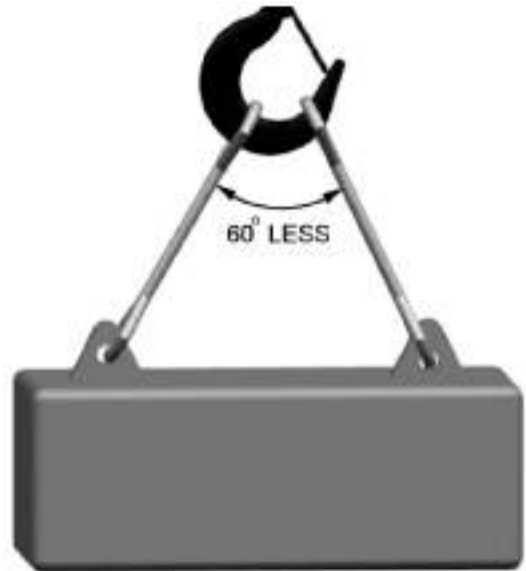


Illustration 316 g06222775

As a rule, try to set the wire rope suspension angle at 60° or below.

Keep out of the area under a suspended load.

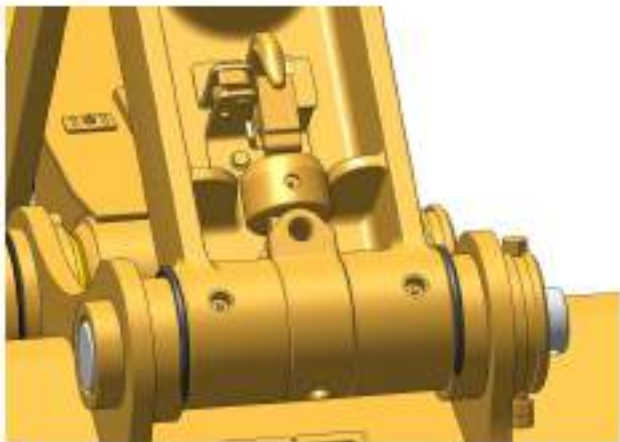


Illustration 315 g06191925

Hook in latched position

Be sure to store the hook during a bucket use. Otherwise, the bucket, the hook, and other parts may be damaged.

Wire rope suspension angle

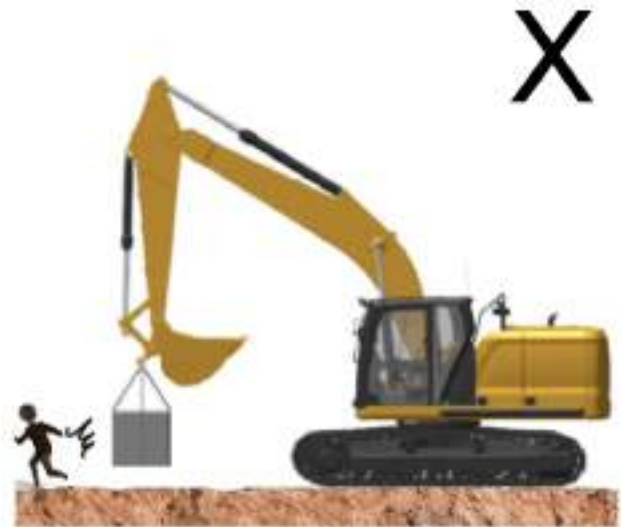


Illustration 317 g06222777

Never allow anyone to enter an area under a suspended load.

Lifting operation with a quick coupler device is prohibited.

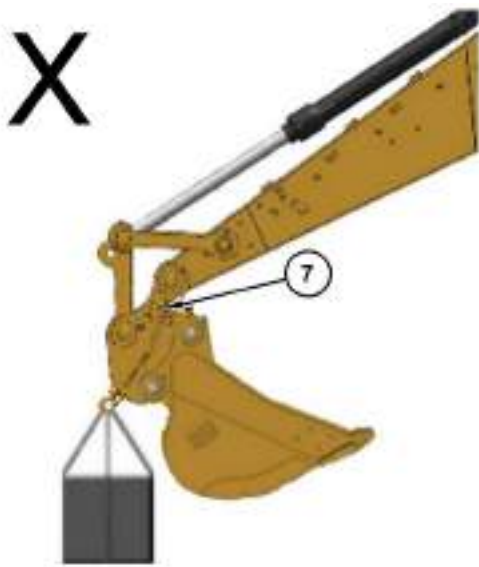


Illustration 318

g06222779

(7) Quick Coupler

Accurate lifting load and operation range cannot be displayed in a lifting operation equipped with a quick coupler. Furthermore, never perform a lifting operation with a quick coupler attached, as doing so causes the hook to contact the quick coupler, applies an abnormal force on the hook, and causes the hook to become damaged and/or the machine to roll over.

i06978374

Bucket - Remove and Install

SMCS Code: 6001-011; 6001-012; 6001; 6101; 6102; 6523

Removal Procedure

WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- Confirm the verbal communication and the hand signals that will be used during the installation.
- Be alert for sudden movement of the front linkage and the work tool.
- Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.

NOTICE

To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.



Illustration 319

g06181120

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

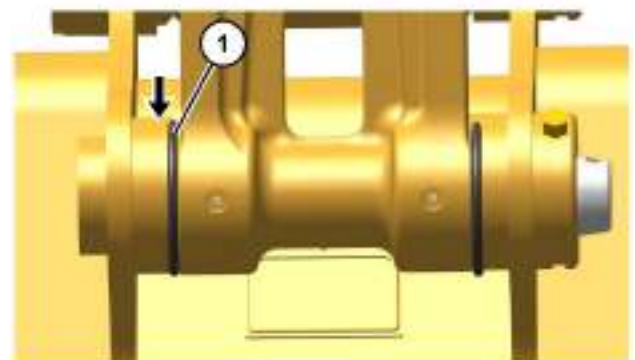


Illustration 320

g06192508

2. Slide O-ring seals (1) off the pin joints and onto the flanges of the bucket.

WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

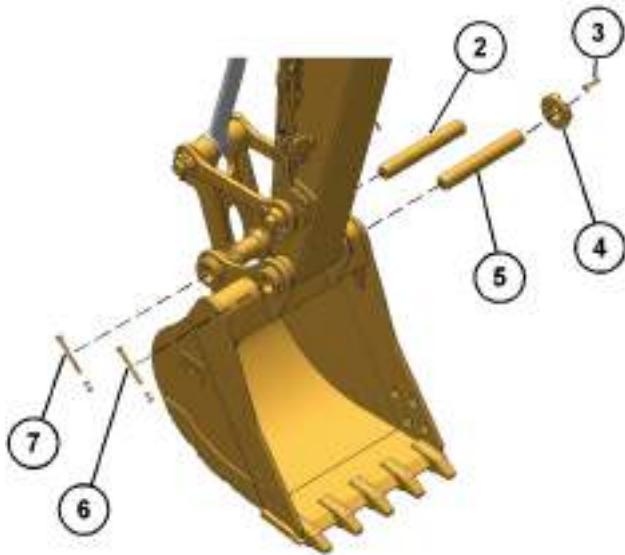


Illustration 321

g06186090

3. Remove nuts and retaining bolt (7) from support pin (2). Remove the support pin .
4. Remove bolts (3) and adapter plate (4). Remove the shims.
5. Remove nuts and retaining bolt (6) from support pin (5). Remove the support pin.
6. Start the engine and raise the stick out of the bucket.
7. Remove the O-ring seals (1) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

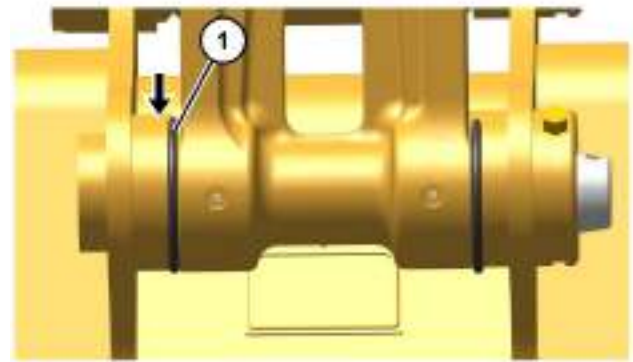


Illustration 322

g06192508

2. Position the O-ring seals (1) onto the flanges of the bucket.
3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

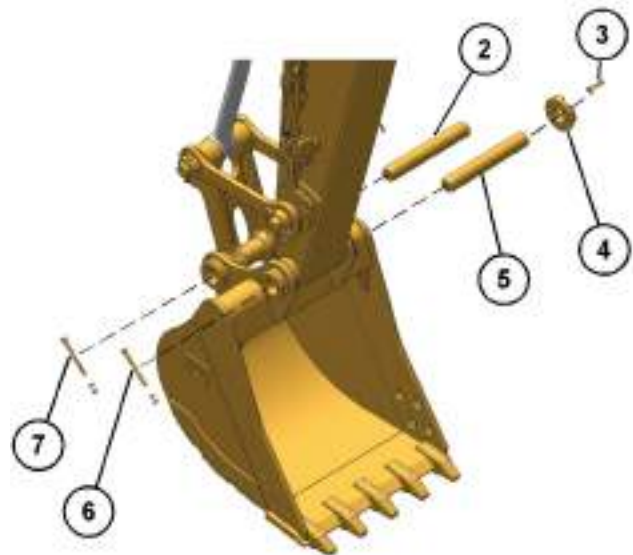


Illustration 323

g06186090

4. Install support pin (5). Align the retaining bolt hole in the support pin with the retaining bolt hole in the bucket.
5. Install the retaining bolt and nuts (6). Install adapter plate (4) without the shims, and without bolts (3) that hold the adapter plate.
6. Refer to Operation and Maintenance Manual, "Bucket Linkage - Inspect/Adjust" to adjust the bucket clearance.
7. Slide O-ring seals (1) in position over the pin joints between the bucket and the stick.

8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.
9. Install support pin (2). Align the retaining bolt hole in the bucket pin with the retaining bolt hole in the bucket.
10. Install retaining bolt and nuts (7).
11. Slide the O-ring seals (1) over the pin joints

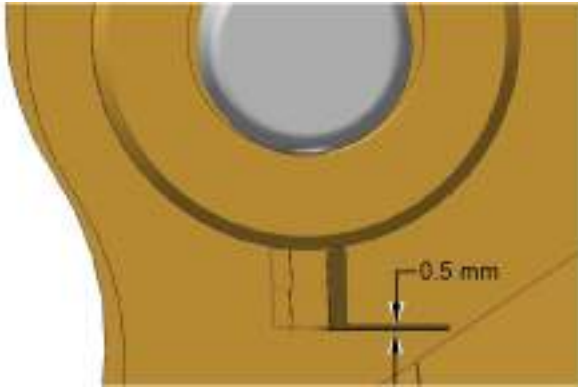


Illustration 324

g06192530

12. Tighten retaining nuts (6) and (7). Position the outside nut even with the end of the retaining bolt or 0.5 mm (0.02 inch) beyond the end of the retaining bolt. Tighten the inside nut against the outside nut.
13. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, "Bucket Linkage - Lubricate".

i08365084

Quick Coupler Operation (Circuit for CW Coupler Hold to Run (If Equipped))

SMCS Code: 6129; 6522; 7000

General Operation

Note: If the machine is configured to sound a buzzer while operating the CW coupler, refer to Operation and Maintenance Manual, Quick Coupler Operation (Circuit for CW Coupler with Alarm).

Note: Machine can be configured with different quick coupler settings in Electronic Technician (ET). With Accelerator or without Accelerator function. And "Hold to Run" or "Alarm" or "Hydraulic Pin Grabber" For activation and deactivation consult your CAT dealer.

Note: If machine is equipped with Tilt Rotator, refer to Operation and Maintenance Manual, Tilt Rotator and consult your CAT Dealer.

This procedure describes the use of the hydraulic circuit with a Cat dedicated quick coupler. If a different quick coupler is used, contact your Cat dealer for pressure adjustment and consult the documentation for the quick coupler for proper operation.

- The engine start switch is on.
- The engine is running.
- The hydraulic lockout control must be in the UNLOCKED position to operate the quick coupler controls.

When the above conditions are achieved, the system will perform the desired operation.

The quick coupler is used to change work tools while the operator remains in the cab. The quick coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins in order for the quick coupler to work properly.

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a locking bar keeps the work tool locked with the force of built-in springs. Ensure that the hydraulic system and the blocking bar are working properly before using the quick coupler.

A lifting eye is included on the quick coupler. Release the work tool from the quick coupler to use the lifting eye to pick up loads. To lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine.

NOTICE

Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the "Quick Coupler Installation and Removal" section of the quick coupler Operation and Maintenance Manual for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

Electric Switch Operation

Illustration 325

g06382398

Quick coupler switch (1) is located inside the cab on the switch panel to the left of the operator's seat. The electric switch has only one position for coupling the work tool and uncoupling the work tool. The switch is equipped with a safety lock (2). The locking tab must be pushed backward before the switch can be pressed.

Coupling the Work Tool**WARNING**

Inspect the coupler wedge engagement before you operate the excavator.

Serious injury or death may result from an improperly engaged coupler.

Inspect coupler wedge engagement from the cab by rotating the bucket or the work tool inward. Extend the bucket cylinder to bring the coupler actuator into view and bring the stick in until the wedges are visible.

WARNING

Place the work tool or bucket in a safe position before engaging the quick coupler. Ensure that the work tool or bucket is not carrying a load.

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

WARNING

The buzzer will not sound when the switch is in the lock position. The position of the switch does not confirm the coupler pins are engaged. A physical test is required by dragging the attachment on the ground to confirm the coupler pins are engaged.

Note: With certain work tool combinations, including quick couplers, the work tool can hit the cab or the front of the machine. Always check for interference when first operating a new work tool.



Illustration 326

g06220881

1. Position the work tool on a level surface.
2. Retract the bucket cylinder. Position the quick coupler in alignment between the hinges of the work tool.

Operation Section
 Circuit for CW Coupler Hold to Run (If Equipped)

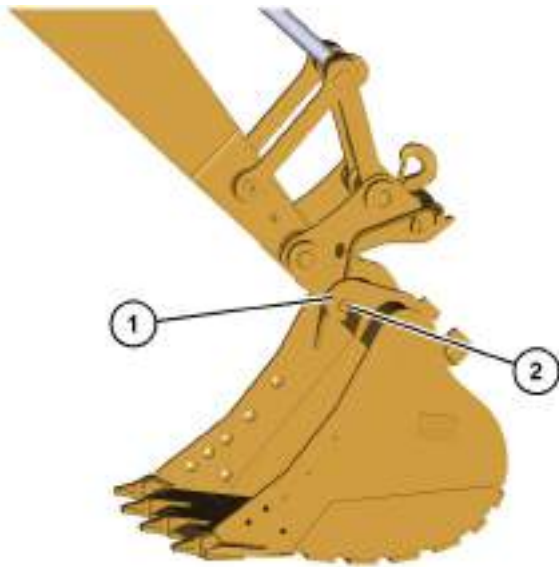


Illustration 327

g06220883

- (1) Hinges
- (2) Lower bosses

3. Move the stick forward and raise the stick until the lower bosses (2) engage the hinges (1) of the work tool.



Illustration 328

g06642184

4. Push the locking tab on the switch backward and then push the switch and hold. The monitor will display "quick coupler unlocking requested" .



Illustration 329

g06642183

5. If machine is set with accelerator, the system will automatically pressurize, while the coupler switch remains pushed and held, until the wedge is fully extended. The monitor will display "quick coupler unlocked" .

If machine is set without accelerator. Operate a hydraulic function (for example, hold the control lever of the bucket cylinder in the retract direction), while the coupler switch remains pushed and held, until the wedge is fully extended. The monitor will display "quick coupler unlocked" .

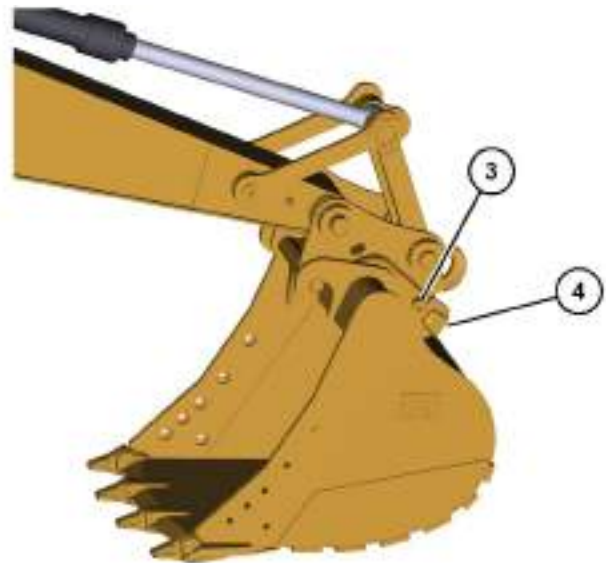


Illustration 330

g06220887

- (3) Center bosses
- (4) Locking area

6. Extend the bucket cylinder to rotate the quick coupler toward the work tool.

Center bosses (3) must engage with the cutout of the hinge.



Illustration 331

g06642184

7. Release coupler switch (1). The monitor will display "Quick Coupler Locking" .



Illustration 332

g06642185

8. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully retracted. The monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.

If machine is set without accelerator. Operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully retracted and the monitor will display “Quick Coupler Locked - Verify Tool Locked” , when the coupler is locked.

WARNING

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

WARNING

Inspect the quick coupler engagement before operating the machine.

Verify that the quick coupler is engaged per the procedure in the Operation and Maintenance Manual. Verify prior to operating the machine, after every engine start, and after an extended time of inactivity.

Serious injury or death may result from improperly engaged coupler.

9. Verify that the quick coupler and the work tool are locked together.
- Retract the bucket cylinder and place the work tool on the ground.
 - Apply pressure to the work tool against the ground.
 - Drag the work tool backward.

NOTICE

Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

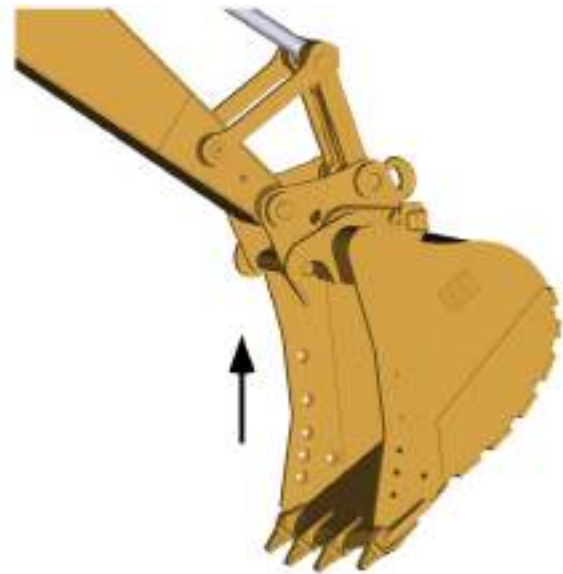


Illustration 333

g06220888

10. Raise the boom or raise the stick. Retract the bucket cylinder to confirm that the wedge is fully engaged. If the wedge is fully engaged, the work tool is locked in place. The work tool is ready to use.

Uncoupling the Work Tool

WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

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

Operation Section
 Circuit for CW Coupler Hold to Run (If Equipped)



Illustration 334

g06220889

1. Level the bucket or level the work tool on the ground.



Illustration 335

g06642184

2. Push the locking tab on the switch backward and then push the switch and hold. The monitor will display “quick coupler unlocking requested” .



Illustration 336

g06642183

3. If machine is set with accelerator, the system will automatically pressurize, while the coupler switch remains pushed and held, until the wedge is fully extended and the monitor will display “quick coupler unlocked” .

If machine is set without accelerator. Operate a hydraulic function (for example, hold the control lever of the bucket cylinder in the retract direction), while the coupler switch remains pushed and held, until the wedge is fully extended. The monitor will display “quick coupler unlocked” .



Illustration 337

g06220891

4. Retract the bucket cylinder to move the quick coupler toward the machine while the coupler switch is being pushed and held.



Illustration 338

g06642184

5. Release coupler switch (1). The monitor will display “Quick Coupler Locking” .



Illustration 339

g06642185

6. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully retracted. The monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.

If machine is set without accelerator. Operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully retracted and the monitor will display “Quick Coupler Locked - Verify Tool Locked” , when the coupler is locked.



Illustration 340

g06220892

7. Lower the stick and move the stick toward the machine to disengage the quick coupler.

i09560237

Quick Coupler Operation (Hydraulic Pin Grabber Quick Coupler (If Equipped))

SMCS Code: 6129; 6522; 7000

General Operation

NOTICE

The Cat Quick Coupler (Hydraulic Pin Grabber) is not designed to be used in applications where there is long exposure to excessive vibration. The vibration caused by extensive use of a hydraulic hammer as well as the added weight of certain demolition tools such as shears, crushers, and pulverizers may cause premature wear and decreased service life of the coupler.

Be sure to carefully inspect the coupler daily for cracks, bent components, wear, distressed welds, etc. when operating with any of the above work tools.

Note: Machine can be configured with different quick coupler settings in Electronic Technician (ET). With Accelerator or without Accelerator function. And “Hold to Run” or “Alarm” or “Hydraulic Pin Grabber” For activation and deactivation consult your CAT dealer.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

Note: If machine is equipped with Tilt Rotator, refer to Operation and Maintenance Manual, Tilt Rotator and consult your CAT Dealer.

The quick coupler is used to change work tools while the operator remains in the cab. The quick coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins in order for the quick coupler to work properly.

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a check valve in the hydraulic cylinder traps oil in the cylinder. Ensure that the hydraulic system is working properly before using the quick coupler.

A lifting eye is included on the quick coupler. Release the work tool from the quick coupler to use the lifting eye to pick up loads. To lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine.

NOTICE

Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the "Quick Coupler Installation and Removal" section of the quick coupler Operation and Maintenance Manual for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

Quick Coupler Operation

Electric Switch Operation



Illustration 341

g06382398

Quick coupler switch (1) is located inside the cab on the switch panel to the left of the operator's seat. The electric switch has only one position for coupling the work tool and uncoupling the work tool. The switch is equipped with a safety lock (2). The locking tab must be pushed backward before the switch can be pressed.

NOTICE

Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the quick coupler Operation and Maintenance Manual, "Quick Coupler Installation and Removal" for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

NOTICE

Inspection of the Center-Lock coupler is required after a failure of the primary engaging system or a miscoupling of the tool, causing the work tool to swing by the secondary lock. Contact your Cat dealer.

Refer to Special Instruction, REHS5676, "The Inspection Procedure for the Center-Lock Coupler" for the proper procedure.

Note: For machines operating hydromechanical work tools equipped with a Center-Lock Pin Grabber Coupler, the addition of a Hydromechanical Conversion Kit may also be required. Refer to the Operation and Maintenance Manual for the quick coupler for more information or consult your Cat dealer.

Coupling the Work Tool**WARNING**

Place the work tool or bucket in a safe position before engaging the quick coupler. Ensure that the work tool or bucket is not carrying a load.

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

WARNING

Inspect the quick coupler engagement before operating the machine.

Serious injury or death may result from improperly engaged coupler.

WARNING

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

WARNING

The alarm will go off when the coupler is locked and the monitor will display a message. These assurances do not confirm that the coupler pins are engaged. A physical test is required by dragging the attachment on the ground to confirm the coupler pins are engaged.

NOTICE

With certain work tool combinations, including quick couplers, the work tool can hit the cab or the front of the machine. Always check for interference when first operating a new work tool.

1. Position the bucket or the work tool on a level surface.
2. Make sure that the pins are in the bucket or the work tool. Make sure that the pin keepers are installed correctly.



Illustration 342

g06187057

3. Extend the stick cylinder and fully extend the bucket cylinder until the quick coupler is curled past a vertical position. This action must be performed before pressing the switch.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)



Illustration 343

g06642184

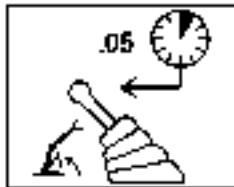


Illustration 344

g01231447

4. Push the locking tab on the switch backward and then push the switch and release. The buzzer will sound and the monitor will display “quick coupler unlocking requested” .



Illustration 345

g06642183

5. Hold the control lever for the bucket cylinder in the EXTEND position until the hook is fully unlocked. The buzzer will continue to sound and the monitor will display “quick coupler unlocked” .



Illustration 346

g06187063

6. Align the quick coupler with the work tool.



Illustration 347

g06187068

7. Rotate the quick coupler to grab the top pin.



Illustration 348

g06187086

8. Rotate the quick coupler downward to grab the bottom pin.



Illustration 349

g06187108

9. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.

This action must be performed before you push the coupler switch to lock the coupler.



Illustration 350

g06642184

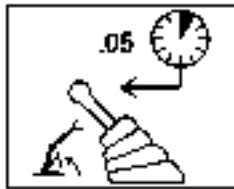


Illustration 351

g01231447

10. Push the locking tab on the switch backward and then push the switch and release. The buzzer will continue to sound and the monitor will display “quick coupler locking” .



Illustration 352

g06642185

NOTICE

Hold the bucket cylinder control lever in the EXTEND position while the quick coupler is locking. Failure to do so may result in unwanted movement of the work tool.

11. Hold the control lever for the bucket cylinder in the EXTEND position until the hook is fully locked. The buzzer will stop to sound and the monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.

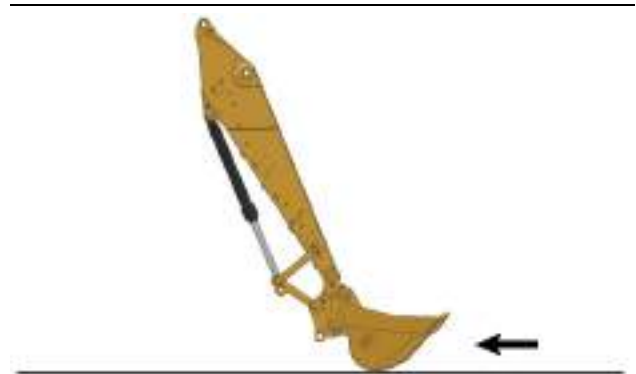


Illustration 353

g06187115

WARNING

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

WARNING

Inspect the quick coupler engagement before operating the machine.

Verify that the quick coupler is engaged per the procedure in the Operation and Maintenance Manual. Verify prior to operating the machine, after every engine start, and after an extended time of inactivity.

Serious injury or death may result from improperly engaged coupler.

12. Verify that the quick coupler and the work tool are locked together.

- Retract the bucket cylinder and place the work tool on the ground.
- Apply pressure to the work tool against the ground.
- Drag the work tool backward.

NOTICE

Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

Uncoupling the Work Tool

WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

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

NOTICE

Auxiliary hoses for work tools must be disconnected before the Hydraulic Quick Coupler is disengaged.

Pulling the work tool with the auxiliary hoses could result in damage to the host machine or the work tool.



Illustration 354

g06187108

1. Extend the stick cylinder and fully extend the bucket cylinder until the work tool is curled past a vertical position. This action must be performed before pressing the switch.



Illustration 355

g06642184

2. Push the locking tab on the switch backward and then push the switch and release. The buzzer will sound and the monitor will display “quick coupler unlocking requested” .

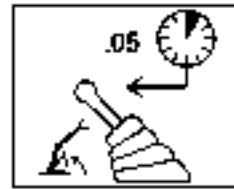


Illustration 356

g01231447



Illustration 357

g06642183

3. Hold the control lever for the bucket cylinder in the EXTEND position until the hook is fully unlocked. The buzzer will continue to sound and the monitor will display “quick coupler unlocked” .



Illustration 358

g06187142

4. Move the boom and the stick until the tool or the bucket is in the storage position. Keep the tool close to the ground.



Illustration 359

g06187151

- 5.** Rotate the quick coupler upward to release the bottom pin.



Illustration 361

g06187108

- 8.** Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position. This action must be performed before you push the coupler switch to lock the coupler.



Illustration 360

g06187156

- 6.** Continue to rotate the quick coupler upward to release the top pin and completely release the work tool from the quick coupler.
- 7.** Move the stick to a position that is clear of the work tool.



Illustration 362

g06642184

- 9.** Push the locking tab on the switch backward and then push the switch and release. The buzzer will continue to sound and the monitor will display "quick coupler locking".

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

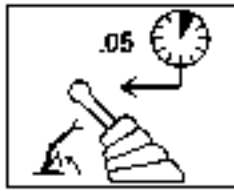


Illustration 363

g01231447



Illustration 364

g06642185

10. Hold the control lever for the bucket cylinder in the EXTEND position until the hook is fully locked. The buzzer will stop to sound and the monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.
11. To lift objects with the lifting eye of the quick coupler, refer to “Coupler Lifting Eye Operation without Bucket” later in this chapter.

Coupling a Bucket that is Reversed



Illustration 365

g06187159

1. When you use a hydraulic pin grabber quick coupler, you can connect to a bucket that is in a reversed position. Refer to Illustration 365 for an example of connecting to a bucket that is in a reversed position.
2. Follow the same steps for coupling the work tool to couple the host machine to a bucket that is reversed. Refer to “Coupling the Work Tool” for the proper procedure.

NOTICE

When some Caterpillar buckets are used in the reverse position, it can be more difficult to couple the bucket and uncouple the bucket than in the normal position.

Care must be taken to ensure that the position of the boom, stick, and bucket are aligned to ensure smooth coupling. The coupler must be in position between the bucket bosses.

If the bucket is not fully engaged in the jaw of the coupler, the quick coupler can become snagged on the bucket bosses. The full weight of the bucket is then carried by the quick coupler sideplates, which can cause damage to the quick coupler.

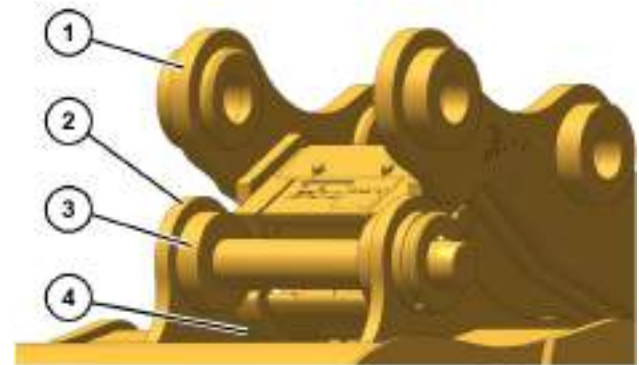


Illustration 366

g06187418

- (1) Quick coupler
- (2) Bucket
- (3) Boss
- (4) Hook

Coupler Lifting Eye Operation without Bucket

A lifting eye is included on the quick coupler. Release the work tool from the quick coupler to use the lifting eye to pick up loads. To lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine. Refer to Operation and Maintenance Manual, Lifting capacities for more information.

Note: The maximum load capacity of the coupler lifting eye is 12000 kg (26455 lb). Exceeding the maximum capacity could result in serious injury or death.

1. Remove the work tool. Refer to “Uncoupling the Work Tool” for the proper procedure.



Illustration 367

g06384615

2. Use the lifting eye of the quick coupler, as needed.
3. To reinstall the bucket or the work tool, refer to "Coupling the Work Tool" for the proper procedure.

i09575706

Quick Coupler Operation (Circuit for CW Coupler with Alarm (If Equipped))

SMCS Code: 6129; 6522; 7000

General Operation

Note: Machine can be configured with different Quick Coupler settings in Cat[®] Electronic Technician (ET), with accelerator or without accelerator function, and "Hold to Run" or "Alarm" or "Hydraulic Pin Grabber" For activation and deactivation consult your Cat dealer.

Note: If machine is equipped with Tilt Rotator, refer to Operation and Maintenance Manual, M0073418, "TRS10, TRS14, TRS18, and TRS23 Tilt-Rotator" and consult your Cat dealer.

This procedure describes the use of the hydraulic circuit with a Cat dedicated Quick Coupler. If a different Quick Coupler is used, contact your Cat dealer for pressure adjustment and refer to the documentation for the Quick Coupler for proper operation.

- The engine start switch is ON. Refer to Operation and Maintenance Manual, "Operator Controls".

- The engine is running.
- The hydraulic lockout control must be in the UNLOCKED position to operate the quick coupler controls. Refer to Operation and Maintenance Manual, "Operator Controls".

When the above conditions are achieved, the system will perform the desired operation.

The Quick Coupler is used to change work tools while the operator remains in the cab. The Quick Coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins for the Quick Coupler to work properly.

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a locking bar keeps the work tool locked with the force of built-in springs. Ensure that the hydraulic system and the locking bar are working properly before using the Quick Coupler.

A lifting eye is included on the Quick Coupler. Release the work tool from the Quick Coupler to use the lifting eye to pick up loads. To lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine. Refer to Operation and Maintenance Manual, "Lifting Capacities" for more information.

NOTICE

Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the “Quick Coupler Installation and Removal” section of the quick coupler Operation and Maintenance Manual for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

Electric Switch Operation



Illustration 368

g07500529

- (1) Quick coupler switch
- (2) Safety lock

Quick coupler switch (1) is located inside the cab on the switch panel to the left of the operator's seat. Refer to Operation and Maintenance Manual, “Operator Controls”. The electric switch has only one position for coupling the work tool and uncoupling the work tool. Quick coupler switch (1) is equipped with a safety lock (2). The locking tab must be pushed backward before quick coupler switch can be pressed.

Coupling the Work Tool

WARNING

Inspect the coupler wedge engagement before you operate the excavator.

Serious injury or death may result from an improperly engaged coupler.

Inspect coupler wedge engagement from the cab by rotating the bucket or the work tool inward. Extend the bucket cylinder to bring the coupler actuator into view and bring the stick in until the wedges are visible.

WARNING

Place the work tool or bucket in a safe position before engaging the quick coupler. Ensure that the work tool or bucket is not carrying a load.

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

WARNING

The buzzer will not sound when the switch is in the lock position. The position of the switch does not confirm the coupler pins are engaged. A physical test is required by dragging the attachment on the ground to confirm the coupler pins are engaged.

Note: With certain work tool combinations, including Quick Couplers, the work tool can hit the cab or the front of the machine. Always check for interference when first operating a new work tool.



Illustration 369

g06220881

Engaging the work tool

1. Position the work tool on a level surface.
2. Retract the bucket cylinder. Position the Quick Coupler in alignment between the hinges of the work tool.

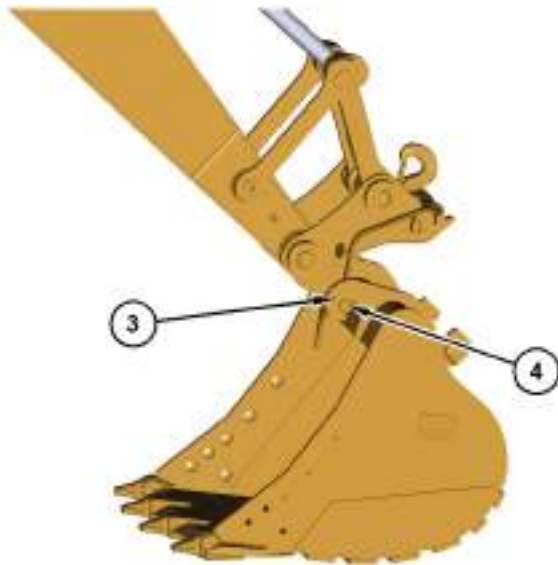


Illustration 370

g07499629

- (3) Hinges
(4) Lower bosses

3. Move the stick forward and raise the stick until lower bosses (4) engage hinges (3) of the work tool.



Illustration 371

g06642184

Quick coupler locking icon

4. Push the locking tab on the quick coupler switch (1) backward and then push the switch and release. The monitor will display “Quick Coupler Unlocking Requested” . Refer to Operation and Maintenance Manual, “Monitoring System” for more information.



Illustration 372

g06642183

Quick coupler unlocking icon

5. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully extended. The buzzer will continue to sound and the monitor will display “Quick Coupler Unlocked” .

If machine is set without accelerator, operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully extended. The buzzer will continue to sound and the monitor will display “Quick Coupler Unlocked” .

Operation Section
Circuit for CW Coupler with Alarm (If Equipped)

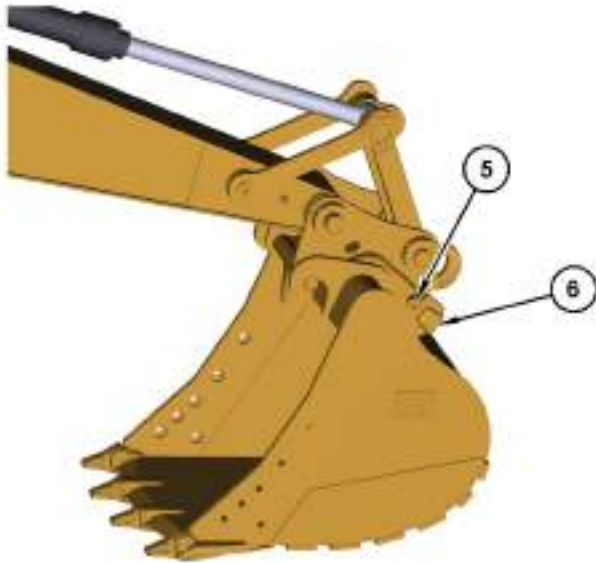


Illustration 373 g07499633

- (5) Center bosses
- (6) Locking area

6. Extend the bucket cylinder to rotate the Quick Coupler toward the work tool.

Center bosses (5) must engage with the cutout of the hinge.



Illustration 374 g06642184

Quick coupler locking icon



Illustration 375 g07500529

- (1) Quick coupler switch
- (2) Safety lock

7. Release quick coupler switch (1). The monitor will display "Quick Coupler Locking" .



Illustration 376 g06642185

Locking icon

8. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully retracted. The buzzer will stop and the monitor will display "Quick Coupler Locked - Verify Tool Locked" when the coupler is locked.

If machine is set without accelerator, operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully retracted. The buzzer will stop and the monitor will display "Quick Coupler Locked - Verify Tool Locked" when the coupler is locked.

WARNING

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

WARNING

Inspect the quick coupler engagement before operating the machine.

Verify that the quick coupler is engaged per the procedure in the Operation and Maintenance Manual. Verify prior to operating the machine, after every engine start, and after an extended time of inactivity.

Serious injury or death may result from improperly engaged coupler.

9. Verify that the Quick Coupler and the work tool are locked together.
 - a. Retract the bucket cylinder and place the work tool on the ground.
 - b. Apply pressure to the work tool against the ground.
 - c. Drag the work tool backward.

NOTICE

Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

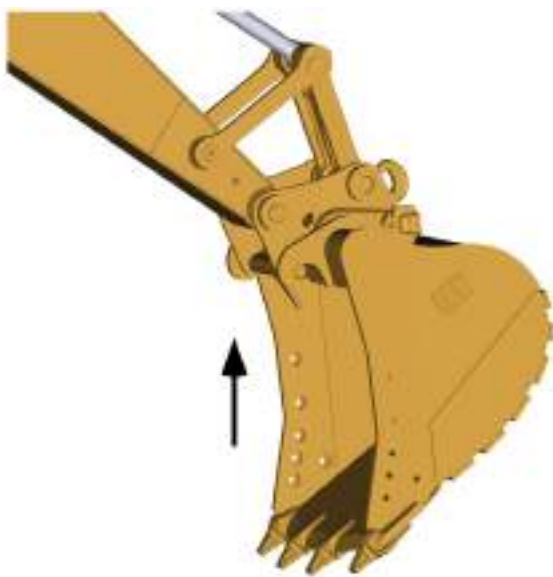


Illustration 377

g06220888

Retracting bucket cylinder

10. Raise the boom or raise the stick. Retract the bucket cylinder to confirm that the wedge is fully engaged. If the wedge is fully engaged, the work tool is locked in place. The work tool is ready to use.

Uncoupling the Work Tool**WARNING**

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

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



Illustration 378

g06220889

Placing the bucket on the ground

1. Level the bucket or level the work tool on the ground.



Illustration 379

g06642184

Quick coupler locking icon

Operation Section
Circuit for CW Coupler with Alarm (If Equipped)

2. Push the locking tab on the switch backward and then push the switch and release. The monitor will display “Quick Coupler Unlocking Requested” .



Illustration 380 g06642183
Quick coupler unlocking icon

3. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully extended. The buzzer will continue to sound and the monitor will display “Quick Coupler Unlocked” .

If machine is set without accelerator, operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully extended. The buzzer will continue to sound and the monitor will display “Quick Coupler Unlocked” .



Illustration 381 g06220891
Work tool engaged

4. Retract the bucket cylinder to move the Quick Coupler toward the machine while the coupler switch is being pushed and held.



Illustration 382 g06642184
Quick coupler locking icon

5. Release coupler switch (1). The monitor will display “Quick Coupler Locking” .



Illustration 383 g06642185
Locking icon

6. If machine is set with accelerator, the system will automatically pressurize until the wedge is fully retracted. The buzzer will stop and the monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.

If machine is set without accelerator. Operate a hydraulic system function (for example, hold the control lever of the bucket cylinder in the retract direction) until the wedge is fully retracted. The buzzer will stop and the monitor will display “Quick Coupler Locked - Verify Tool Locked” when the coupler is locked.



Illustration 384

g06220892

Work tool disengaged

7. Lower the stick and move the stick toward the machine to disengage the quick coupler.

i08826570

Work Tool Operation (If Equipped)

SMCS Code: 6700; 7000

Hammer Operation (If Equipped)



Illustration 385

g06222793

NOTICE

Use only a hydraulic hammer that is recommended by Caterpillar.

Do not use Hammer on UHD (Ultra High Demolition) front. Hammer can be used only when retrofit boom is attached on UHD machines.

The use of a hydraulic hammer that is not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for information on recommended hydraulic hammers.

Only use the hydraulic hammer to break rocks, concrete, and other hard objects. Before you start hydraulic hammer operation, place the machine on a level, stable surface.

Before you start hydraulic hammer operation, close the front window. Caterpillar recommends the installation of a window guard on the front window for protection from flying debris.

NOTICE

In order to avoid structural damage to the host machine or the hydraulic hammer, comply with the following:

Do not attempt to break rocks or concrete by burying the hammer tool completely into the rocks or concrete.

Do not apply a prying force to the hammer tool in order to remove the hammer tool from the material.

Do not allow the hydraulic hammer to operate at one location and for more than 15 seconds. Change the location of the hydraulic hammer and repeat the procedure. Failure to change the location of the hydraulic hammer could cause the hydraulic oil to overheat. Overheated hydraulic oil could damage the accumulator.

Stop the hydraulic hammer immediately if the jumper lines are pulsating violently. This indicates that the accumulator nitrogen charge is lost. Consult your Cat dealer for the necessary repair.

NOTICE

Do not use the dropping force of the hydraulic hammer to break rocks or other hard objects. This could cause structural damage to the machine.

Do not use the sides or back of the hydraulic hammer to move rocks or other hard objects. Doing this could cause damage not only to the hammer but to stick or boom cylinder.

Do not operate the hydraulic hammer with any of the cylinders fully retracted or extended. Doing this could cause structural damage to the machine, resulting in reduced machine life.

Do not use the hydraulic hammer to lift an object.

Do not operate the hydraulic hammer while the stick is vertical to the ground. This could allow the stick cylinder to vibrate excessively.

Operate the attachment control levers carefully to keep the hydraulic hammer tool from hitting the boom.

Do not operate the hydraulic hammer under water unless the hydraulic hammer is properly equipped. Operating the hydraulic hammer under water could damage the machine hydraulic system. Consult your Cat dealer for information on underwater operation.

Do not operate the hydraulic hammer with the upper structure sideways to the undercarriage. Before you start hydraulic hammer operation, place the upper structure in the recommended positions that are shown in illustration 386 . Any other operating positions could make the machine unstable. Any other operating positions could place excessive loads on the undercarriage.

Refer to the following for any additional questions about the operation and care of your Cat hydraulic hammer:

- Operation and Maintenance Manual, SEBU7346, "Hydraulic Hammers"
- The Operation and Maintenance Manual specific to your machine

An operation and maintenance decal, SMEU7397, is available for all hydraulic hammers. The decal provides procedures for operation and maintenance of the hydraulic hammers. The decal can be placed on the machine or the hammer. The decal can be obtained through the normal literature ordering channels.

Shear Operation (If Equipped)

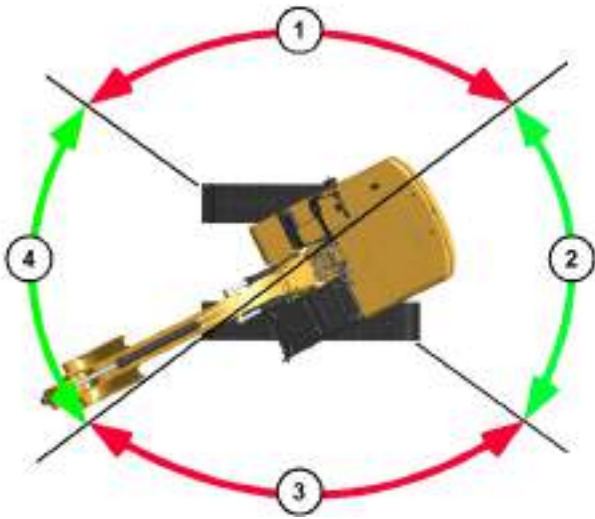


Illustration 386

g06192837

- (1) Incorrect working position
- (2) Correct working position
- (3) Incorrect working position
- (4) Correct working position



Illustration 387

g06222798

⚠ WARNING

Do not operate or work on this work tool unless you have read and understand the instructions and warnings in the Operation And Maintenance Manual for both the work tool and the host machine.

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

Contact your Caterpillar dealer for replacement manuals. Proper care is your responsibility.

NOTICE

Selection of a hydraulic shear must be done with extra care.

Use of a hydraulic shear not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic shear information.

WARNING

Serious injury or death could occur from the demolition of pipes, vessels, tanks or other containers that may contain gas, flammable materials or hazardous chemicals.

Do not perform any demolition work on these items until all of their contents have been removed.

Follow all regulations for the removal and disposal of these materials.

NOTICE

Using the demolition tool to level the work site or push over standing structures may damage the machine or the demolition tool. Use appropriate equipment to do site preparation or maintenance operations.

NOTICE

To avoid structural damage to the machine, do not break road surfaces by placing the cutting edge of the hydraulic shear on the ground and moving the machine.

Be sure that no one is near the work tool to prevent injury. Keep the work tool under control at all times to prevent injury. When a demolition tool is used, all personnel must maintain a minimum distance of 10 m (33 ft).

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.

Crusher Operation (If Equipped)

WARNING

Improper operation and maintenance of the crusher could cause personal injury or death. Observe the following procedures for safe operation of the crusher.

Consult your Cat dealer for more information on the operation and maintenance of the crusher.

Do not operate the host machine with the work tool unless you have read and understood the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in machine or work tool damage, and/or serious injury or death. Contact your Cat dealer for a replacement manual, if needed.

When the crusher is installed on the host machine, always make sure that the protective guarding is in place.

Using the crusher in an incorrect manner can damage the machine and/or cause personal injury or death.

Always ensure that the work area is clear of ground personnel, due to the potential crush hazards with falling debris and machine movement.

Resting or placing your foot on the work tool pedal could result in unexpected movement of the machine / work tool which could result in personal injury or death. Always lock the crusher when not in use.

NOTICE

Selection of a hydraulic crusher must be done with extra care.

Use of a hydraulic crusher not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic crusher information.

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.



Illustration 388

g06222800

Demolition work on the roof of a building could lead to serious personal injury if the building were to collapse and the excavator turned over or fell off the roof. The demolition work must be started ONLY AFTER surveying the building for its structural integrity.

X



Illustration 390

g06222806

Do not perform demolition work at the base of the machine, because the ground could be unstable and cause the machine to fall.

X



Illustration 389

g06222803

Crushing work above your head must be avoided because objects can fall and damage the machine.

X



Illustration 391

g06222809

Do not suddenly lower or stop the work tool, otherwise the excavator could turn over.

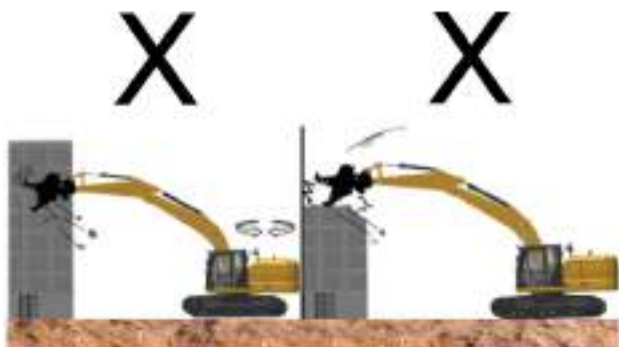


Illustration 392

g06222813

Crushing work using impact, swing, or dropping forces of the excavator could cause damages to the machine and also could lead to personal injury. As such, NEVER perform such an operation.



Illustration 394

g06222821

When performing work at elevated positions, always use care for the surroundings as well as for falling objects to avoid personal injury. Use guide personnel and signs as required.



Illustration 393

g06222817

Crushing work with hydraulic cylinder at stroke end position could damage the excavator, resulting in shortening of lifespan. Also, as it could lead to unexpected personal injury due to breakage of the machine, do not perform any work at stroke end.



Illustration 395

g06222829

When working sideways, the track can lift. Avoid abrupt operation and operate slowly.



Illustration 396 g06222831

Crushers could interfere with the boom and the cab depending on the type and method of usage. Know the working range of the crusher being used.



Illustration 398 g06222836

Never extend the boom cylinder suddenly. Sudden extension of the boom could cause tip backwards.

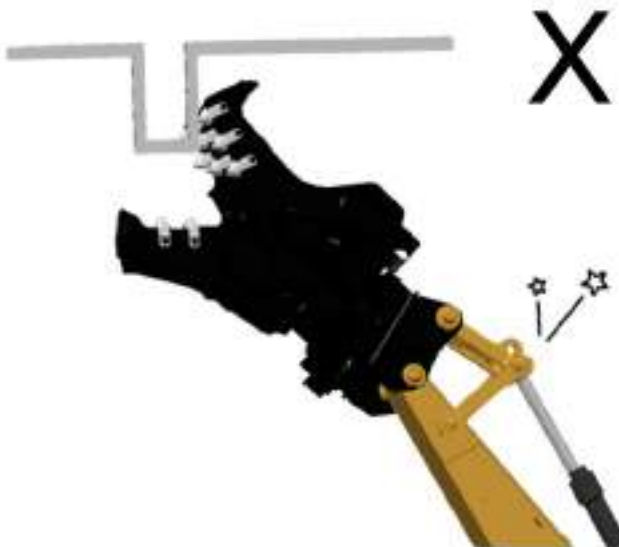


Illustration 397 g06222833

If the tooth of the crusher engages an object at a slant, excessive forces could be applied to the front regions. As such move the crusher to the front.



Illustration 399 g06222831

Sudden extension of the bucket cylinder, or sudden extension of the stick cylinder could cause damages at the stroke end position, resulting in personal injury. Operations that cause sudden extension of the cylinders is **PROHIBITED!**

Parking

i07868085

Stopping the Machine

SMCS Code: 7000

WARNING

Leaving the machine unattended when the engine is running may result in personal injury or death. Before leaving the machine operator station, neutralize the travel controls, lower the work tools to the ground and deactivate all work tools, and place the lever for the hydraulic lockout control in the LOCKED position.

Note: There may be regulations that define the requirements for the operator and/or support personnel to be present when the engine is running.

Park on a level surface. If the machine must be parked on a grade, chock the tracks securely.

Note: The swing parking brake is automatically applied when the machine is stopped. The swing parking brake is released when the engine is running and the joystick is activated.

1. Turn the engine speed dial counterclockwise to reduce engine speed.



Illustration 400

g06181402

2. Release the travel levers/pedals to stop the machine.

3. Lower the work tool to the ground. Apply a slight downward pressure.
4. Move the hydraulic lockout control to the LOCKED position.

i07088536

Freezing Conditions

SMCS Code: 7000

If freezing temperatures are expected, remove the mud and the dirt from each track roller frame. Park the machine on wood planks. Use the following procedure to clean each track roller frame.



Illustration 401

g06188791

1. Position the boom over one side of the machine.
2. Use boom down pressure to lift the track on one side off the ground. Operate the track in the forward direction. Then operate the track in reverse. Continue this procedure until the maximum amount of material is thrown off the track.
3. Lower the track onto the wood planks.
4. Repeat the procedure for the other track.
5. Clean the area around the carrier rollers and around the track rollers.
6. Lower the work tool onto a wood plank to prevent the work tool from touching the ground.

i07968177

Stopping the Engine

SMCS Code: 1000; 7000

NOTICE

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

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

NOTICE

Never turn the battery disconnect switch to the OFF position while the engine is running. Serious damage to the electrical system may result.

1. Park the machine on level ground. Refer to Operation and Maintenance Manual, "Stopping the Machine" for the recommended procedure.
2. While the machine is stopped, run the engine for 5 minutes at low idle. Idling the engine allows hot areas of the engine to cool gradually.
3. Turn the engine start switch to the OFF position.

Note: If the "Regen Active" indicator is illuminated, do not shut off the engine. Refer to Operation and Maintenance Manual, "Monitoring System" for more information on indicators.

Engine Shutdown Switch

NOTICE

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

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

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

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

Note: Always use the engine start switch to stop the engine. Use the engine shutdown switch as an alternate method to stop the engine if the start switch fails.

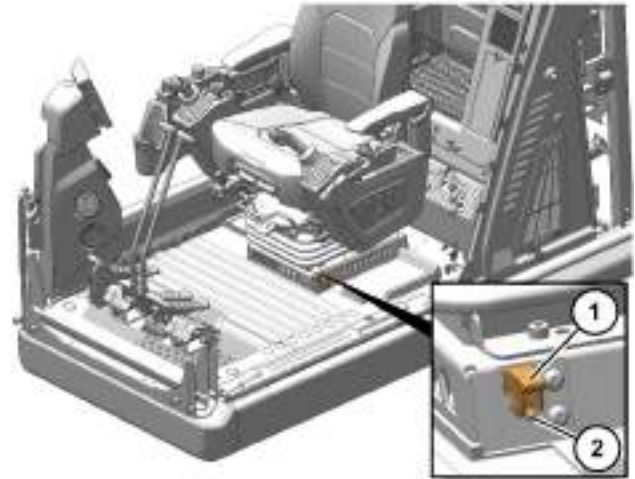


Illustration 402

g06181487

1. The engine shutdown switch is located below the left side of the operator seat.
2. Lift cover (1).
3. Push switch (2) upward. Pushing the switch upward should stop the engine and prevent the engine from being started again.
4. Return the switch to the original position. The engine will be enabled to start.

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

5. Use the method that follows if the previous steps do not stop the engine.

Stop the Engine if an Electrical Malfunction Occurs

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

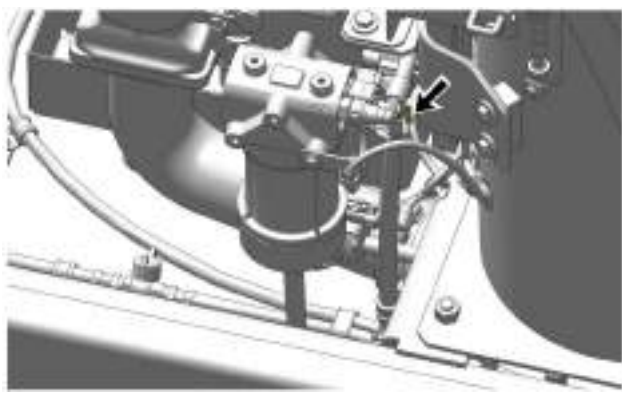


Illustration 403

g06497195

The fuel shutoff valve is located behind the right access door.

Shut off the fuel supply by pulling out the fuel shutoff valve, red tab, and rotating clockwise. The engine will stop after consuming the fuel in the fuel line. The engine may continue to run for a few minutes.

Repair the engine before you restart the engine. The fuel system may need to be primed. See Operation and Maintenance Manual, "Fuel System - Prime" for instructions.

i07103299

Leaving the Machine

SMCS Code: 7000



Illustration 404

g06224270

1. Use the steps and the hand holds when you dismount. When you dismount, face the machine and use both hands.

2. Inspect the engine compartment for debris. Clean out any debris to avoid a fire hazard.
3. Remove all flammable debris from the front bottom guard through the access doors to reduce a fire hazard. Discard the debris properly.
4. Always turn the battery disconnect switch to the OFF position before leaving the machine.
5. If the machine will not be operated for a month or more, remove the battery disconnect switch key.
6. Lock all compartments and all vandalism covers (if equipped).

i07426757

Machine Storage

SMCS Code: 7000

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

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

For detailed steps on long-term storage refer to Special Instruction, SEHS9031, "Storage Procedure for Caterpillar Products". This Special Instruction provides information on a specified storage period of up to 1 year.

Transportation Information

i08163556

Shipping the Machine

SMCS Code: 7000; 7500

WARNING

Automatic Engine Speed Control (AEC) will increase engine speed automatically when you operate the control levers and/or travel pedals with AEC switch on.

When loading and unloading the machine from the truck or working in close quarters always turn AEC switch off to prevent any possibility of sudden movement of machine, which could result in serious injury or death.

Set the travel speed control switch to LOW before loading the machine. Never operate this switch when loading the machine on a trailer.

Investigate the travel route for overpass clearances. Make sure that there will be adequate clearance for the machine.

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

Note: Obey all laws that govern the characteristics of a load (height, weight, width, and length). Observe all regulations that govern wide loads. Certain regions may require the removal of door hooks and cab bumpers, if equipped. Consult all local and regional regulations

Choose the flattest ground when you load the machine or when you unload the machine.

1. Before you load the machine, chock the trailer wheels or the rail car wheels.
2. When you use loading ramps, make sure that the loading ramps have adequate length, adequate width, adequate strength, and an adequate slope.
3. Maintain the slope of the loading ramps within 15 degrees of the ground.
4. Position the machine so that the machine can drive straight up the loading ramps. The final drives should be toward the rear of the machine. Do not operate the control levers while the machine is on the loading ramps.
5. When you drive over the loading ramp joint areas, maintain the balance point of the machine.

6. Lower the work tool to the bed or to the floor of the transport machine.
7. To prevent rolling of the machine or sudden movement of the machine, perform the following items:
 - Chock both tracks.
 - Install sufficient tie-downs at several locations.
 - Fasten wire cables.
8. If equipped, remove door hooks, cab bumpers, and fuel tank step as necessary. Refer to local regulations.

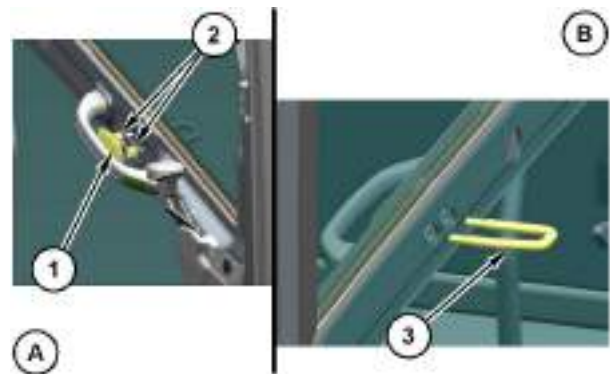


Illustration 405

g06516462

Typical example of door hook

- (A) Inside
(B) Outside
(1) Cover
(2) Nuts
(3) Door Hook

- a. Remove cover (1) and nuts (2) to remove door hook (3).

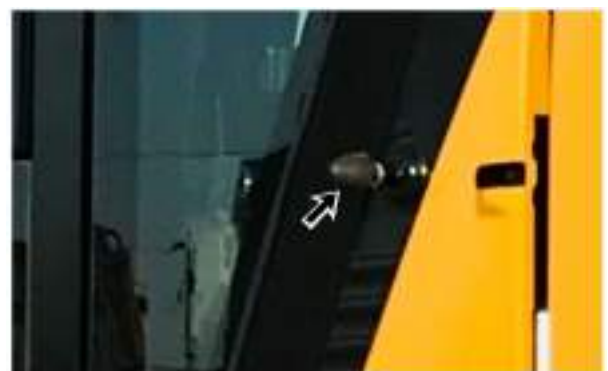


Illustration 406

g06516469

Typical example of cab bumper

- b. Remove any bumpers on your cab.

NOTICE

Do not allow the chrome surface of the bucket cylinder rod to touch any part of the trailer. Damage to the rod can occur from impact with the trailer during transport.

Note: Refer to Operation and Maintenance Manual, "Specifications".

Shipping a Machine that is not Completely Assembled

If the machine must be shipped when the boom, stick, or counterweight is not assembled on the machine, follow the instructions in Operation and Maintenance Manual, "Operation".

WARNING

The ROPS structural certification depends on the support of the boom, stick, and counterweight in the event of a machine tip over or a machine rollover incident.

When the machine needs to be moved without the boom, stick, or counterweight being installed, avoid any machine operations which could affect machine stability as a machine tip over or a machine rollover incident could result in serious injury or death.

The machine should be operated slowly on flat, stable ground or pavement by qualified operators.

i07539618

Securing the Machine

SMCS Code: 7000

WARNING

Do not transport the machine if there is a malfunction of the swing parking brake system.

The machine may swing during transportation if the swing parking brake system is not functioning properly which could result in injury or death.

Contact your Cat dealer for service.

Comply with any laws that govern the characteristics of a load (length, width, height, and weight).

1. Move the hydraulic lockout control to the LOCKED position.
2. Turn the engine start ring to the OFF position or press button to stop engine.

3. Turn the battery disconnect switch to OFF and remove the disconnect switch key.
4. Remove the ether starting aid cylinder. See Operation and Maintenance Manual, "Ether Starting Aid Cylinder - Replace" for the removal procedure.
5. Lock the door and the access covers. Attach any vandalism protection.

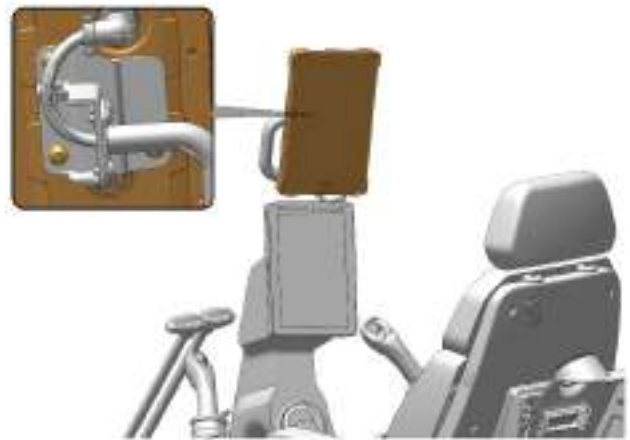


Illustration 407

g06181075

Note: Caterpillar strongly recommends removing the Cat Grade Control monitor (if equipped) before transporting the machine to protect the monitor from damage or theft.

6. Disconnect the wiring harness from the Cat Grade Control monitor. Remove the three screws that secure the monitor to the mounting bracket and remove the monitor. Remove the monitor from the cab and store in the monitor carrying case.
7. Cover the exhaust opening.

NOTICE

Do not allow the turbocharger to rotate while the engine is not operating. Damage to the turbocharger can result.

Note: Before you unload the excavator from the transport machine, remove the protective covering from the exhaust opening.

i09662824

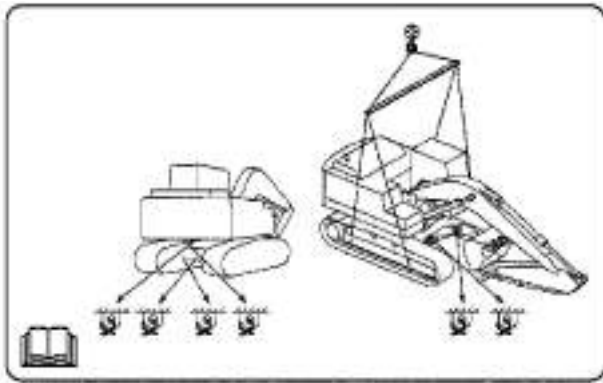


Illustration 408

g06289667

8. Chock the tracks and secure the machine with tie-downs. Make sure that you use the proper rated wire cable.

Use the front towing eyes on the lower frame, the rear towing eyes on the lower frame, and the rear towing eye that is on the upper frame.

Securely fasten all loose parts and all removed parts to the trailer or to the rail car.

When the engine is stopped, the swing parking brake is automatically applied. The swing brake prevents the upper structure from rotating.

NOTICE

In freezing weather, protect the cooling system with antifreeze, to the lowest outside expected temperature on the travel route. Or, drain the cooling system completely.

Lifting and Tying Down the Machine

SMCS Code: 7000; 7500

WARNING

Improper lifting and tie-down techniques can allow the load to shift or fail resulting in personal injury or property damage. Use only properly rated cables and slings with lift and tie down points provided on the machine. Keep the deck of the transport vehicle clean and use anti-slip mats on steel decks.

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

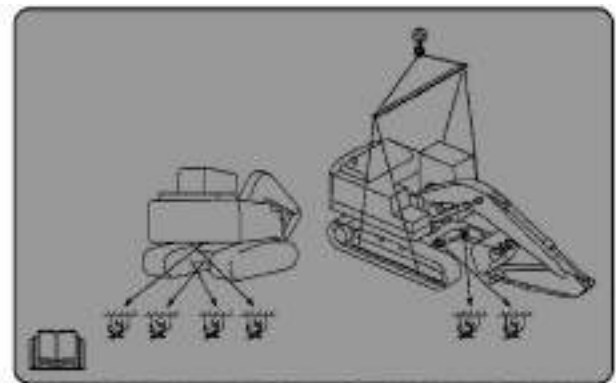


Illustration 409

g07492200

Lift and tie-down film

The lift and tie-down film is located near the base of the boom.

Lifting the machine



Illustration 410

g06184026

Lifting the machine

The machine center of gravity is located at the center of the swing gear.



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

The weight and the instructions that are given herein describe the machine as the machine is manufactured by Caterpillar.

Refer to the “Specifications” for specific weight information.

Note: Only lift objects from approved lifting points and with approved lifting devices

1. Use proper rated cables and slings for lifting. The crane should be positioned so that the machine is lifted parallel to the ground.
2. To prevent contact with the machine, lifting cables should have sufficient length.
3. Move the hydraulic lockout control to the LOCKED position. Refer to “Operator Controls” for more information.
4. Thread the cable between the first and second rollers at each end of the track.

5. Do not use the foot step as a lifting point.

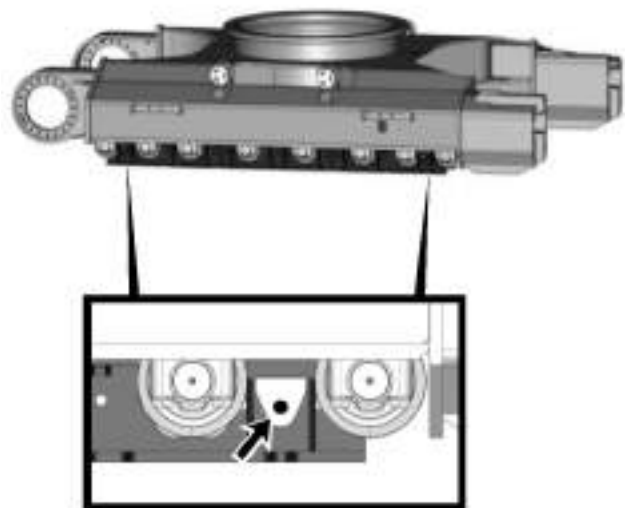


Illustration 411

g06279536

Hole in the full length roller guard

6. If the full length roller guard is equipped, there are holes at the ends of the guard for lifting cables. Refer to Illustration 411 for more information.
7. Apply the proper protector to prevent machine or wire damage and slippage. Make sure that the rollers are not affected by the load.

Tying Down the Machine

Note: Obey all local and regional governmental regulations.

Diagonal Lashing

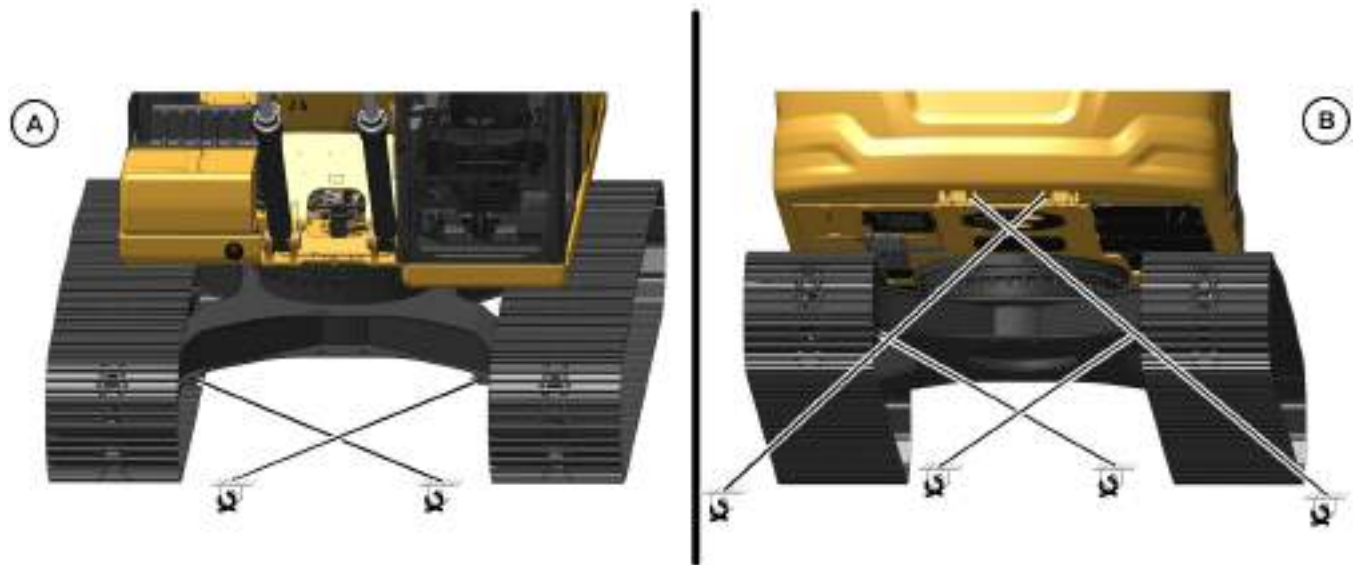


Illustration 412

g06435607

(A) Front of the machine

(B) Rear of the machine

There are two methods that can be used to tie down a machine. Local and/or regional regulations will determine which method to use.

- Tying with undercarriage - Applicable for all machines
- Tying with upper frame (if required) - Applicable only for some machines or configurations

Tying Down the Machine



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

The weight and the instructions that are given herein describe the machine as the machine is manufactured by Caterpillar.

Refer to the “Specifications” for specific weight information.

1. Use proper rated cables and shackles for tying down the machine.
2. Use the rear eyes and the front eyes that are provided on the lower frame to fasten tie-downs. Use corner protectors for sharp corners.
3. Move the hydraulic lockout control to the LOCKED position. Refer to “Operator Controls” for more information.
4. If there is a requirement of diagonal lashing for tying down, use the proper tie-down point on the lower frame. Set the lashing angle which is on the longitudinal axis of the machine and the cable, at 30 degrees to 50 degrees.
5. Keep the surface of the transport vehicle clean.
6. For steel deck transport vehicles use skid-inhibiting or anti-slip mats with a friction coefficient of minimum 0.3.

Tying Down Force

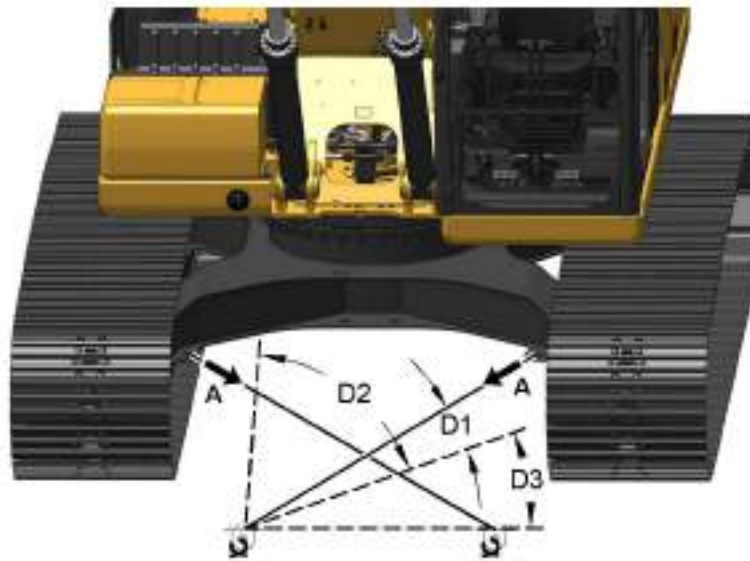


Illustration 413

g07491378

Machine tie-down angles

Table 36

Type of Frame	Tying Force (A)	D1	D2	D3
Base Frame	185 kN (41589 lb)	30 degrees	50 degrees	40 degrees
Upper Frame	Not required			

Lifting the Machine Segments

Bucket

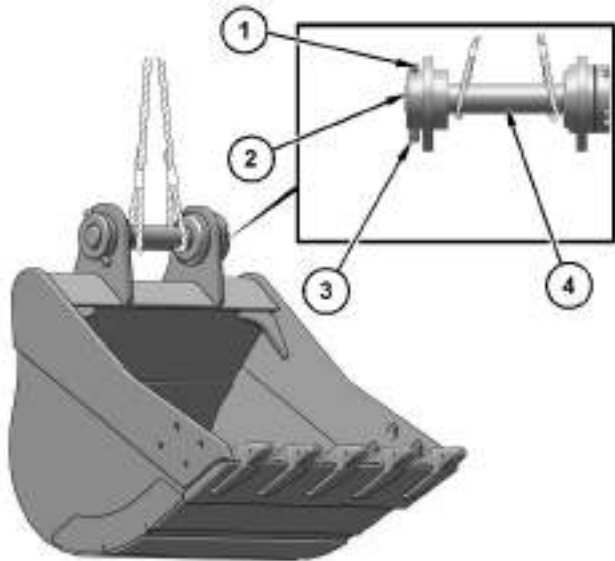


Illustration 414

g07532692

- (1) Nut
- (2) Pin
- (3) Bolt
- (4) Sleeve

1. Install pin (2) and install sleeve (4) in the brackets of the bucket.
2. Illustration 414 indicates the method to secure pin (2) with bolts (3) and nuts (1). Refer to Specifications, SENR3130, "Torque Specifications" for more information.
3. Fasten two proper rated wire cables to pin (2).

Towing Information

i09557366

Towing the Machine

SMCS Code: 7000

WARNING

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

Block the machine to prevent movement before final drives are disengaged. The machine can roll free if it is not blocked. With final drives disengaged, the machine cannot be stopped or steered.

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

Relieve the hydraulic tank and line pressure before any disassembly.

Even after the machine has been turned off, the hydraulic oil can still be hot enough to burn. Allow the hydraulic oil to cool before draining.

NOTICE

To tow the machine, both final drives must be disengaged.

Do not operate the travel motors with the final drives disengaged. Damage could result.

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

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

Do not allow an operator to be on the machine that is being towed.

Before you tow the machine, make sure that the tow line or the tow bar is in good condition. Do not use a wire rope that is kinked, twisted, or damaged. Make sure that the tow line or the tow bar has enough strength for the towing procedure that is involved. The strength of the tow line or of the tow bar should be at least 150 percent of the gross weight of the towed machine. This requirement is for a disabled machine that is stuck in the mud and for being towed on a grade.

Do not use a chain for pulling a disabled machine. A chain link can break. This may cause personal injury. Use a wire rope with ends that have loops or rings. Put an observer in a safe position to watch the pulling procedure. The observer can stop the procedure if the wire rope starts to break. Stop pulling whenever the towing machine moves without moving the towed machine.

During towing, do not allow anyone to step between the towing and the towed machines.

Do not allow the wire rope to be straddled while the machine is being towed.

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

Avoid towing the machine on a slope.

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

Prior to releasing the brake of the final drive, firmly lock both tracks to prevent the machine from moving suddenly. When the machine is ready to be towed, release the brake of the final drive. Refer to "Final Drive Sun Gear Removal".

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

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

All situation requirements cannot be listed. Minimal towing machine capacity is required on smooth, level surfaces. Maximum towing machine capacity is required on an incline or on a surface that is in poor condition.

Do not tow a loaded machine.

Consult your Cat[®] dealer for the equipment that is necessary for towing a disabled machine.

Retrieval and Towing of Machine

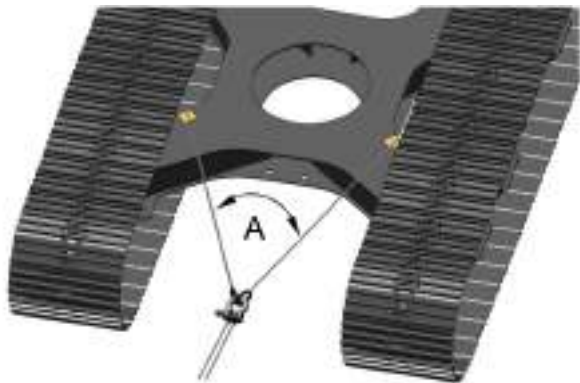


Illustration 415

g06289671

(A) Angle

Note: Shackles must be used for towing the machine. The wire rope should be horizontal and straight to the track frame.

Install a properly rated wire rope to the lower frame of the towing machine and the lower frame of the towed machine. The permissible force for the lower frame is 100 percent of the gross weight of the towed machine.

Note: To prevent damage to the wire rope or the lower frame of the machines, use protective sleeves on the corners of the lower frame.

Retrieve the disabled machine carefully. The applied load for each wire rope should be equal. Angle (A) between each wire rope should be 60 degree maximum. Operate the machine at a low speed.

Lightweight Towing

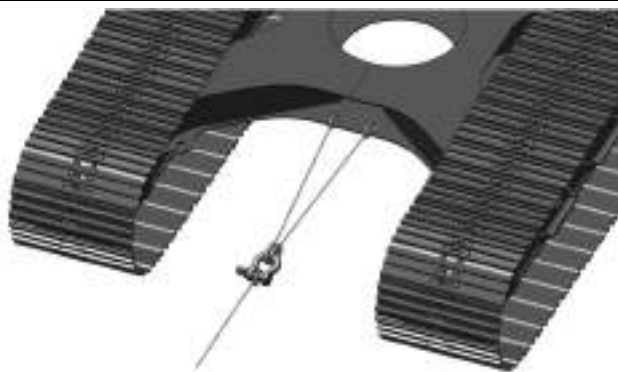


Illustration 416

g06186106

Refer to Operation and Maintenance, "Specifications" for the maximum load for lightweight towing.

Shackles must be used for towing the machine. The wire rope should be horizontal and straight to the track frame.

Install a properly rated wire rope to the lower frame of the towing machine and the lower frame of the towed machine. Operate the machine at a low speed.

i06954175

Final Drive Sun Gear Removal

SMCS Code: 4050

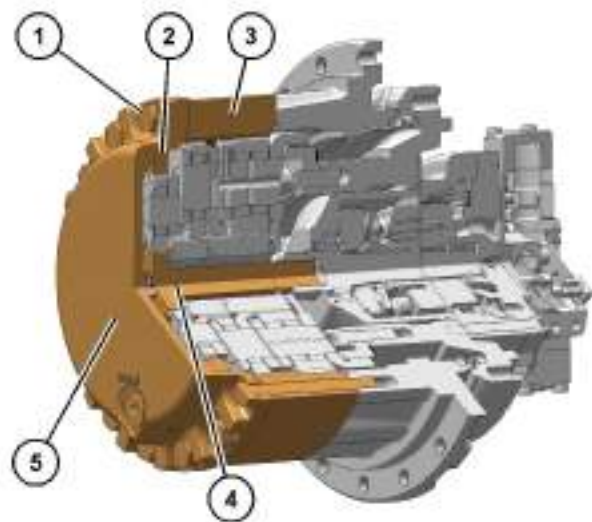


Illustration 417

g06188195

- (1) Bolt
- (2) Ring gear
- (3) Ring gear
- (4) Sun gear
- (5) Final drive cover

WARNING

Without the sun gear in place, the brakes are ineffective. Personal injury or death could result. Provide other means to hold or stop the machine.

1. Thoroughly clean the area around the final drive. Make sure that you also clean the track shoes that are positioned above the final drive.

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

2. Drain the final drive oil into a suitable container. See Operation and Maintenance Manual, "Final Drive Oil - Change" for the procedure.

- 3.** Remove 14 of 16 cover bolts (1) from final drive cover (5). Do not leave a bolt in the top hole of the cover.
- 4.** Insert an alignment dowel through the top hole of the cover and into the threads in the final drive housing. This is necessary to support ring gear (2) and ring gear (3) while you are removing the final drive cover.
- 5.** Remove one track shoe to allow access to the face between final drive cover (5) and ring gear (2).
- 6.** Loosen remaining two cover bolts (1).
- 7.** Use a hammer and a wedge to separate final drive cover (5) and ring gear (2). Make sure that ring gear (2) and ring gear (3) stay in place.
- 8.** Remove remaining two cover bolts (1) and final drive cover (5).
- 9.** Remove sun gear (4) from final drive.
- 10.** Install final drive cover (5) and 16 cover bolts (1).
- 11.** Fill the final drive with new oil. See Operation and Maintenance Manual, "Final Drive Oil - Change" for the procedure.
- 12.** Repeat Steps 1 through 11 for the other final drive.
- 13.** Refer to the Service Manual for information on the installation of the final drive sun gear.

Engine Starting (Alternate Methods)

i06953771

Engine Starting with Jump Start Cables (If Equipped)

SMCS Code: 1000; 7000

WARNING

Failure to properly service the batteries may cause personal injury.

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

Do not smoke when checking battery electrolyte levels.

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

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

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

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

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

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

NOTICE

To prevent damage to engine bearings and to electrical circuits when you jump-start a machine, do not allow the stalled machine to touch the machine that is used as the electrical source.

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

Use only equal voltage for starting. Check the battery and starter voltage rating of your machine. Use only the same voltage for jump starting. Use of a welder or higher voltage will damage the electrical system.

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

Refer to Special Instruction, SEHS7633, "Battery Test Procedure" for complete testing and charging information. This publication is available from your Cat dealer.

When the auxiliary start receptacles are not available, use the following procedure.

1. Lower the equipment to the ground. Move all controls to the HOLD position. Move the hydraulic lockout control to the LOCKED position.
2. Turn the start switch on the stalled machine to the OFF position. Turn off all accessories.
3. Turn the battery disconnect switch on the stalled machine to the ON position.
4. Move the machine that is being used as an electrical source near the stalled machine so that the jump-start cables reach the stalled machine.
Do not allow the machines to contact each other.
5. Stop the engine of the machine that is being used as an electrical source. If you are using an auxiliary power source, turn off the charging system.



Illustration 418

g06181546

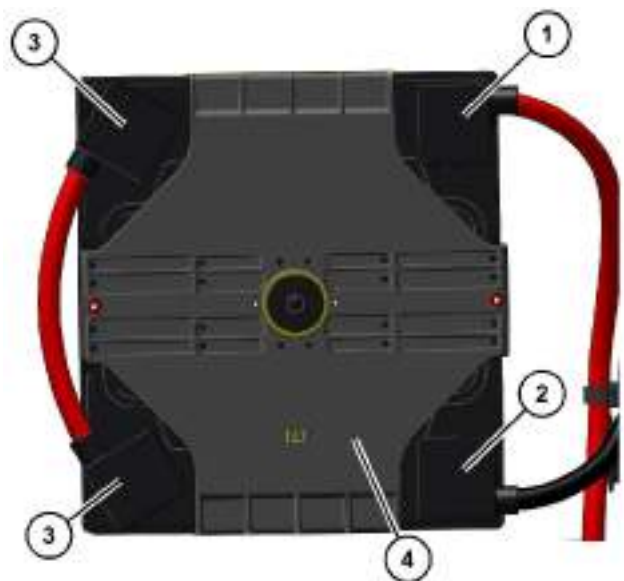


Illustration 419

g06181551

- (1) Red positive post to starter
- (2) The black negative post connects to the battery disconnect switch.
- (3) Do not use these two connections for jump starting. The red positive post is connected in series to the black negative post.
- (4) Cover

6. Ensure that battery caps on both machines are tight and correctly placed. Ensure that batteries in the stalled machine are not frozen. Make sure that the batteries have enough electrolyte.

Note: The positive terminal of the 24 V system of the source and the negative terminal of the 24 V system of the source must be identified correctly before the jumper cables are connected. The positive terminal of the 24 V system of the discharged battery must be identified correctly before the jumper cables are connected.

7. The positive ends of the jump-start cable are red. Connect one positive end of the jump-start cable to the positive cable terminal of the discharged battery. Some machines have battery sets.

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

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

8. Connect the other positive end of the jump-start cable to the positive cable terminal of the electrical source.
9. Connect one negative end of the jump-start cable to the negative cable terminal of the electrical source.
10. Finally, connect the other negative end of the jump-start cable to the frame of the stalled machine. Do not connect the jump-start cable to the battery post. Do not allow the jump-start cables to contact the battery cables, the fuel lines, the hydraulic lines, or any moving parts.
11. Start the engine of the machine that is being used as an electrical source or energize the charging system on the auxiliary power source.
12. Wait at least two minutes before you attempt to start the stalled machine. This will allow the batteries in the stalled machine to partially charge.
13. Attempt to start the stalled engine. See Operation and Maintenance Manual, "Engine Starting" for the correct starting procedure.
14. Immediately after you start the stalled engine, disconnect the jump-start cables in reverse order.

Maintenance Section

Maintenance Access

i08002328

Access Door and Cover Locations

SMCS Code: 726A-CH

Engine Hood



Illustration 420

Allows access to engine.

g06395745

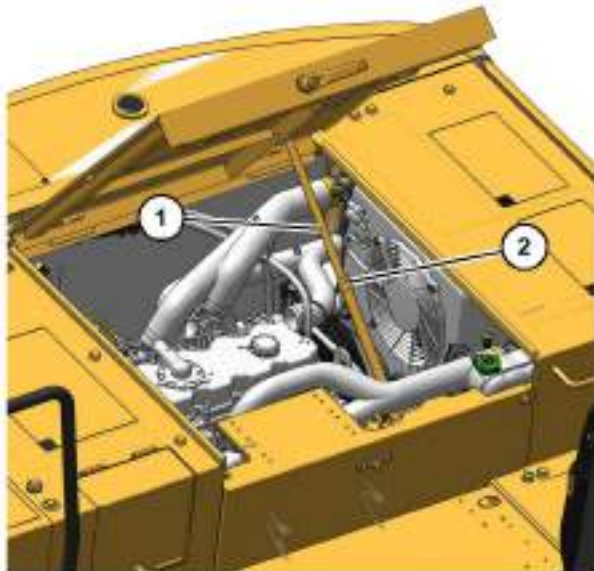


Illustration 421

g06225771

1. Open the engine hood.

2. Gas spring (1) will lock in place to hold the engine hood open.

WARNING**Operation of the Push Button Release for the Engine Hood**

When closing the engine hood, only operate the push-button release by hand.

Failure to remove hands from the push-button release before closing the engine hood could result in personal injury.

Be sure to remove hands from the push-button release before completely closing the engine hood.

NOTICE

Do not add pressure to the engine hood when open.

WARNING

When closing the engine hood, Do Not operate the push-button release by foot.

Operation of the push-button release by foot could result in damage to the gas spring of the closing mechanism and/or personal injury.

Only operate the push-button release for closing the engine hood by hand.

- To close the engine hood, support the engine hood with the door handle. Press the push-button release (2) to unlock the gas spring. Release the push button and slowly close the engine hood.

Coolant Reservoir Access Hatch

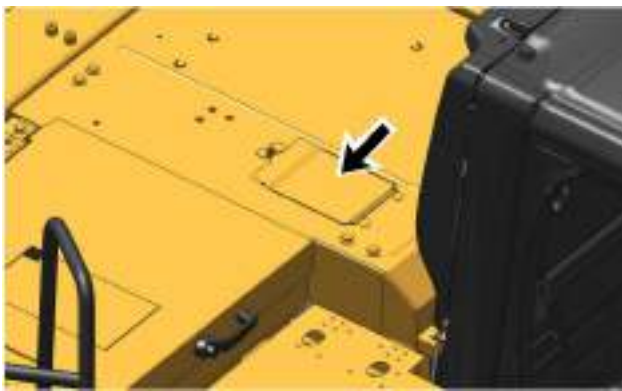


Illustration 422

g06503414

Allows access to the coolant reservoir cap.

Left Side Access Door



Illustration 423

g06395741

Allows access to the coolant sample port, coolant drain, cooling cores, power fuses, battery disconnect switch, and coolant reservoir sight gauge.

Right Side Access Door



Illustration 424

g06395732

Allows access to the engine oil filter, engine oil sampling port, and ground level dipstick. Also, the compartment houses the hydraulic pump, fuel filters, fuel tank drain valve, and hydraulic tank sight gauge.

Storage Box



Illustration 425

g06395746

Allows access to the Diesel Exhaust Fluid (DEF) tank for machines equipped with Tier 4 engines.

Lubricant Viscosities and Refill Capacities

i09415412

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 7581

General Information for Lubricants

When you are operating the machine in temperatures below -20°C (-4°F), refer to Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations for All Caterpillar Machines". This publication is available from your Cat[®] dealer.

Refer to the "Lubricant Information" section in the latest revision of the Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" for a list of Cat[®] engine oils and for detailed information.

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

Selecting the Viscosity

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

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Measure the temperature when the machine is started and while the machine is operated. To determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the "Lubricant Viscosities for Ambient Temperatures" tables, use the highest oil viscosity that is allowed for the ambient temperature.

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

NOTICE

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

Engine Oil

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

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

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

Typical aftertreatment systems may include the following:

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

Other systems may apply.

Oils that are per API CI-4 or prior categories are not allowed. These oils have high ash and are not appropriate for use in engines with aftertreatment devices.

Table 37

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase for all Machines	Cat DEO-ULS Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat DEO-ULS SYN	SAE 5W-40	-30	50	-22	122
	Cat DEO-ULS	SAE 10W-30	-18	40	0	104
		SAE 15W-40	-10	50	14	122
Pump Coupling (If Equipped)	Cat DEO-ULS	SAE 10W-30	-18	40	0	104

Hydraulic Systems

Refer to the “Lubricant Information” section in the latest revision of the Operation and Maintenance Manual, SEBU6250, “Caterpillar Machine Fluids Recommendations” for detailed information.

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

- Cat HYDO Advanced 10 SAE 10W
- Cat HYDO Advanced 20 SAE 20W
- Cat HYDO Advanced 30 SAE 30
- Cat BIO HYDO Advanced, Multigrade

Cat HYDO Advanced oils allow 6000 hours or higher oil drain intervals for most applications. S·O·S Services oil analysis is recommended when the oil drain interval is increased to 6000 hours or higher. In comparison, non-Cat commercial hydraulic oils (second choice oils) allow 2000 hours oil drain interval. It is recommended to follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular machine. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

Second choice oils are listed below.

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

Note: Oil drain intervals of the oils listed above are less than those of Cat HYDO Advanced oils. The oil drain interval of these oils is typically 2000 hours and up to a maximum of 4000 hours. An exception is Cat TDTO Cold Weather oil which allows 6000 hours or higher oil drain interval. S·O·S Services oil analysis is required when the oils listed above are used in Cat hydraulic system components and hydrostatic transmissions.

Table 38

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Hydraulic System	Cat HYDO Advanced 10 Cat TDTO	SAE 10W	-20	40	-4	104
	Cat HYDO Advanced 20 Cat TDTO	SAE 20W	-5	45	23	113
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	10	50	50	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	50	-22	122
	Cat MTO Cat DEO-ULS Cat DEO	SAE10W-30	-20	40	-4	104
	Cat DEO-ULS Cat DEO	SAE15W-40	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	-15	50	5	122
	Cat DEO-ULS SYN	SAE 5W-40	-25	40	-13	104
	Cat DEO-ULS Cold Weather	SAE0W-40	-40	40	-40	104
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104

For applications requiring the use of fire-resistant hydraulic fluids, recommends the use of EcoSafe FR-46. This product is a fully synthetic, non-aqueous hydraulic fluid. Water based and glycol-based hydraulic products are not recommended for use in Cat machine hydraulic systems. EcoSafe FR-46 is an ISO 46 multi-grade product. For more information refer to the product information provided by the manufacturer of EcoSafe hydraulic oil. Refer to your Cat dealer for availability.

Other Fluid Applications

Table 39

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosity Grade	°C		°F	
			Min	Max	Min	Max
Final Drives and Swing Drives	Cat TDTO Cold Weather	SAE 0W-20	-40	0	-40	32
	Cat TDTO	SAE 10W	-30	0	-22	32
		SAE 30 ⁽¹⁾	-30	35	-22	95
		SAE 50	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	-25	25	-13	77
Track Roller Frame Recoil Spring and Pivot Shaft Bearings	Cat TDTO Cold Weather	SAE 0W-20	-40	0	-40	32
	Cat TDTO	SAE 10W	-30	0	-22	32
		SAE 30 ⁽¹⁾	-20	25	-4	77

(continued)

(Table 39, contd)

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosity Grade	°C		°F	
			Min	Max	Min	Max
		SAE 50	0	50	32	122
	Cat TDTO-TMS	Multi-Grade	-25	25	-13	77
Track Idlers and Track Rollers	Cat DEO-ULS Cat DEO	SAE 15W-40 ⁽¹⁾	-10	50	14	122
	Cat DEO Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat DEO-ULS SYN	SAE 5W-40	-35	40	-31	104
	Cat FDAO SYN	Multi-Grade	-30	50	-22	122

⁽¹⁾ Factory fill oil for standard configuration machines.

Special Lubricants

Grease

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

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

Table 40

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
External Lubrication Points	Cat Prime Application Grease	NLGI Grade 2	-20	140	-4	284
	Cat Extreme Application Grease	NLGI Grade 1	-20	140	-4	284
		NLGI Grade 2	-15	140	+5	284
	Cat Extreme Application Grease-Artic	NLGI Grade 0.5	-50	130	-58	266
	Cat Extreme Application Grease-Desert	NLGI Grade 2	-10	140	+14	284
	Cat Utility Grease	NLGI Grade 2	-20	140	-4	284
	Cat Ball Bearing Grease	NLGI Grade 2	-20	160	-4	320

Diesel Fuel Recommendations

Diesel fuel must meet Caterpillar Specification for Distillate Fuel and the latest revisions of "ASTM D975" and "EN 590" to ensure optimum engine performance. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for the latest fuel information and for Cat fuel specification.

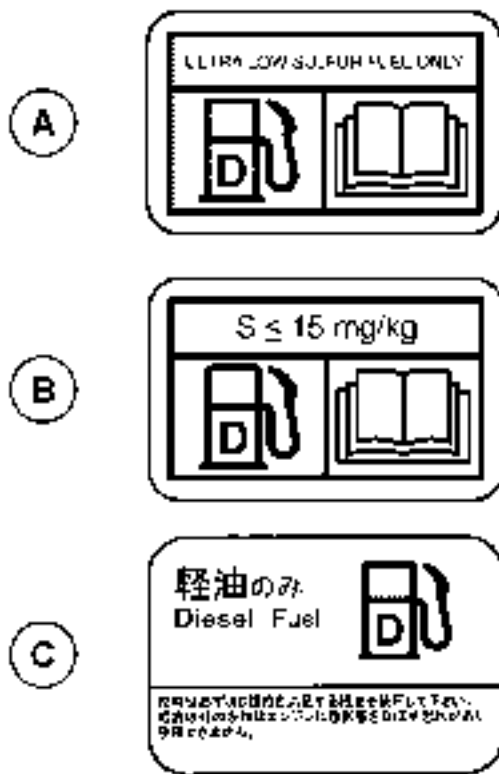


Illustration 426

g03218956

- (A) North America film
(B) Europe, Africa, Middle East film
(C) Japan film

NOTICE

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

European/China ULSD 0.0010 percent (≤ 10 ppm (mg/kg)) sulfur fuel is required by regulation for use in nonroad engines type-approved to EU Stage V / China Nonroad Stage IV. Additionally, the Cetane number should not be less than 45, and the bio-diesel content should not be greater than 20% volume/volume.

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

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

Failures that result for the use of improper fuels are not Caterpillar factory defects. Therefore, the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in non-road and machine applications that are not Tier 4/ Stage V certified engines and are not equipped with aftertreatment devices. For Tier 4/Stage V certified engines, always follow operating instructions to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more details about fuels, lubricants, and Tier 4/Stage V requirements.

Diesel Exhaust Fluid**General Information**

Diesel Exhaust Fluid (DEF) is a liquid that is injected into the exhaust system of engines equipped with Selective Catalytic Reduction (SCR) systems. SCR reduces emissions of nitrogen oxides (NOx) in diesel engine exhaust.

Diesel Exhaust Fluid (DEF) is also known under other names including Aqueous Urea Solution (AUS) 32, AdBlue, or generically referred to as urea.

In engines equipped with SCR emissions reduction system, DEF is injected in controlled amounts into the engine exhaust stream. At the elevated exhaust temperature, urea in DEF is converted to ammonia. The ammonia chemically reacts with NOx in diesel exhaust in the presence of the SCR catalyst. The reaction converts NOx into harmless nitrogen (N₂) and water (H₂O).

DEF Recommendations

For use in Cat engines, DEF must meet all the requirements defined by "ISO 22241-1" Requirements.

Caterpillar recommends the use of DEF available through the Cat parts ordering system for use in Cat engines equipped with SCR systems.

In North America, commercial DEF that is API approved and meets all the requirements defined in "ISO 22241-1" may be used in Cat engines that are equipped with SCR systems.

Outside of North America, commercial DEF that meets all requirements defined in "ISO 22241-1" may be used in Cat engines that are equipped with SCR systems.

The supplier should provide documentation to prove that the DEF is compliant with the requirements of "ISO 22241-1".

NOTICE

Cat[®] does not warrant the quality or performance of non-Cat fluids.

NOTICE

Do not use agriculture grade urea solutions. Do not use any fluids that do not meet "ISO 22241-1" Requirements in SCR emissions reduction systems. Use of these fluids can result in numerous problems including damage to SCR equipment and a reduction in NOx conversion efficiency.

DEF is a solution of solid urea that is dissolved in demineralized water to produce a final concentration of 32.5% urea. DEF concentration of 32.5% is optimal for use in SCR systems. DEF solution of 32.5% urea has the lowest attainable freeze point of -11.5 °C (11.3 °F). DEF concentrations that are higher or lower than 32.5% have higher freeze points. DEF dosing systems and "ISO 22241-1" specifications are designed for a solution that is approximately 32.5%.

Caterpillar offers a refractometer, Cat part number 360-0774, that can be used to measure DEF concentration. Follow the instructions provided with the instrument. Appropriate commercial portable refractometers can be used to determine urea concentration. Follow the instructions from the manufacturer.

DEF Guidelines

DEF solution is typically colorless and clear. Changes to color or clarity are indicators of quality issues. Quality of DEF can degrade when stored and handled inappropriately or if DEF is not protected from contamination. Details are provided below.

If quality issues are suspected, testing of DEF should focus on urea percentage, alkalinity as NH₃ and biuret content. DEF that does not pass all these tests or that is no longer clear should not be used.

Materials compatibility

DEF is corrosive. Due to the corrosion caused, DEF must be stored in tanks constructed of approved materials. Recommended storage materials:

Stainless Steels:

- 304 (S30400)
- 304L (S30403)
- 316 (S31600)
- 316L (S31603)

Alloys and metals:

- Chromium Nickel (CrNi)
- Chromium Nickel Molybdenum (CrNiMo)
- Titanium

Non-metallic materials:

- Polyethylene
- Polypropylene
- Polyisobutylene
- Teflon (PFA)
- Polyfluoroethylene (PFE)
- Polyvinylidene fluoride (PVDF)
- Polytetrafluoroethylene (PTFE)

Materials NOT compatible with DEF solutions include Aluminum, Magnesium, Zinc, Nickel coatings, Silver and Carbon steel, and Solders containing any of the above. Unexpected reactions may occur if DEF solutions come in contact with any non-compatible material or unknown materials.

Bulk storage

Follow all local regulations covering bulk storage tanks. Follow proper tank construction guidelines. Tank volume typically should be 110% of planned capacity. Appropriately vent indoor tanks. Plan for control of overflow of the tank. Heat tanks that dispense DEF in cold climates.

Bulk tank breathers should be fitted with filtration to keep airborne debris from entering the tank. Desiccant breathers should not be used because water will be absorbed, which potentially can alter DEF concentration.

Handling

Follow all local regulations covering transport and handling. DEF transport temperature is recommended to be -5 °C (23 °F) to 25 °C (77 °F). All transfer equipment and intermediate containers should be used exclusively for DEF. Containers should not be reused for any other fluids. Ensure that transfer equipment is made from DEF-compatible materials. Recommended material for hoses and other non-metallic transfer equipment includes:

- Nitrile Rubber (NBR)
- Fluoroelastomer (FKM)
- Ethylene Propylene Diene Monomer (EPDM)

The condition of hoses and other nonmetallics that are used with DEF should be monitored for signs of degradation. DEF leaks are easily recognizable by white urea crystals that accumulate at the site of the leak. Solid urea can be corrosive to galvanized or unalloyed steel, aluminum, copper, and brass. Leaks should be repaired immediately to avoid damage to surrounding hardware.

Cleanliness

Contaminants can degrade the quality and life of DEF. Filtering DEF is recommended when dispensed into the DEF tank. Filters should be compatible with DEF and should be used exclusively with DEF. Check with the filter supplier to confirm compatibility with DEF before using. Mesh-type filters using compatible metals, such as stainless steel, are recommended. Paper (cellulose) media and some synthetic filter media are not recommended because of degradation during use.

Care should be taken when dispensing DEF. Spills should be cleaned immediately. Machine or engine surfaces should be wiped clean and rinsed with water. Caution should be used when dispensing DEF near an engine that has recently been running. Spilling DEF onto hot components will cause harmful vapors.

Stability

NOTICE

Storing Diesel Exhaust Fluid in high heat areas is not recommended. Do not store DEF in high heat generating areas on the machine, such as the pump compartment or the engine compartment. The quality of the DEF can degrade when exposed to high temperatures.

DEF fluid is stable when stored and handled properly. The quality of DEF rapidly degrades when stored at high temperatures. The ideal storage temperature for DEF is between -9°C (15.8°F) and 25°C (77°F). DEF that is stored above 35°C (95°F) for longer than 1 month must be tested before use. Testing should evaluate Urea Percentage, Alkalinity as NH_3 and Biuret content.

The length of storage of DEF is listed in the following table:

Table 41

Storage Temperature	Expected DEF Life
Below 25°C (77°F)	18 months
25°C (77°F) to 30°C (86°F)	12 months
30°C (86°F) to 35°C (95°F)	6 months
Above 35°C (95°F)	test quality before use

Refer to "ISO 22241" document series for more information about DEF quality control.

Note: Dispose of all fluids according to applicable regulations and mandates.

Fuel Additives

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

Biodiesel Fuel Recommendations

NOTICE

Never use raw vegetable or plant-based oils in place of esterified biodiesel.

The use of oils that are not esterified can lead to engine damage, up to and including engine failure.

Biodiesel is a fuel that can be made from various renewable resources that include vegetable oils, animal fat, and waste cooking oil. These oils and fats are chemically processed (esterified), and filtered to remove water and contaminants.

For biodiesel storage requirements, consult your fuel supplier.

Note: In some regions, biodiesel blends are known as Fatty Acid Methyl Ester (FAME).

Use biodiesel blends that meet national, regional, and local standards.

For more information on biodiesel standards, and to reduce the risks associated with biodiesel usage, refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations".

Biodiesel Blend Limits

NOTICE

The use of biofuel blends above the acceptable limit can lead to higher engine downtime.

Biodiesel blend levels up to B20 are acceptable to use in this product.

The use of higher biodiesel blend levels are acceptable in regions where mandated. Consult your Cat dealer.

Note: The energy density of biodiesel blends above B20 are noticeably lower than diesel fuel.

Note: For engines equipped with emission aftertreatment devices, biodiesel blends must be blended with U.S. Ultra Low Sulfur Diesel, or European Sulfur Free Diesel.

Coolant Information

The information provided in this “Coolant Recommendation” section should be used with the “Lubricants Information” provided in the latest revision of Operation and Maintenance Manual, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

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

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/Coolant)

NOTICE

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

Table 42

Recommendations for Finished Coolants for use in Cat engines				
Coolant Type	Recommendations	Product	Service hours ⁽¹⁾⁽²⁾	Required Maintenance ⁽³⁾
Cat ELC, Cat ELI, or commercial coolant that meets Cat EC-1	Preferred	Cat ELC	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life
		Cat ELI (water based) ⁽⁴⁾	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life

(continued)

Maintenance Section
Fluids Recommendations

(Table 42, contd)

Recommendations for Finished Coolants for use in Cat engines				
	Min requirements	Cat EC-1 specification and "ASTM D6210" and Organic Additive Technology (OAT) based on a combination of a monocarboxylic acid and a dicarboxylic acid. Free of phosphate, borate, and silicate. Tolyltriazole: minimum typical concentration of 900 ppm Nitrite: minimum typical concentration of 500 ppm in new coolants	6000 hours or 6 years	Add Extender at 3000 service hours or one half of service life
Cat DEAC, Cat SCA, conventional coolants, and commercial extended life coolants that do not meet EC-1	Acceptable	Cat DEAC	3000 hours or 3 years	SCA at maintenance intervals
		Cat SCA (water based) ⁽⁴⁾	3000 hours or 2 years	SCA at maintenance intervals
	Min requirements for fully formulated Heavy-Duty Commercial coolants	"ASTM D6210" and Nitrite (as NO ₂) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 2 years	SCA at maintenance intervals
	Min requirements for SCA and water ^{(4) (5)}	Commercial supplemental coolant additive and water having Nitrite (as NO ₂) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 1 year	Per manufacturer recommendations

- (1) New Coolants at 50 volume percent diluted. Coolants that are prediluted at the coolant manufacturer must be diluted with water that meets Reagent 4 "ASTM D1193" requirements.
- (2) Maintain the in-service coolant at the given limits.
- (3) For appropriate maintenance procedures, refer to the details given in this Chapter. For applications that allow the use of Cat ELI in water, a minimum of 7.5 percent of Cat ELI is recommended. For applications that allow the use of SCA and water, a minimum of 6 percent to a maximum of 8 percent concentration of Cat SCA are recommended.
- (4) Water-based coolants are not allowed for use in machines that has NO_x reduction aftertreatment devices, in engines that has AATAC and in Marine engines that have SWAC
- (5) There are currently no industry standards to define the quality of water-based conventional coolants. To control the quality of SCA and water coolants, the commercial SCA additive package should pass ASTM D6210 when this package is used in a glycol-based coolant. Do not use a commercial SCA additive package that only meets the ASTM D3306 or equivalent specification when used in a glycol-based coolant.

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Capacities (Refill)

SMCS Code: 1000; 7000

Table 43

313 GC Approximate Capacities (Refill)			
Component or System	Liters	US gal	Recommended Type
Cooling System	14	3.6	Refer to "Lubricant Viscosities".
Fuel Tank	254	67	
Engine Crankcase with Filter	11	3	
Hydraulic System ⁽¹⁾	85	22.4	
Each Final Drive	3	0.8	
	kg	lbs	
Swing Gear	9	19.9	Refer to "Lubricant Viscosities".
Refrigerant ⁽²⁾	0.9	1.98	R-134a
	mL	oz	
Refrigerant Oil ⁽²⁾	240	8	Polyalkylene Glycol (PAG) Oil

⁽¹⁾ The amount of hydraulic fluid that is needed to refill the hydraulic system after performing "Hydraulic System Oil - Change"

⁽²⁾ Refer to Service Manual, "Air Conditioning and Heating R-134a for All Cat[®] Machines" for additional information

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S·O·S Information

SMCS Code: 1000; 1348; 3080; 4050; 5050; 7000;
7542-008

S·O·S Services is a highly recommended process for Cat customers to use in order to minimize owning and operating cost. Customers provide oil samples, coolant samples, and other machine information. The dealer uses the data in order to provide the customer with recommendations for management of the equipment. In addition, S·O·S Services can help determine the cause of an existing product problem.

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations" for detailed information concerning S·O·S Services.

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

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

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

Maintenance Support

i07477696

Prepare the Machine for Maintenance

SMCS Code: 1000; 7000

Refer to the following procedure before you perform any maintenance to the machine.

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the attachments have been lowered, oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

NOTICE

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

Refer to Special Publication, PERJ1017, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

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

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

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

2. Engage the parking brake. Place wheel blocks in front and behind the wheels or tracks.
3. Lower all work tools to the ground.
4. Stop the engine.

5. Release the pressure in the hydraulic system. Refer to Operation and Maintenance Manual, "System Pressure Release" for more information.

Perform a visual inspection first. If the visual checks are completed but the problem has not been identified, perform operational checks. If the problem has not been identified, perform instrument tests. This procedure will help to identify system problems.

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Service Interval Chart

SMCS Code: 7000

The service interval chart is inside the battery compartment door on the left side of the machine.

Refer to the Operation and Maintenance Manual, "Maintenance Interval Schedule" for the correct maintenance intervals and procedures that are specific to your machine.

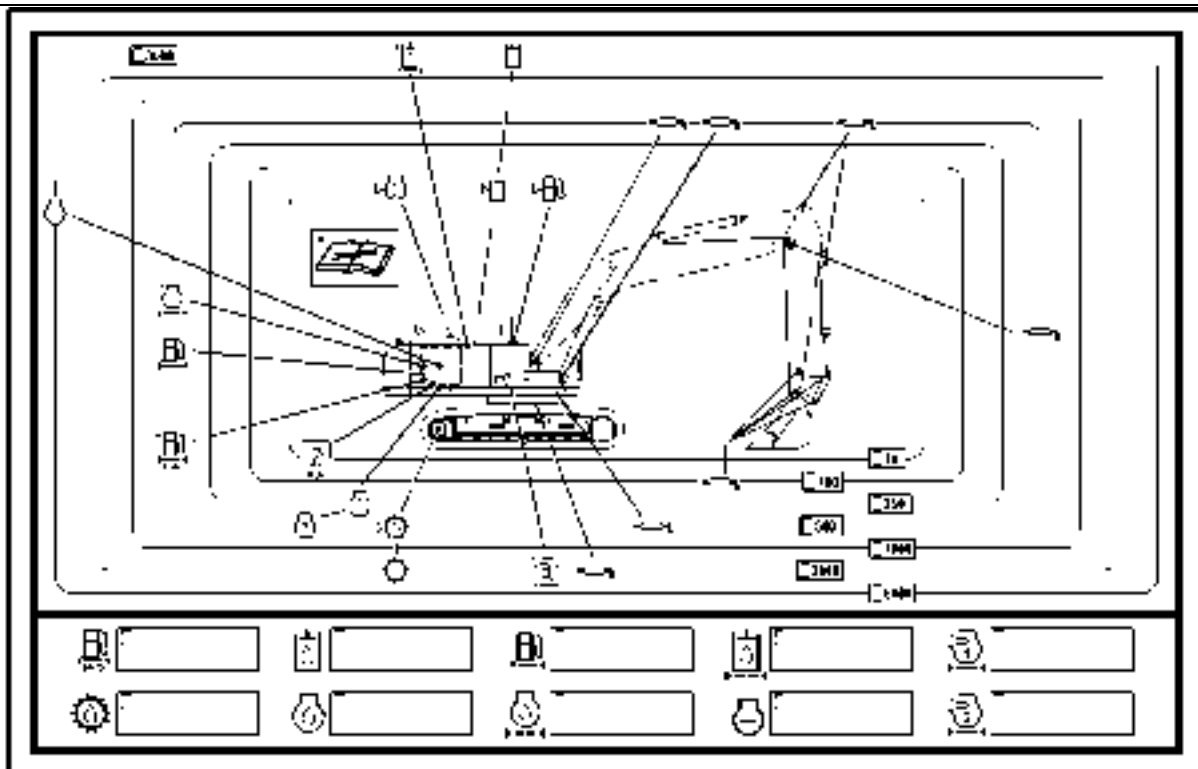


Illustration 427

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- | | | | |
|--|---|--|---|
| | Operation and Maintenance Manual – Refer to the OMM for maintenance instructions and guidelines. | | Final drive oil – Change the final drive oil. |
| | Service hour interval – Hourly interval in which a maintenance procedure should be performed. | | Fuel cap filter – Replace the fuel cap filter. |
| | Cooling system coolant – Change the ELC (Extended Life Coolant) . | | Fuel level – Check the fuel level. |
| | Engine air filter primary element – Clean or replace the primary air filter element. | | Fuel system filter – Replace the fuel system filters. |
| | Engine air filter secondary element – Replace the secondary air filter element. | | Fuel system water separator – Drain the water separator. |
| | Engine oil level – Check the engine oil level. | | Fuel system water separator element – Replace the fuel system water separator element. |
| | Engine oil – Change the engine oil. | | Grease zerk – Lubricate the designated locations. |
| | Engine oil filter – Change the engine oil filter. | | Hydraulic oil level – Check the hydraulic oil level. |
| | Final drive oil level – Check the final drive oil level. | | Hydraulic oil – Change the hydraulic oil. |



Hydraulic oil filter – Change the hydraulic oil filter.

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System Pressure Release

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

WARNING

Personal injury or death can result from sudden machine movement.

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

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

Coolant System

WARNING

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

To relieve the pressure from the coolant system, turn off the machine. Allow the cooling system pressure cap to cool. Remove the cooling system pressure cap slowly to relieve pressure.

Hydraulic System

The release of hydraulic pressure in a hydraulic circuit is required before service is performed to that hydraulic circuit. Release the pressure in the following hydraulic circuits before any hydraulic lines are disconnected or removed from that hydraulic circuit.

- Boom hydraulic circuit
- Stick hydraulic circuit
- Bucket hydraulic circuit
- Swing hydraulic circuit
- Travel hydraulic circuit
- Attachment hydraulic circuits (if equipped)
- Pilot hydraulic circuit
- Return hydraulic circuit

Note: Refer to the Disassembly and Assembly Manual for additional information concerning service of the components of specific hydraulic circuits.

Release of Hydraulic Pressure from the Main Hydraulic System

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

NOTICE

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

Refer to Special Publication, PERJ1017, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

Perform the following steps to release the hydraulic system pressure from the main hydraulic system.

Note: For additional safety, wrap hydraulic joint with material that could absorb/reduce any residual pressure of oil when released. Loosen the joint slowly, pause, and carefully check hydraulic joint for tensions indicating presence of pressure or spring force in lines or components.

1. Position the machine on level ground.



Illustration 428

g06185115

2. Fully retract the stick cylinder rod. Adjust the position of the bucket so that the bucket is parallel to the ground. Lower the boom until the work tool is flat on the ground. Refer to Illustration 428 .
3. Release the system pressure from the implement and swing hydraulic circuits.

Note: Perform Step 3b through Step 3d immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

- a. Shut off the engine.
- b. Turn the engine start switch to the ON position without starting the engine.
- c. Place the hydraulic activation control lever in the UNLOCKED position.

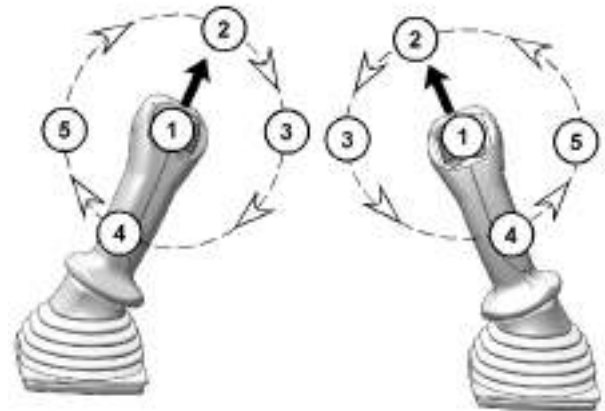


Illustration 429

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- d. Move both joysticks in a circular motion to the FULL STROKE positions multiple times until the pilot accumulator has been exhausted.

Note: Pilot pressure is required to relieve hydraulic system pressure.

- e. Place the hydraulic activation control lever in the LOCKED position.
- f. Start the engine to recharge the pilot accumulator.

Note: Do not activate any controls when recharging the pilot accumulator.

- g. Shut off the engine.
- h. Repeat Step 3b through Step 3g until the high-pressure lines have been released.

Note: Each time the accumulator is recharged, start the joysticks at different positions or rotate in the reverse direction. Doing so will ensure that the same circuit is not being relieved each time.

Note: You can also move only the joysticks or pedals of the hydraulic circuit that requires service to the full stroke positions after moving joysticks in a circular motion multiple times. This action will release the high pressure only in that single hydraulic circuit. This action will also release any pressure that might be present in the pilot hydraulic circuit.

4. Release hydraulic system pressure in the attachment circuits.
 - a. Start the engine to charge pilot accumulator.

Maintenance Section
System Pressure Release

b. Shut off the engine.

Note: Perform Step 4c through Step 4e immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

c. Turn the engine start switch to the ON position without starting the engine.

d. Place the hydraulic activation control lever in the UNLOCKED position.

e. Activate the switch or pedal for the attachment circuit.

f. Place the hydraulic activation control lever in the LOCKED position.

g. Start the engine to recharge pilot accumulator.

Note: Do not activate any controls when recharging pilot accumulator.

h. Shut off the engine.

i. Repeat Step 4c through Step 4f for each attachment circuit.

5. After releasing the hydraulic pressure in each of the desired hydraulic circuits, place the hydraulic activation control lever in the LOCKED position.

6. Turn the engine start switch to the OFF position.

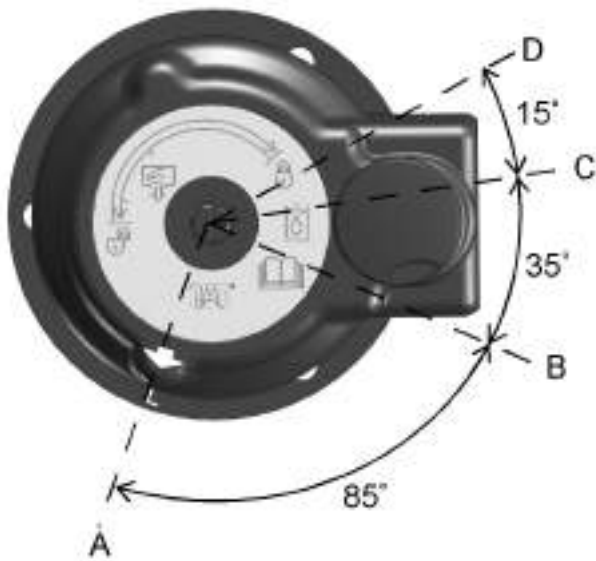


Illustration 430

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Hydraulic oil tank filler cap

- (A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

7. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 430 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push down the filler cap and move the arrow from position (C) to position (D).

Note: The travel hydraulic circuit is open to the hydraulic tank. Pressure from the travel circuit is released by releasing pressure from the return circuit.

8. Release the pressure that may be present in the boom circuit to remove the risk of residual pressure in the line. Make sure that the engine start switch is in the OFF position and the pressure in the hydraulic tank has been released.

a. Remove the hydraulic oil tank filler cap.

b. Remove any covers to access the main control valve.



Illustration 431

g06512097

Main control valve

(5) Screw

c. Use a clean hose of adequate length and size and connect to screw (5). Put the other end of the hose in the filler cap opening.

d. Slowly loosen screw (5) by a maximum of 1/2 turn. Loosening the screw allows the hydraulic oil in the boom circuit to drain into the hydraulic tank.

e. Tighten screw (5) to 13 ± 2 N·m (9 ± 1 lb ft).

Note: Refer to the Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped" for information on lowering the work tool with the engine off.

f. Disconnect the hose from screw (5). Do not allow the oil that is contained in the hose to spill. Drain the oil into a suitable container.

9. The pressure in the multiple hydraulic circuits that require service is now released and lines and components can be disconnected or removed from those hydraulic circuits.

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Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Cat dealer.

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

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

NOTICE

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

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

- Bearings of the drive train
- Hydraulic components

- Electrical components
- Other components of the machine

4. Protect any wiring harnesses and components from the debris and the spatter which is created from welding.
5. Use standard welding procedures to weld the materials together.

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Severe Service Application

SMCS Code: 1000

An engine which operates outside of normal conditions is operating in a severe service application.

An engine that operates in a severe service application may need more frequent maintenance intervals in order to maximize the following conditions:

- Reliability
- Service life

The number of individual applications cause the impossibility of identifying all of the factors which may contribute to severe service operation. Consult your Caterpillar dealer for the unique maintenance that may be necessary for your engine.

An application is a severe service application if any of the following conditions apply:

Severe Environmental Factors

- Frequent operation in dirty air
- Frequent operation at an altitude which is above 1525 m (5000 ft)
- Frequent operation in ambient temperatures which are above 32° C (90° F)
- Frequent operation in ambient temperatures which are below 0° C (32° F)

Severe Operating Conditions

- Frequent operation with inlet air which has a corrosive content
- Operation with inlet air which has a combustible content
- Operation which is outside of the intended application
- Operation with a plugged fuel filter

- Extended operation at low idle (more than 20% of hours)
- Frequent cold starts at temperatures below 0° C (32° F)
- Frequent dry starts (starting after more than 72 hours of shutdown)
- Frequent hot shutdowns (shutting down the engine without the minimum of 2 minutes to 5 minutes of cool down time)
- Operation above the engine rated speed
- Operation below the peak torque speed
- Operating with fuel which does not meet the standards for distillate diesel fuel as stated in Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "Distillate Diesel Fuel"
- Operating with a blend of distillate fuel which contains more than 20 percent biodiesel

Improper Maintenance Procedures (Maintenance Procedures Which May Contribute to a Severe Service Application)

- Inadequate maintenance of fuel storage tanks from causes such as excessive water, sediment, and microorganism growth.
- Extending maintenance intervals beyond the recommended intervals
- Using fluids which are not recommended in Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations"
- Extending maintenance intervals for changing the engine oil and engine coolant without S·O·S validation
- Extending maintenance intervals for changing air filters, oil filters, and fuel filters
- Failure to use a water separator
- Using filters which are not recommended by Special Publication, PEWJ0074, "2008 Cat Filter and Fluid Application Guide"
- Storing the engine for more than 3 months but less than 1 yr (For information about engine storage, refer to Special Publication, SEHS9031, "Storage Procedure for Caterpillar Products")

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Maintenance Interval Schedule

SMCS Code: 7000

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

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

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

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

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

The following guidelines should be followed if the service hours are not met:

Items listed between 10 and 100 service hours should be performed at least every 3 months.

Items listed between 250 and 500 service hours should be performed at least every 6 months.

Items listed between 1000 service hours and 2500 service hours should be performed at least every year.

When Required

" Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace"	291
" Battery Electrolyte Level - Check"	291
" Battery or Battery Cable - Inspect/Replace"	292
" Blade Cutting Edges - Inspect/Replace"	293
" Bucket Linkage - Inspect/Adjust"	304
" Bucket Tips - Inspect/Replace"	306
" Cab Air Filter (Fresh Air) - Clean/Replace"	312

" Camera - Clean"	312
" Condenser (Refrigerant) - Clean"	313
" Engine Air Filter Primary and/or Secondary Element - Replace"	319
" Film (Product Identification) - Clean"	326
" Fuel System - Prime"	329
" Fuel Tank Strainer - Clean"	332
" Fuses - Replace"	333
" Oil Filter - Inspect"	347
" Radiator, Aftercooler and Oil Cooler Cores - Clean"	347
" Rollover Protective Structure (ROPS) - Inspect"	349
" Shovel Crane - Inspect"	350
" Shovel Crane - Lubricate"	353
" Track Adjustment - Adjust"	356
" Window Washer Reservoir - Fill"	359
" Window Wiper - Inspect/Replace"	359
" Windows - Clean"	360

Every 10 Service Hours or Daily

" Travel Alarm - Test"	358
" Bucket Lifting Eye - Inspect"	303
" Cooling System Coolant Level - Check"	317
" Engine Oil Level - Check"	321
" Fuel System Water Separator - Drain"	331
" Fuel Tank Water and Sediment - Drain"	332
" Hydraulic System Oil Level - Check"	344
" Indicators and Gauges - Test"	346
" Seat Belt - Inspect"	349
" Track Adjustment - Inspect"	357
" Undercarriage - Check"	359

Every 10 Service Hours or Daily for First 50 Hours

" Blade Linkage - Lubricate"	294
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“ Boom and Stick Linkage - Lubricate” 294

Every 100 Service Hours

“ Bucket Linkage - Lubricate” 305

Initial 500 Service Hours

“ Cooling System Coolant Sample - Obtain” 317

“ Final Drive Oil - Change” 327

Every 500 Service Hours

“ Boom and Stick Linkage - Lubricate” 294

“ Boom, Stick, and Frame - Inspect” 295

“ Engine Oil and Filter - Change” 323

“ Final Drive Oil Sample - Obtain” 328

“ Fuel System Primary Filter (Water Separator) Element - Replace” 329

“ Hydraulic System Oil Sample - Obtain” 346

“ Swing Bearing - Lubricate” 354

Every 1000 Service Hours

“ Battery - Clean” 291

“ Battery Hold-Down - Tighten” 292

“ Belt - Inspect/Adjust/Replace” 292

“ Engine Oil Sample - Obtain” 323

“ Final Drive Oil Level - Check” 327

Every 2000 Service Hours

“ Cooling System Coolant Sample - Obtain” 317

“ Final Drive Oil - Change” 327

“ Fuel Tank Cap Filter - Replace” 331

Every Year

Every 3000 Service Hours

“ Hydraulic System Oil Filter (Return) - Replace” 341

Every 3 Years

“ Seat Belt - Replace” 350

Every 5000 Service Hours

“ Receiver Dryer (Refrigerant) - Replace” 348

Every 6000 Service Hours or 3 Years

“ Cooling System Coolant Extender (ELC) - Add” 316

“ Hydraulic System Oil - Change” 336

Every 12 000 Service Hours or 6 Years

“ Cooling System Coolant (ELC) - Change” 313

i06954215

Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace

SMCS Code: 1054-040-A/C; 1054-510-A/C

NOTICE

An air recirculation filter element plugged with dust will result in decreased performance and service life to the air conditioner or cab heater.

To prevent decreased performance, clean the filter element, as required.

The air conditioner filter is on the lower left side of the cab behind the seat.

1. Slide the operator seat forward.

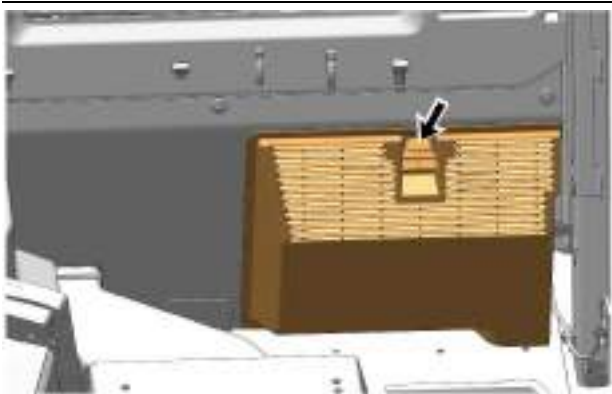


Illustration 432

g06181599

2. Release the cover latch.

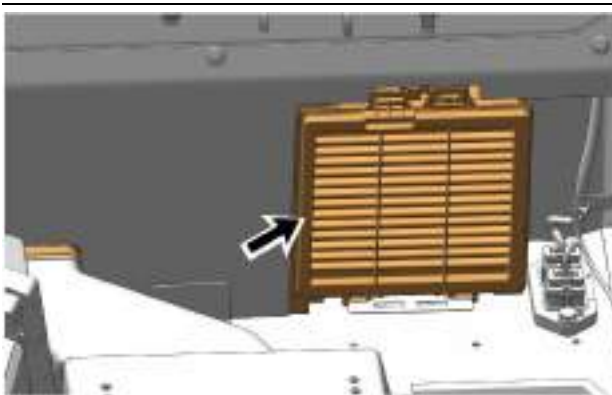


Illustration 433

g06181603

3. Slide the filter element upward.
4. Tap the air filter to remove the dirt. Do not use compressed air to clean the filter.

5. After you clean the filter element, inspect the filter element. If the filter element is damaged or badly contaminated, use a new filter element. Make sure that the filter element is dry.

6. Install the filter element.

7. Install the cover.

NOTICE

Failure to reinstall the filter element for the air conditioning system will contaminate and damage the system components.

i00934864

Battery - Clean

SMCS Code: 1401-070

Clean the battery surface with a clean cloth. Keep the terminals clean and keep the terminals coated with petroleum jelly. Install the post cover after you coat the terminal post with petroleum jelly.

i06019968

Battery Electrolyte Level - Check

SMCS Code: 1401; 1401-535-FLV; 1401-535

WARNING

All lead-acid batteries contain sulfuric acid which can burn the skin and clothing. Always wear a face shield and protective clothing when working on or near batteries.

Note: If the machine is operated in extreme temperatures, check the electrolyte level Every 500 Service Hours or 3 months.

When the engine is not run for long periods of time or when the engine is run for short periods, the batteries may not fully recharge. Ensure a full charge in order to help prevent the battery from freezing.

1. Clean the battery surface with a clean cloth. Clean the terminals and the cable clamps. Coat the clamps and the terminals with silicone lubricant or petroleum jelly. Install the post cover.
2. Inspect the electrolyte level in each battery cell. Maintain the electrolyte level to the bottom of the filler openings. Use distilled water. If distilled water is not available, use clean drinking water.

i00934872

Battery Hold-Down - Tighten

SMCS Code: 7257

Tighten the hold-downs for the battery in order to prevent the batteries from moving during machine operation.

i07592714

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401; 1401-510; 1401-040; 1401-561; 1402-510; 1402-040**WARNING**

Personal injury can result from battery fumes or explosion.

Batteries give off flammable fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts the skin or eyes.

Prevent sparks near the batteries. Sparks could cause vapors to explode. Do not allow jumper cable ends to contact each other or the engine. Improper jumper cable connections can cause an explosion.

Always wear protective glasses when working with batteries.

1. Turn all the switches to the OFF position. Turn the engine start switch key to the OFF position.
2. Turn the battery disconnect switch to the OFF position. Remove the key.
3. Remove the battery hold-down.

Note: The machine may contain more than one set of batteries.

4. Disconnect the negative battery cable at the battery.
5. Disconnect the positive battery cable at the battery.
6. Disconnect the battery cable at the battery disconnect switch.
7. Inspect the battery terminals for corrosion. Clean the battery terminals and the surfaces of the batteries with a clean cloth.
8. Inspect the battery cables for wear or damage.

9. Make any necessary repairs. If necessary, replace the battery cables and/or the battery.
10. Connect the positive battery cable at the battery.
11. Connect the negative battery cable at the battery.
12. Coat the battery terminals with petroleum jelly to prevent corrosion and install the terminal covers.
13. Reinstall the battery hold-down. Tighten the hold-downs for the battery to prevent the batteries from moving during machine operation.
14. Connect the battery cable at the battery disconnect switch.
15. Install the key and turn the battery disconnect switch ON.

Recycle the Battery

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

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

i08745602

Belt - Inspect/Adjust/Replace

SMCS Code: 1357-040; 1357-025; 1357-510; 1397-510; 1397-040; 1397-025**WARNING**

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

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

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

NOTICE

The V-belt must be tensioned correctly. Failure to tension the belt properly could damage the belt and/or to the air conditioner compressor.

Prepare the machine for maintenance. Refer to "Prepare the Machine for Maintenance".

Note: This engine is equipped with a belt tightener that automatically adjusts the belt to the correct tension.

1. Unlatch the engine hood and raise the engine hood. Refer to "Access Door and Cover Locations" for more information.

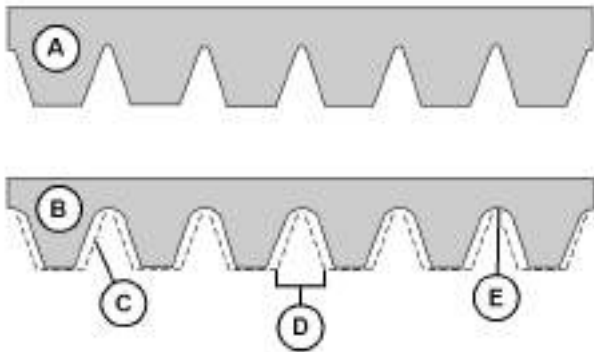


Illustration 434

g06206193

- (A) New belt
(B) Worn belt

2. Inspect the condition of the serpentine belt. Over time the belt ribs will lose material (C). The space between the ribs will increase (D). The loss of material will cause the pulley sheave to contact the belt valley. This will lead to belt slippage and accelerated wear (E). Replace the belt if the belt is worn or frayed.
3. If the belt requires replacement, perform Step 3a through Step 3f.
 - a. Remove the upper fan guard.

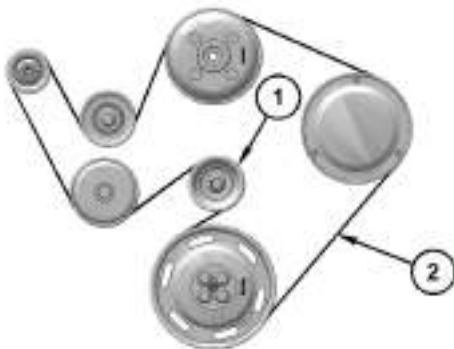


Illustration 435

g06761913

- (1) Belt tensioner
(2) Belt

- b. Rotate belt tensioner (1) counter clockwise to remove belt (2).

- c. Remove belt (2).
- d. Install new belt (2).
- e. Rotate belt tensioner (1) clockwise to install belt (2).
- f. Install the upper fan guard.

4. Lower the engine hood and latch the engine hood. Refer to "Access Door and Cover Locations" for more information.

i08002347

Blade Cutting Edges - Inspect/Replace (If Equipped)

SMCS Code: 6801

WARNING

Personal injury or death can result from a falling blade.

Block the blade before changing the cutting edges and the end bits.

Check the cutting edge of the blade and the end bits of the blade for wear. If any of the parts have signs of unusual wear or damage, replace the part.

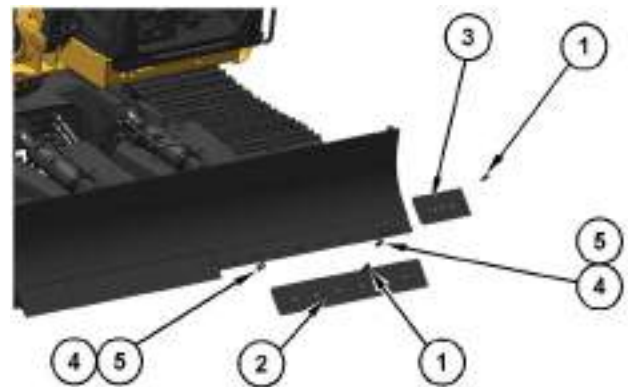


Illustration 436

g06503439

- (1) Bolt
(2) Cutting edge
(3) End bit
(4) Nut
(5) Washer

1. Raise the blade and place blocking underneath the blade.
2. Lower the blade onto the blocking.
3. Remove bolts (1), washers(4), and nuts (5).
4. Remove cutting edge (2) and end bits (3).

5. Clean the surface between the cutting edge and the end bits.
6. Turn the cutting edge and/or the end bits upside-down if those edges are not worn.
7. If both sides of the cutting edge and the end bits are worn, replace the parts with new parts.
8. Install the new parts or the rotated parts with bolts (1). Tighten the bolts to a torque of 270 ± 40 N·m (200 ± 30 lb ft).
9. Raise the blade and remove the blocking.
10. Lower the blade to the ground.
11. After a few hours of operation, tighten bolts (1) to the torque that is specified in Step 8.

i08097524

Blade Linkage - Lubricate

SMCS Code: 6060-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the blade linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Wipe all fittings before you apply lubricant.

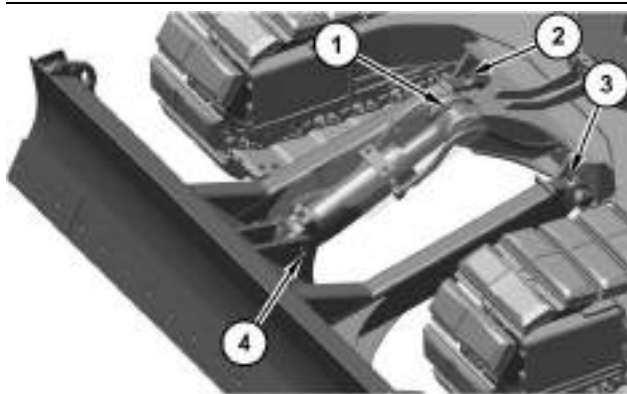


Illustration 437

g06335435

1. Apply lubricant through fitting (1). This fitting is on the rod end of the blade cylinder.
2. Apply lubricant through fitting (4). This fitting is on the head end of the blade cylinder.
3. Apply lubricant through fitting (2) and through fitting (3). These fittings are on the bar that supports the blade.

i07531958

Boom and Stick Linkage - Lubricate

SMCS Code: 6501-086; 6502-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, and stick linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Apply lubricant through all fittings after operation under water.

Wipe all fittings before you apply lubricant.

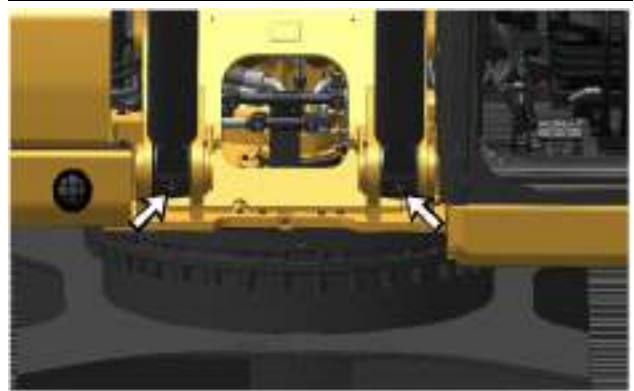


Illustration 438

g06183509

1. Apply lubricant through the fitting at the base of each boom cylinder.

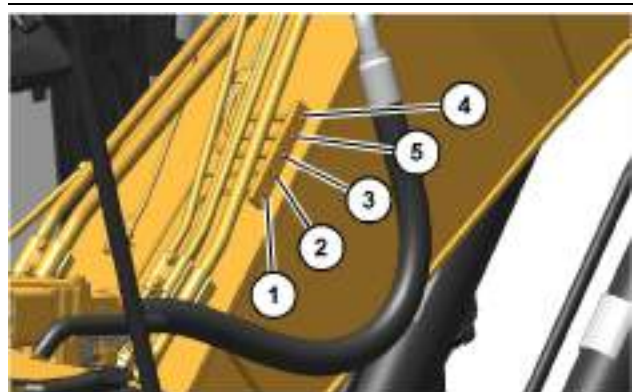


Illustration 439

g06183534

Note: Your machine may have the fittings mounted in a vertical position as shown in the illustration above, or your machine may have the fittings mounted in a horizontal position.

2. The fittings are at the base of the boom. The fittings can be serviced from the platform on the fuel tank. To lubricate the lower boom bearings, apply lubricant through fittings (1) and (2).
3. Apply lubricant through fittings (3) and (4) for the boom cylinder rod.
4. Apply lubricant through fitting (5) for the stick cylinder head.

Note: To ensure proper lubrication of the lower boom bearings and of the boom cylinder rod end bearings, lubricant should be applied through fittings (1), (2), (3), and (4). Apply lubricant first when the boom is raised and any attachment is suspended. Then apply lubricant when the boom is lowered and the attachment is rested on the ground with a slight downward pressure.



Illustration 440

g06183854

5. Apply lubricant through fitting (6). Fitting (6) is at the connection point of the boom and of the stick.

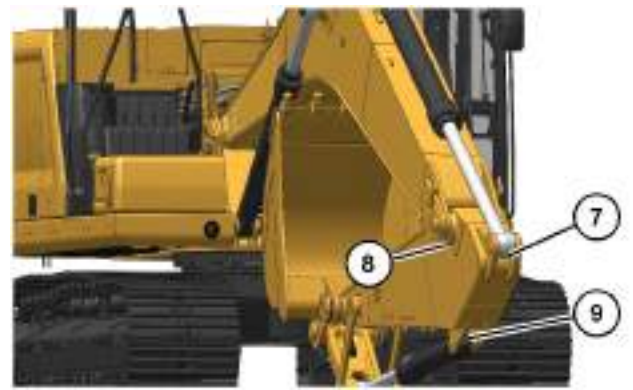


Illustration 441

g06183864

6. Apply lubricant through fitting (7) on the stick cylinder rod. Apply lubricant through fitting (8) at the connection point of the boom and of the stick. Apply lubricant through fitting (9) at the bucket cylinder head end.

i09692251

Boom, Stick, and Frame - Inspect

SMCS Code: 6501; 6502; 6506

WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the **LOCKED** position and attach a Special Instruction, SEHS7332, “Do Not Operate” or similar warning tag to the hydraulic lockout control.

WARNING

Access to this service point may require climbing on the equipment. Slipping or falling while climbing on the equipment could result in personal injury or death. Refer to the Operation and Maintenance Manual, “Mounting and Dismounting” topic, for safety information.

⚠ WARNING

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

The boom can fall if a control is moved or if a hydraulic component fails.

Do not rely on a hydraulic cylinder to hold the boom.

Support the boom during all service procedures.

⚠ WARNING

Boom load may cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing possible injury or death.

To avoid possible injury or death, be sure no one is under or near the work tool before manually lowering the boom.

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

NOTICE

The areas highlighted are of particular importance but other areas must not be neglected. The entire structure must be carefully examined.

Prepare the machine for maintenance. Refer to "Prepare the Machine for Maintenance".

All earthmoving equipment is prone to a high degree of wear. Regular inspections for structural damage are necessary.

The interval between these inspections depends on the factors that follow.

- The age of the machine.
- The severity of the application.
- The loads that have been carried on the machine.
- The amount of routine servicing that has been carried out.

If the machine has been involved in any accident, the machine must be inspected thoroughly. Inspect the machine regardless of the date of the last inspection.

The machine must be clean before the machine is inspected.

Proper repair of frames and structures requires specific knowledge of the following subjects.

- Materials that have been used to manufacture the frame members.
- Frame member construction.
- Repair techniques that are recommended by the manufacturer.

Consult your Cat[®] dealer if repairs are necessary. The Cat[®] dealer is qualified to carry out repairs on your behalf.

All repairs should be carried out by a Cat[®] dealer. If you carry out your own repairs, contact your Cat[®] dealer for advice about proper repair techniques.

Particular attention should be given to all welded structures. Inspect the following items thoroughly for cracks and for defects:

- Boom
- Stick
- Blade
- Upper frame
- Lower frame
- Bucket linkage lifting eye

Boom

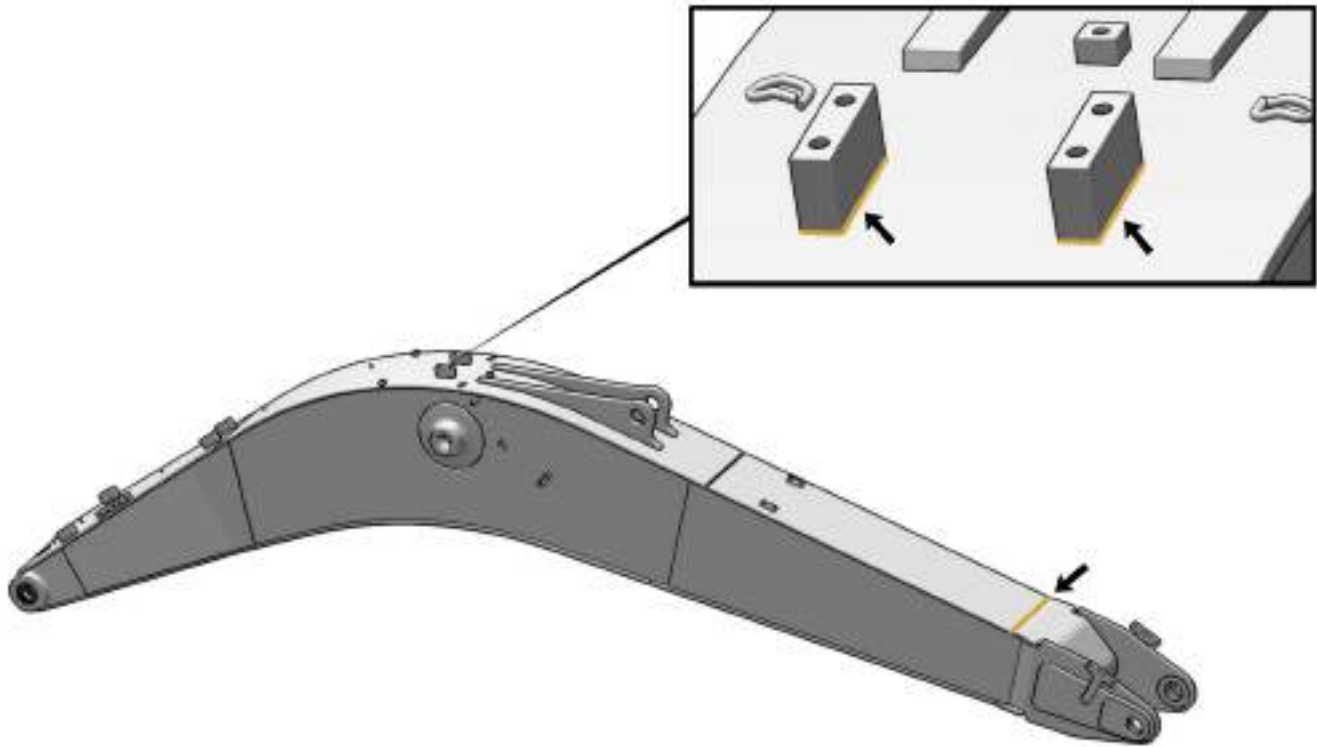


Illustration 442

g07552764

Typical example
Checkpoints on boom

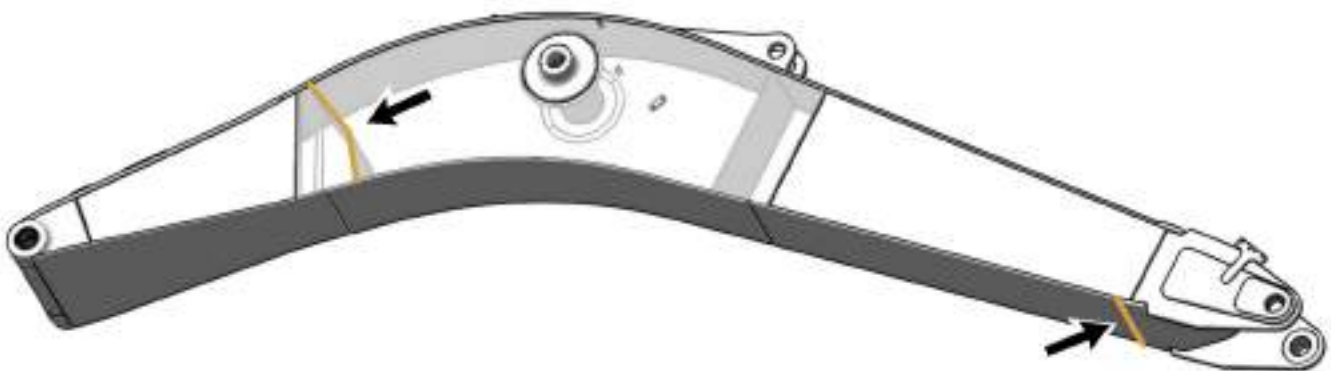


Illustration 443

g07552769

Typical example
Checkpoints on boom

Check all welded joints and check the mounting points on the boom. Refer to illustration 442 and illustration 443 for more information.

Note: Replace any hardware that is loose, damaged, or missing with original replacement parts only.

Stick

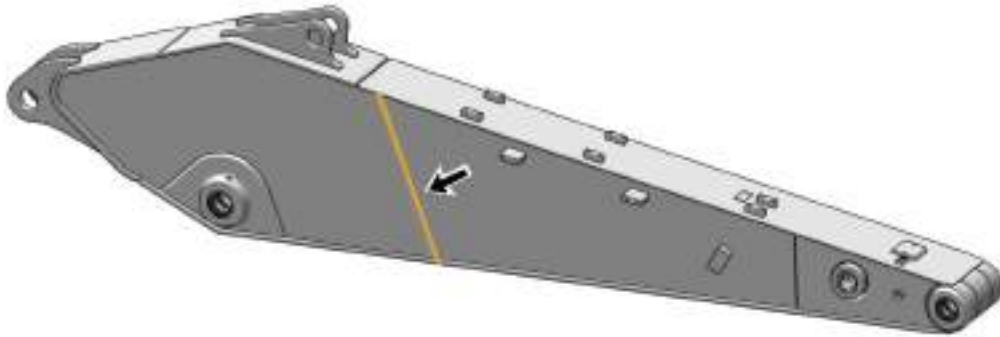


Illustration 444

g07552777

Typical example
Checkpoints on stick

Check all welded joints and check the mounting points for the stick.

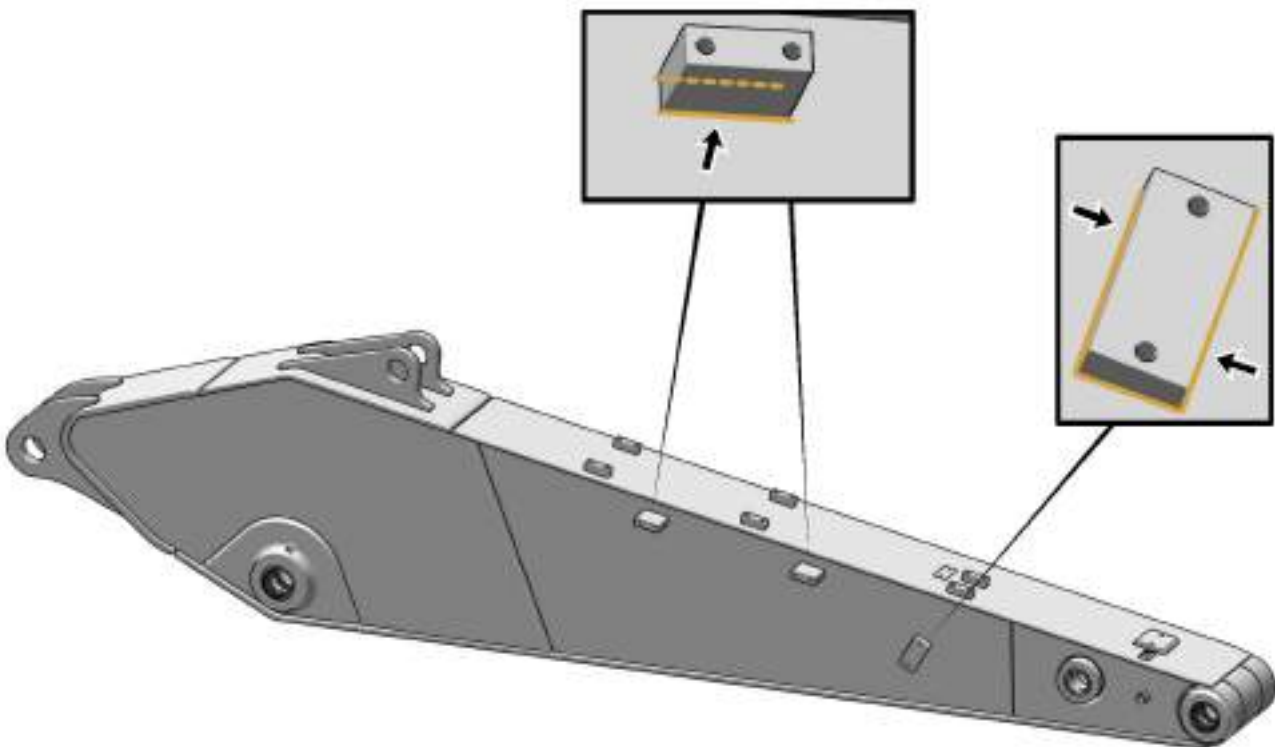


Illustration 445

g07552783

Typical example
Checkpoints on stick

Similarly, check on other side of the stick. Refer to illustration 444 and illustration 445 for more information.

Upper Frame

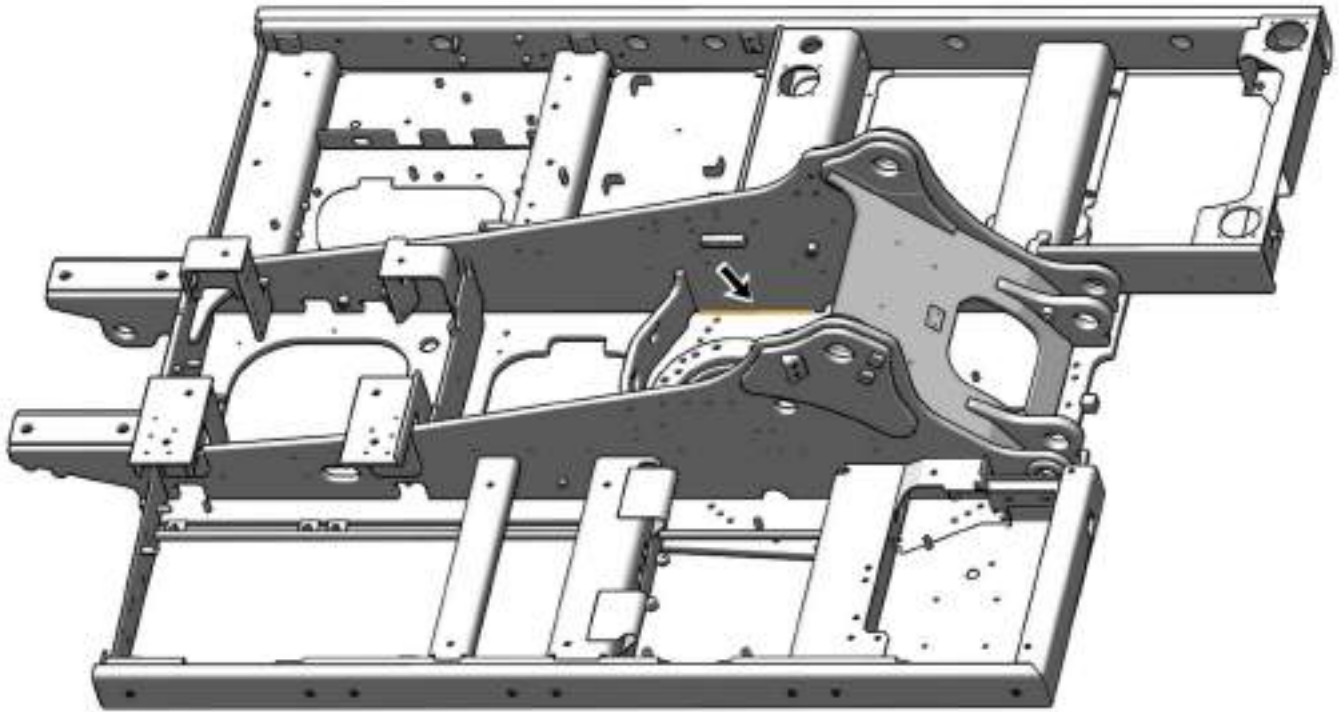


Illustration 446

g07552789

Checkpoints on upper frame

Visual inspection on both left and right side of upper frame

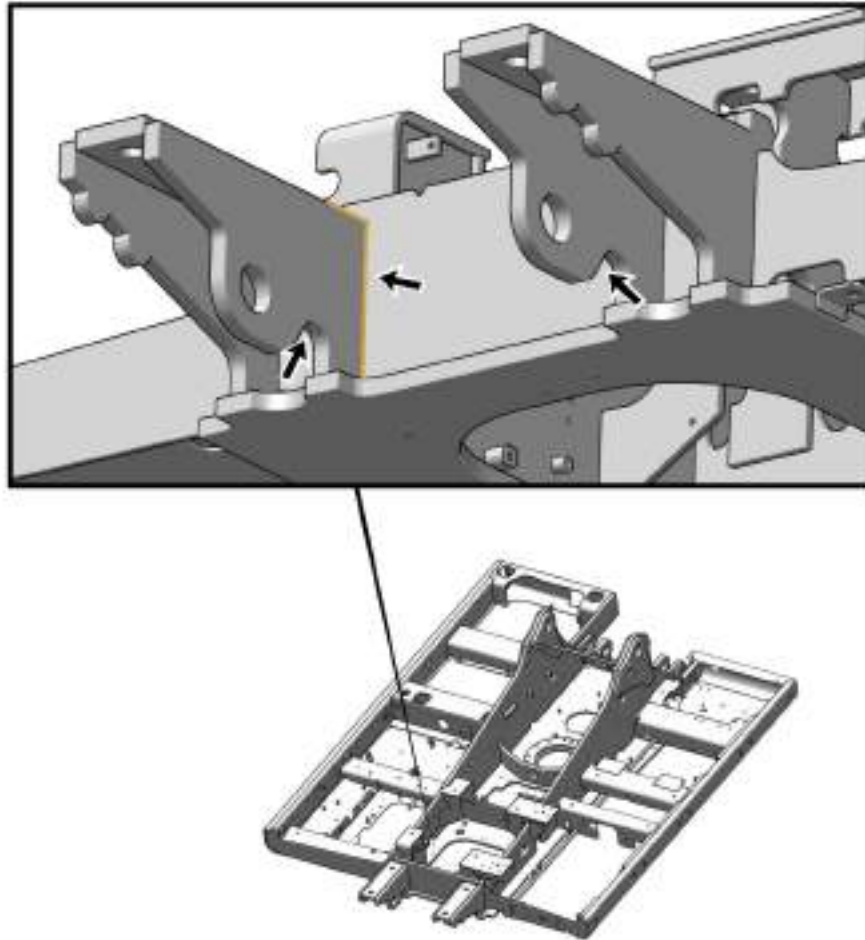


Illustration 447

g07552796

Checkpoints on upper frame

Visual inspection on both left and right side of the machine

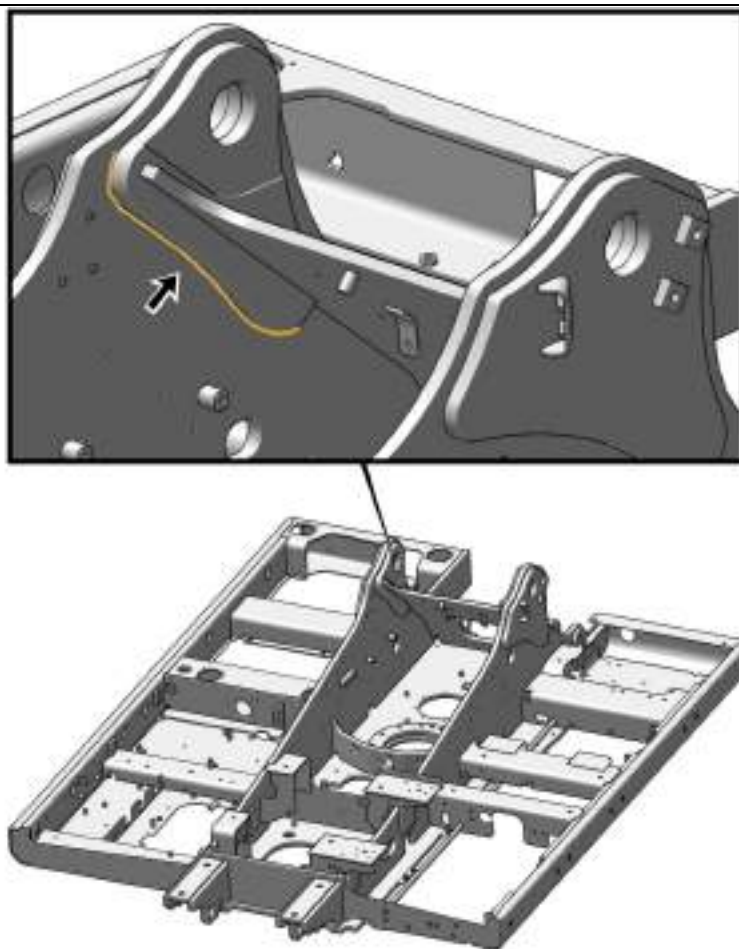


Illustration 448

g07552810

Checkpoints on upper frame

Visual inspection on both left and right side of upper frame

Check for damaged panels. Specifically look for any damage to the cab that might invalidate the certification. The cab is a safety device that must be maintained in good condition. Check for loose hardware or missing hardware. Refer to illustration 446 , illustration 447 , and illustration 448 for more information.

Note: Replace any hardware that is loose, damaged, or missing with original replacement parts only.

Lower Frame

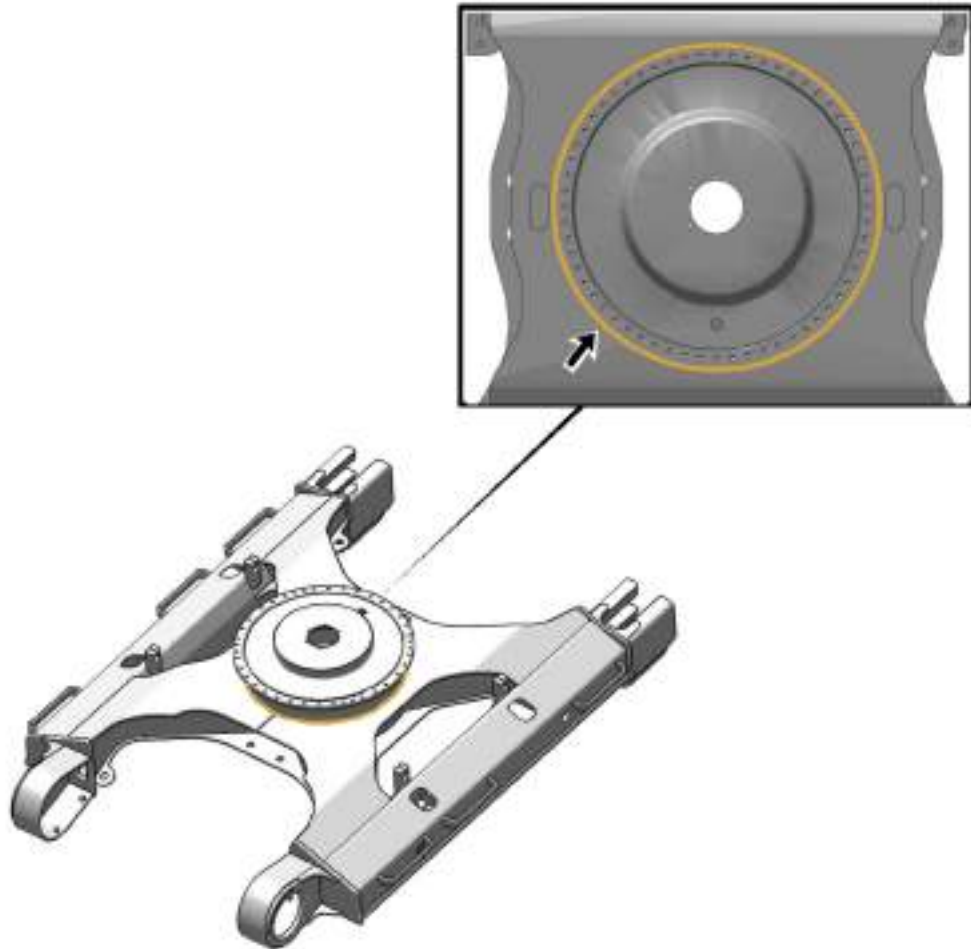


Illustration 449

g07552819

Typical example

Checkpoints on lower frame

Check the weld joints in the lower structure. Check for loose hardware or missing hardware.

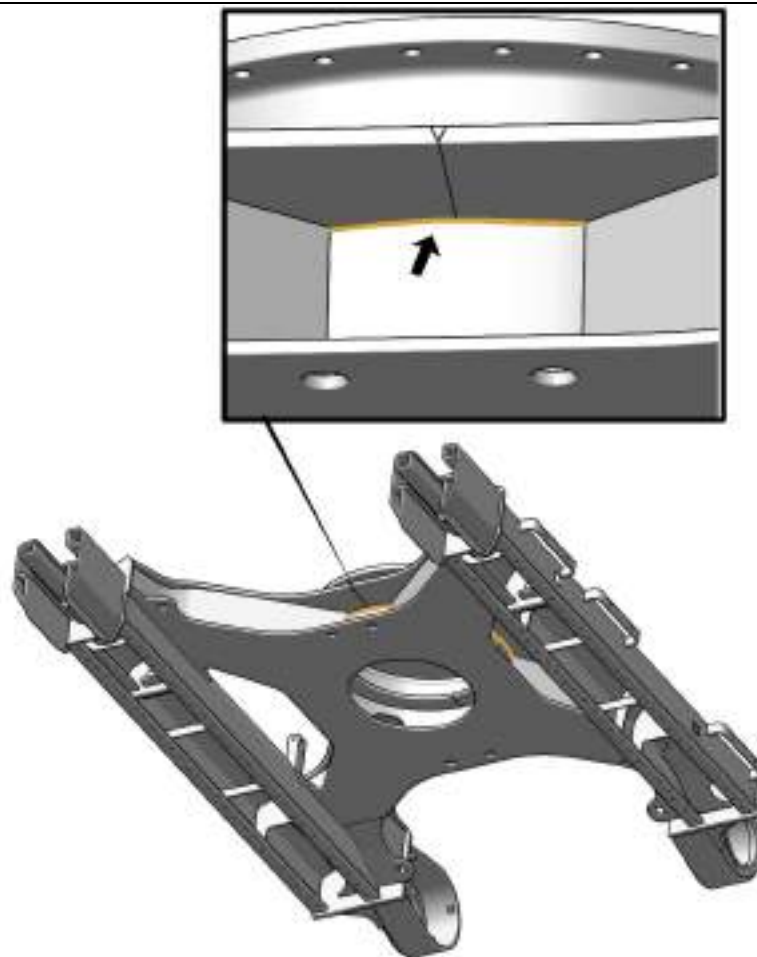


Illustration 450

g07552823

Typical example

Checkpoints on lower frame

Check the weld joints in the lower structure. Check for loose hardware or missing hardware. Refer to illustration 449 and illustration 450 for more information.

Prepare the machine for maintenance. Refer to "Prepare the Machine for Maintenance".

i08707939

Bucket Lifting Eye - Inspect

SMCS Code: 1122; 6001

WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

i08683901

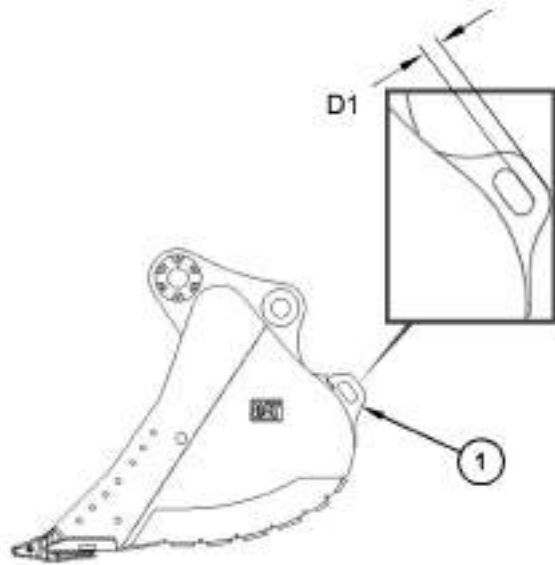


Illustration 451

g06750345

Typical example of bucket

- (1) Bucket lifting eye
(D1) Minimum allowable thickness

Table 44

Linkage	Nominal Thickness	Minimum Allowable Thickness (D1)
B	24 mm (0.9 inch)	21 mm (0.8 inch)
CB	29 mm (1.1 inch)	25 mm (1.0 inch)
DB	34 mm (1.3 inch)	29 mm (1.1 inch)
TB	44 mm (1.7 inch)	39 mm (1.5 inch)
VB	49 mm (1.9 inch)	43 mm (1.7 inch)
HB	59 mm (2.3 inch)	51 mm (2.0 inch)

Visually inspect bucket lifting eye (1). If any of the following conditions exist, consult your Cat® dealer.

- Excessive pitting or corrosion
- Excessive nicks or gouges
- Excessive wear or cracking of the welds
- Wall thickness is below minimum allowable thickness (D1). Refer to Table 44 .

Bucket Linkage - Inspect/Adjust

SMCS Code: 6513-040; 6513-025

If equipped with adjustable bucket linkage, perform the following steps.

WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the **LOCKED** position and attach a Special Instruction, SEHS7332, “Do Not Operate” or similar warning tag to the hydraulic lockout control.

NOTICE

Improperly adjusted bucket clearance could cause galling on the contact surfaces of the bucket and stick, resulting in excessive noise and/or damaged O-ring seals.

Prepare the machine for maintenance. Refer to “Prepare the Machine for Maintenance”.



Illustration 452

g06185692

Area for linkage adjustment

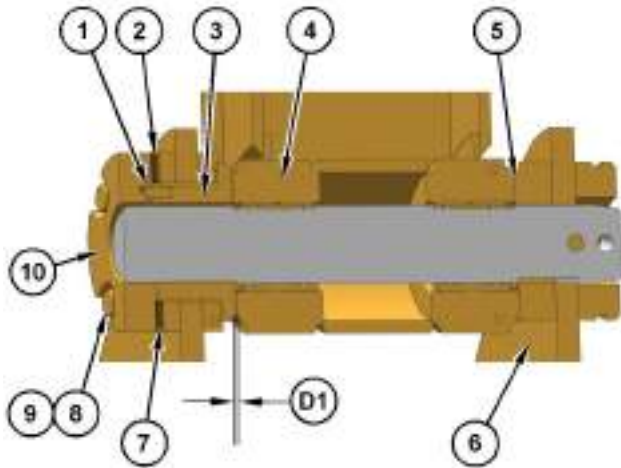


Illustration 453

g06733974

- (1) Pin
- (2) Shim
- (3) Flange
- (4) Stick boss
- (5) No gap
- (6) Bucket boss
- (7) Location
- (8) Bolt
- (9) Washer
- (10) Plate
- (D1) Bucket clearance

The clearance of the bucket control linkage on this machine can be adjusted by shimming. If the gap between the bucket and the stick becomes excessive, adjust bucket clearance (D1) to 0.5 to 1.0 mm (0.02 to 0.04 inch).

Two shims of different thickness are used at location (7). The thicknesses of the shims are 0.5 mm (0.02 inch) and 1.0 mm (0.04 inch).

1. Position the machine on a level surface and lower the bucket to the ground.
2. Slowly operate the swing control lever until stick boss (4) and the bucket boss (6) are in full face contact at no gap (5). This will help to determine the total clearance of the connection point of the stick and of the bucket.
3. Move the hydraulic lockout control to the LOCKED position. Refer to Operation and Maintenance Manual, "Operator Controls".
4. Stop the engine. Refer to Operation and Maintenance Manual, "Stopping the Engine".
5. Measure bucket clearance (D1), which is the existing total clearance.

6. Determine the number of shims that need to be removed from shims (2) by using the following calculation:

Subtract 0.5 mm (0.02 inch) or 1.0 mm (0.04 inch) from bucket clearance (D1).

7. Remove the appropriate number of shims at location (7) to meet the above thickness. Make sure that you use a minimum of three 0.5 mm (0.02 inch) shims. To remove the shims, remove bolts (8), washers (9), and plate (10).
8. After the correct number of shims has been removed and pin (1) is aligned with the pin hole, install plate (10), bolts (8), and washers (9). Tighten the bolts to $240 \pm 40 \text{ N}\cdot\text{m}$ ($175 \pm 30 \text{ lb ft}$).
9. After installation, make sure that bucket clearance (D1) is still correct.

i06970647

Bucket Linkage - Lubricate

SMCS Code: 6513-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the bucket linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on grease.

Wipe all fittings before you apply lubricant.

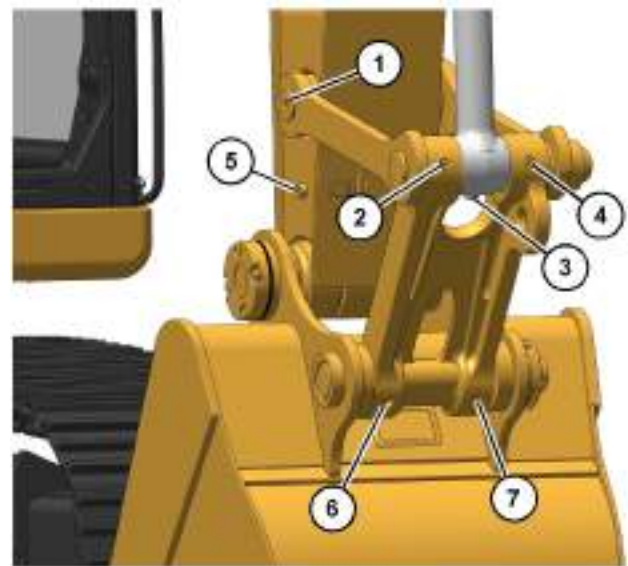


Illustration 454

g06183336

Note: Completely fill all cavities of the bucket control linkage with grease when you initially install a bucket.

1. Apply lubricant through fittings for the linkages (1), (2), (3), and (4).
2. Apply lubricant through fittings for the bucket (5), (6), and (7).

Note: Service the above fittings after you operate the bucket under water.

i09598478

Bucket Tips - Inspect/Replace

SMCS Code: 6805-040; 6805-510

WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket tips or side cutters.

WARNING

Retaining bolts can have sharp edges that may cause personal injury. Do not hold the bolts by hand. Use appropriate tools to hold and remove bolts.

K Series GET Drive-through System Bucket Tips

Note: To maximize the life of the bucket tip and the penetration of the bucket tip, the bucket tip can be rotated.



Illustration 455

g01055179

Acceptable wear



Illustration 456

g01055196

Replace this bucket tip.

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal Procedure

WARNING

Retainer pin, when struck with force, can fly out and cause injury to nearby people.

Make sure the area is clear of people when driving retainer pins.

To avoid injury to your eyes, wear protective glasses when striking a retainer pin.



Illustration 457

g06528662

- (1) Bucket tip
- (2) Retainer
- (3) Adapter

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.



Illustration 458

g01054386

Internal view

1. Use a hammer and a punch to drive out the retainer. The retainer can be removed from the top of the bucket tip or from the bottom of the bucket tip.
2. Remove the bucket tip from the adapter with a slight counterclockwise rotation.

Installation Procedure

1. Clean the adapter, if necessary.
2. Install the new bucket tip or the rotated bucket tip onto the adapter with a slight clockwise rotation.

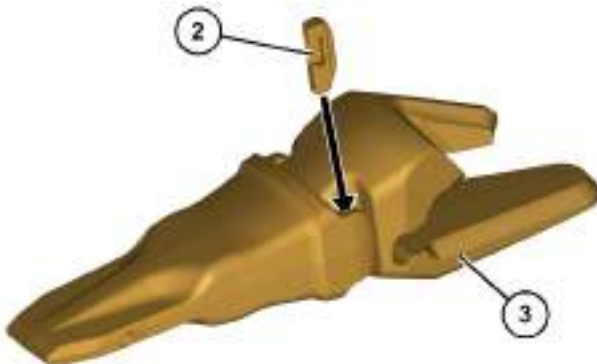


Illustration 459

g06528668

Proper location for installing the retainer

3. The retainer can be installed from the top of the bucket tip or from the bottom of the bucket tip. Use a hammer and a 1 inch X 1 inch X 8 inch steel bar stock to drive retainer (2) into adapter (3).

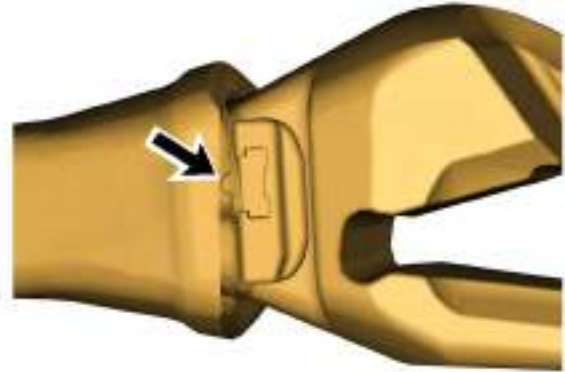


Illustration 460

g06528672

Internal View

The latch of the retainer is properly seated in the recess of the bucket tip.



Illustration 461

g06528674

A properly installed retainer does not extend beyond the ear of the bucket tip.

4. The retainer is properly seated if the retainer can be moved slightly by the technicians hand. If the retainer cannot be moved, adjust the retainer, as needed. The ends of the retainer should not extend beyond the ear of the bucket tip.

J Series GET Bucket Tips**WARNING**

Block the bucket before changing the bucket teeth.

To prevent possible injury to the eyes, wear a protective face shield when striking the pin.

The pin, when struck, can fly out and cause injury to nearby personnel.

Maintenance Section
Bucket Tips - Inspect/Replace

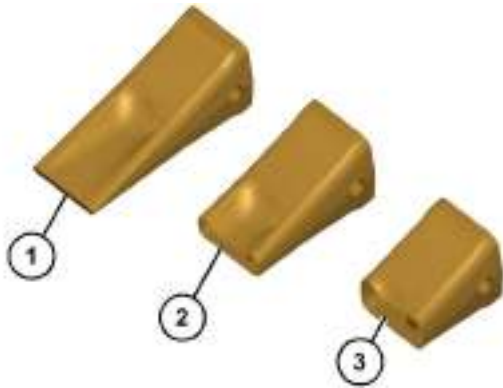


Illustration 462

g06528680

- (1) Usable tip
(2) Replaceable bucket tip
(3) Overworn tip

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

1. Remove the pin from the bucket tip. The pin can be removed by one of the following methods.

- Use a hammer and a punch from the retainer side of the bucket to drive out the pin.
- Use a Pin-Master. Follow Step 1a through Step 1c for the procedure.

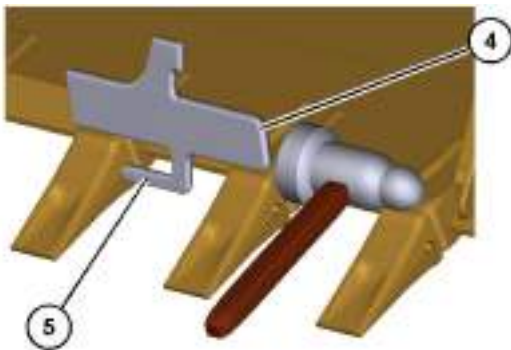


Illustration 463

g06214793

- (4) Back of Pin-Master
(5) Extractor

- Place the Pin-Master on the bucket tip.
- Align extractor (5) with the pin.
- Strike the Pin-Master at the back of the tool (4) and remove the pin.

Note: Discard the old pin and the retainer assembly. When you change tips, use a new pin and a new retainer assembly. Refer to the appropriate parts manual for your machine.

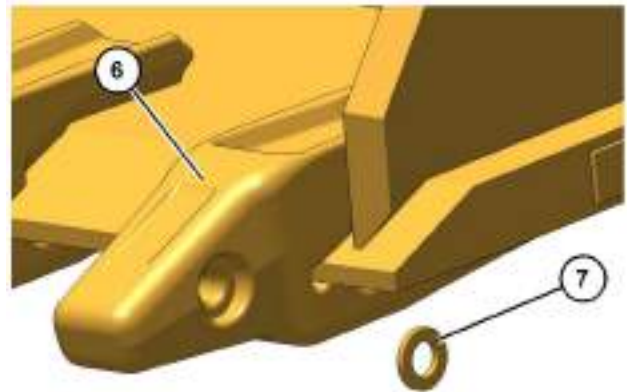


Illustration 464

g06214921

- (6) Retainer assembly
(7) Adapter

2. Clean the adapter and the pin.

3. Fit retainer assembly (6) into the counterbore that is in the side of adapter (7). Make sure that the face of the retainer assembly with the marking "OUTSIDE" is visible.



Illustration 465

g06214795

4. Install the new bucket tip onto the adapter.

Note: The bucket tips can be rotated by 180 degrees to allow the tip to wear evenly. You may also move the tips from the outside teeth to the inside teeth. Check the tips often. If wear is present on the tips, rotate the tips. The outside teeth generate the most wear.

5. Drive the pin through the bucket tip. The pin can be installed by using one of the following methods:

- From the same side of the retainer, drive the pin through the bucket tip, the retainer assembly, and the adapter.
- Use a Pin-Master. Follow Step 5a through Step 5e for the procedure.

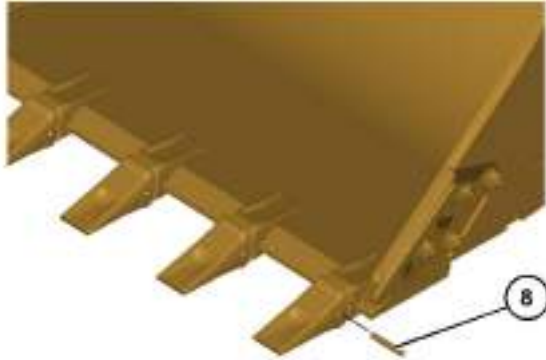


Illustration 466

g06214803

(8) Pin

- Insert pin (8) through the bucket tip.

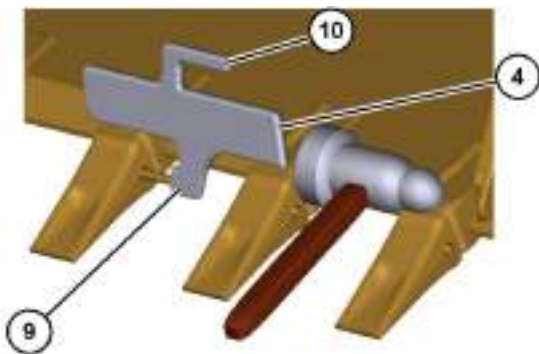


Illustration 467

g06214807

- Place the Pin-Master over the bucket tips so that the pin will fit into the counterbore of the pin holder (9).
- Strike the Pin-Master with a hammer at the back of the tool (4) to insert the pin.
- Slide pin holder (9) away from the pin and rotate the tool slightly to align pin setter (10) with the pin.

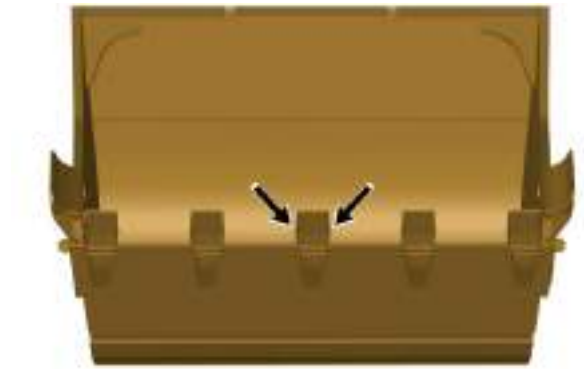


Illustration 468

g06214812

Final assembly of pin into bucket tip

- Strike the end of the tool until the pin is fully inserted.

Bucket Tips (Cat® Advansys) - If Equipped

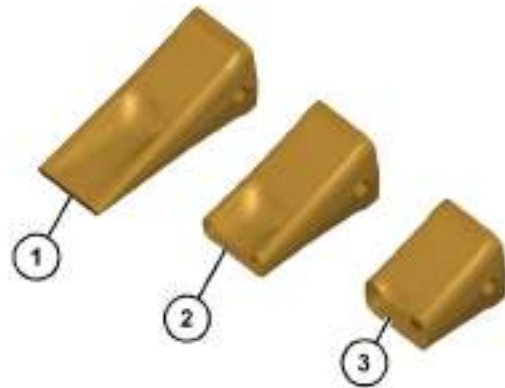


Illustration 469

g06528680

- Usable tip
- Replaceable bucket tip
- Overworn tip

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal

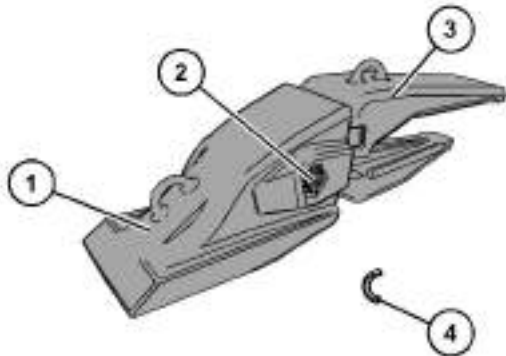


Illustration 470

g06528701

- (1) Bucket Tip
- (2) Retainer
- (3) Adapter
- (4) Compression Sleeve

1. Use a 1/2" ratchet and rotate the retainer (2) 180 degrees to the unlocked position.
2. Remove the bucket tip (1) from adapter (3).
3. Clean adapter (3).

Installation

1. Clean the adapter and the area around the latch, if necessary.
2. Install the new bucket tip (1) onto the adapter (3).

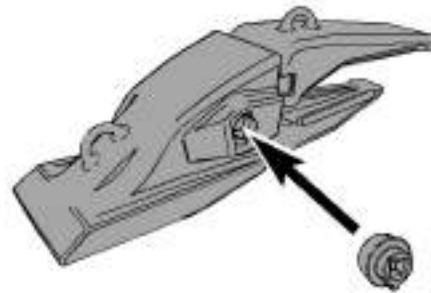


Illustration 471

g06528728

3. Use a 1/2" ratchet to rotate the retainer (2) 180 degrees to the locked position.

Side Cutters

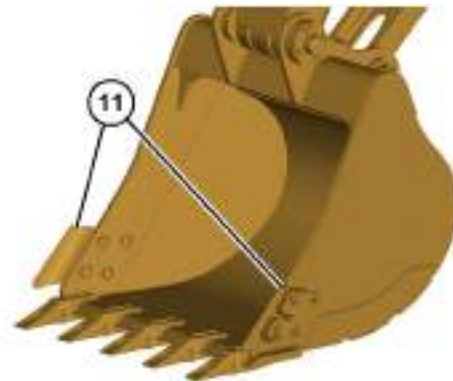


Illustration 472

g06214814

Bucket With Side Cutters

1. Remove the mounting bolts and the side cutters (11).
2. Clean the mounting surface of the side plate on the bucket and of the side cutter. Remove any burrs or protrusions on the mating surfaces.

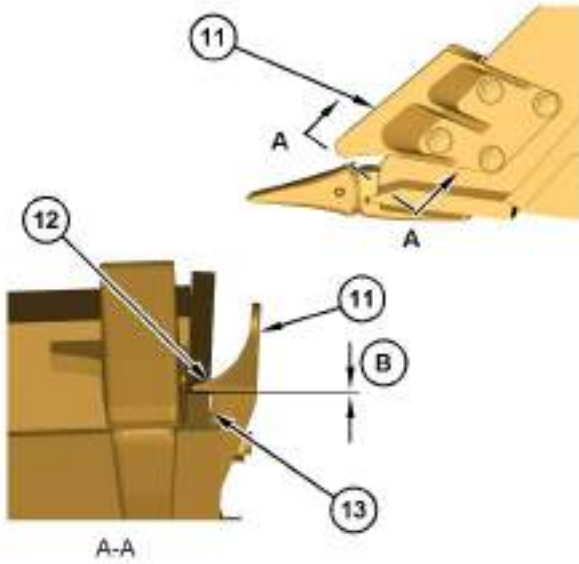


Illustration 473 g06214887

- (12) Shear ledge on a side cutter
- (13) Side plate on a bucket
- (B) 0.0 mm (0.0 inch)

Note: Some side cutters may be rotated for additional wear.

3. Install the side cutter.

Note: Certain bolts may require thread compound.

4. Hand tighten the bolts.

5. Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.

6. Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

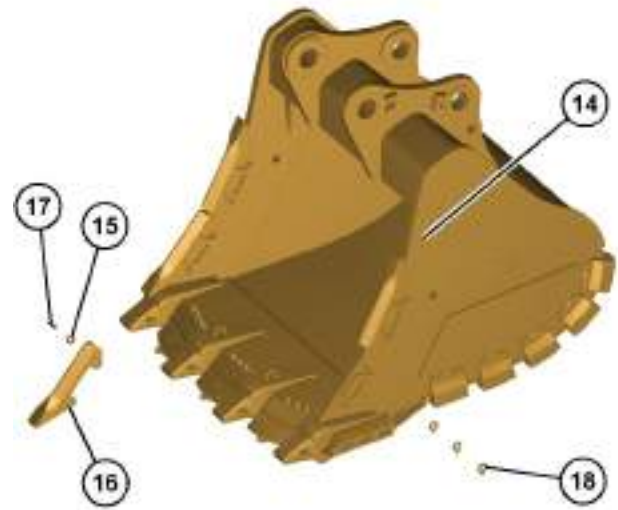


Illustration 474 g06219766

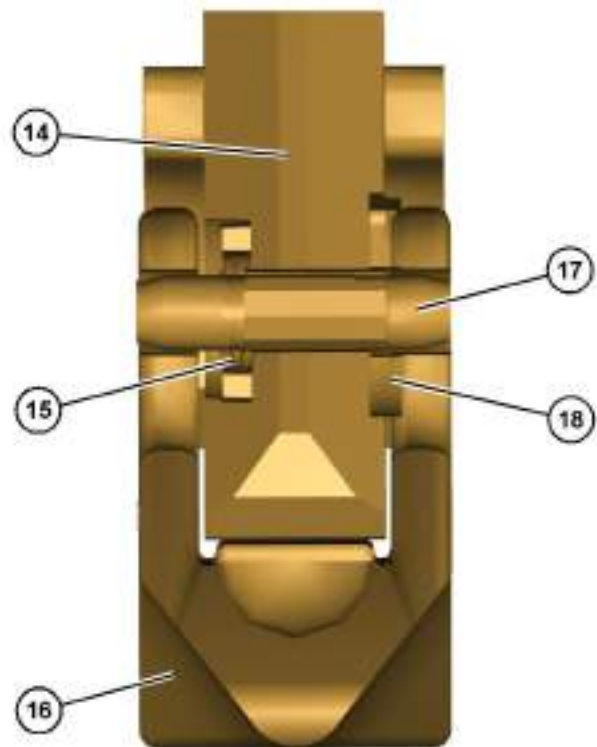


Illustration 475 g06219767

- (14) Side plate
- (15) Retainer
- (16) Side protector
- (17) Pin
- (18) Shim

1. Hit pin (17) from the side of the bucket without the retainer to remove side protector (16) from side plate (14).
2. Clean side protector (16), pin (17), retainer(15), and side plate (14) before installation.

Note: Lateral clearance between the side plate and the side protector should not exceed 1 mm (0.04 inch). Shims (18) may be required to decrease the lateral clearance which will decrease movement. Install the shims between the side plate and the side protector on the opposite side of the retainer.

3. Put retainer (15) in side plate (14).
4. Align two pin holes of the new protector and the side plate. Hit the pin from the retainer side of the bucket.

Note: If the pin and/or the retainer are worn, replace the pin and/or the retainer.

i07092323

Cab Air Filter (Fresh Air) - Clean/Replace

SMCS Code: 7342-070; 7342-510

The cab air filter is on the left side of the cab.

1. Use the ignition key to open the access panel.



Illustration 476

g06182115

2. Remove air filter (1).
3. Tap the air filter to remove the dirt. Do not use compressed air to clean the filter.
4. After you clean the air filter, inspect the air filter. If the air filter is damaged or badly contaminated, use a new air filter.
5. Install the air filter.
6. Close and lock the access panel.

i08002381

Camera - Clean

SMCS Code: 7348-070

WARNING

Failure to use an appropriate external ladder or an appropriate platform for direct access to the rear view camera could result in slipping and falling which could result in personal injury or death. Be sure to use an appropriate external ladder or an appropriate platform for direct access to the rear view camera.

The machine's counterweight and the engine hood are not approved as a maintenance platforms.

WARNING

Unexpected machine movement can cause injury or death.

In order to avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

Note: When you access the camera for cleaning, be sure to observe safe procedures for access. Maintain a three-point contact and/or use a body harness.



Illustration 477

g06396304

The rear view camera is in the top of the counterweight.

If necessary, use a damp cloth to clean the glass of the camera. The camera is sealed. The camera is not affected by a wash with high-pressure spray.

Note: Alternatively, cameras may be cleaned from ground level by using a wash with a high-pressure spray or a damp rag on a wand.



Illustration 478

g06396305

Clean the right side view camera.

i07690750

Condenser (Refrigerant) - Clean

SMCS Code: 1805-070

NOTICE

If excessively dirty, clean condenser with a brush. To prevent damage or bending of the fins, do not use a stiff brush.

Repair the fins if found defective.



Illustration 479

g06395741

1. Open the access door on the left side of the machine. The condenser is located in front of the radiator.

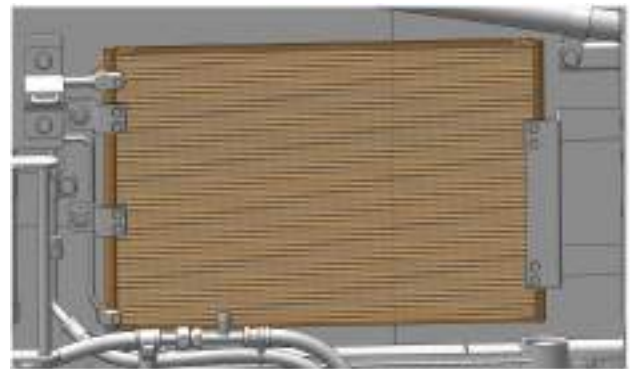


Illustration 480

g06183025

2. Inspect the condenser for debris. Clean the condenser, if necessary.
3. Use clean water to wash off all dust and dirt from the condenser.
4. Close the access door.

i07690487

Cooling System Coolant (ELC) - Change

SMCS Code: 1350-044

WARNING

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

⚠ WARNING

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

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

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

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

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

NOTICE

Do not change the coolant until you read and understand the cooling system information in Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

Failure to do so could result in damage to the cooling system components.

NOTICE

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

Note: This machine was filled at the factory with Cat Extended Life Coolant.

If the coolant in the machine is changed to Extended Life Coolant from another type of coolant, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

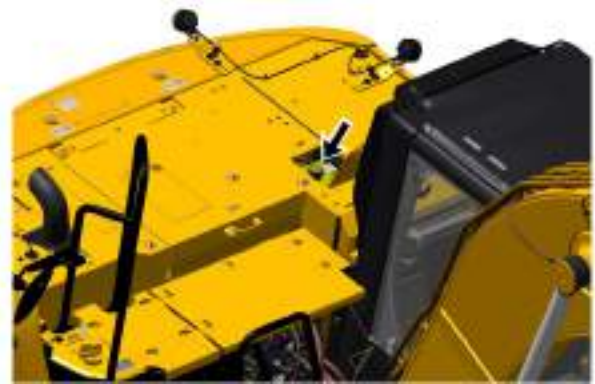


Illustration 481

g06396520

1. Open the access door to the radiator cap.

Slowly loosen the pressure cap that is on the coolant reservoir to release pressure from the cooling system.

2. Remove the pressure cap.
3. Inspect the gasket on the pressure cap. If the gasket is damaged, replace the pressure cap.



Illustration 482

g06395741

4. Open the access door on the left side of the machine.

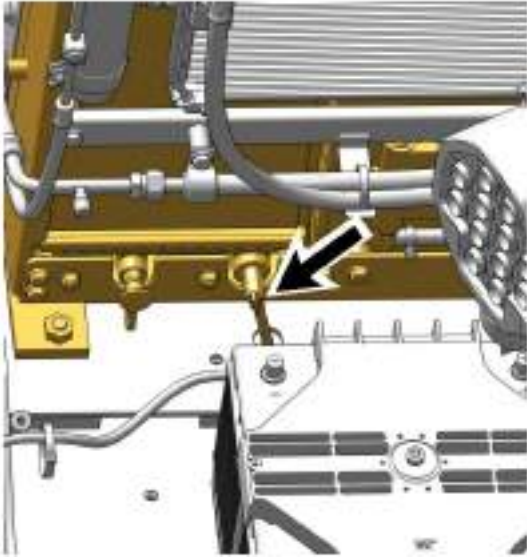


Illustration 483

g06396618

5. Open the drain valve and allow the coolant to drain into a suitable container. The drain valve is on the bottom of the radiator.

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

6. Flush the cooling system. Follow Step 6a through Step 6h to flush the cooling system.

- a. Close the drain valve.
- b. Fill the cooling system with clean water.
- c. Install the pressure cap.
- d. Start the engine and run the engine until the engine reaches operating temperature.
- e. Stop the engine and allow the engine to cool.
- f. Loosen the pressure cap slowly to relieve any pressure in the cooling system.
- g. Open the drain valve that is on the bottom of the radiator and allow the coolant to drain into a suitable container.
- h. Flush the radiator with clean water until the draining water is transparent.

7. Close the drain valve.

8. Add the Extended Life Coolant. Refer to the following topics:

- Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations"

- Operation and Maintenance Manual, "Capacities (Refill)"

9. After the cooling system has been filled, perform the following procedures during initial start-up:

- a. Start the engine without the filler cap.
- b. Run the engine at low idle for 10 minutes.
- c. Then, increase the engine speed to a high idle until the water temperature regulator is open and the coolant level is stabilized.
- d. Maintain the coolant at the proper level as the water temperature regulator opens and air is purged from the system. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check".

10. Install the cooling system pressure cap.

11. Stop the engine.

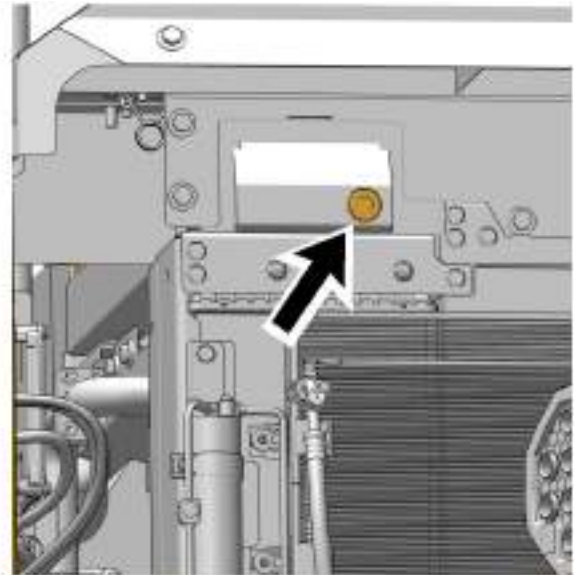


Illustration 484

g06396716

12. Check the coolant reservoir. Maintain the coolant level so that coolant is in the site gauge. If more coolant is needed, see Operation and Maintenance Manual, "Cooling system Coolant Extender (ELC) - Add".

13. If more coolant is necessary, remove the pressure cap and add the appropriate coolant solution.

14. Install the pressure cap.

15. Close the access door to the radiator cap. Close the left access door.

i07690530

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352; 1353; 1395

WARNING

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

WARNING

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

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

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

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

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

Use Cat Extended Life Coolant (ELC) when you add coolant to the cooling system. See Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for all cooling system requirements.

Use a Coolant Conditioner Test Kit to check the concentration of the coolant.

NOTICE

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

Note: This machine was filled at the factory with Cat Extended Life Coolant.

1. Park the machine on level ground.
2. Stop the engine.

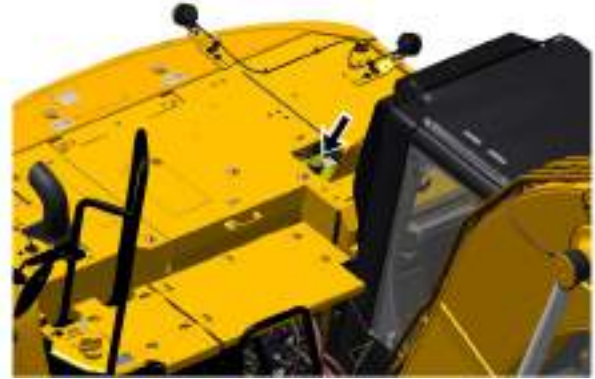


Illustration 485

g06396520

3. Open the access door to the radiator cap.
 - Make sure that the cooling system has cooled down. Loosen the cooling system pressure cap slowly to relieve system pressure. Remove the pressure cap.
- Note:** Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.
4. You may need to drain some coolant from the radiator so that Cat Extender can be added to the cooling system.
 - Note:** Always discard drained fluids according to local regulations.
5. Add Cat Extended Life Coolant (ELC) to the cooling system. Refer to the following topics for the proper amount of Cat Extender:
 - Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations"
 - Operation and Maintenance Manual, "Capacities (Refill)"
6. Inspect the o-ring of the cooling system pressure cap. If the o-ring is damaged, replace the pressure cap.
7. Install the cooling system pressure cap.
8. Close the access door.

i07690737

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV; 1350-040; 1395-535-FLV

WARNING

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

WARNING

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

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

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

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

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

1. Park the machine on level ground.
2. Stop the engine.
3. Open the rear access door on the left side of the machine.

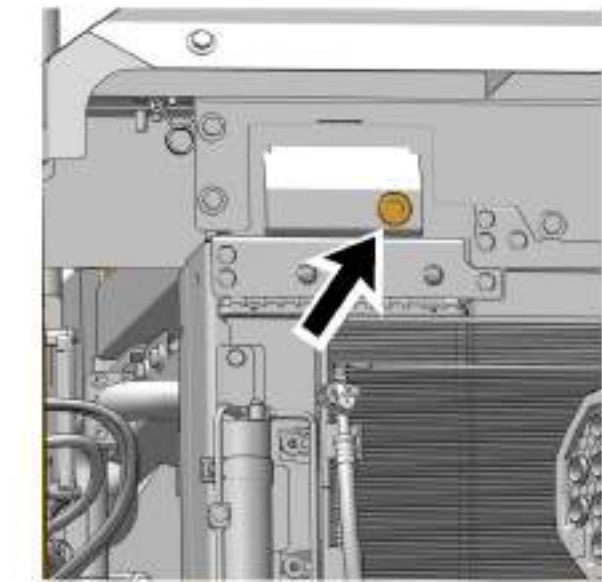


Illustration 486

g06396716

4. Maintain the coolant level so that coolant is in the site gauge. If more coolant is needed, see Operation and Maintenance Manual, "Cooling system Coolant Extender (ELC) - Add".
5. Close the access door.

i08745591

Cooling System Coolant Sample - Obtain

SMCS Code: 1395-554; 1395-008

WARNING

Use caution when servicing a warm machine. Fluids (hydraulic oil, engine oil, transmission fluid, coolant, etc.) can be extremely hot. Severe burns will result from contact with hot fluids.

WARNING

Pressurized System: Hot coolant can cause serious burns. 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.

WARNING

Access to this service point may require climbing on the equipment. Slipping or falling while climbing on the equipment could result in personal injury or death. Refer to the Operation and Maintenance Manual, “Mounting and Dismounting” topic, for safety information.

Prepare the machine for maintenance. Refer to “Prepare the Machine for Maintenance”.

The cooling system coolant should be sampled and monitored with regular frequency. The samples should be analyzed per the following guidelines:

- **Level 1 analysis: Every 250 hours**
- **Level 2 analysis: Every 2000 hours**

Note: It is not necessary to obtain a Coolant Sample (Level 1) if the cooling system is filled with Cat ELC® (Extended Life Coolant). Cooling systems that are filled with Cat ELC only require Level 2 analysis.

Note: Obtain a Coolant Sample (Level 1) if the cooling system is filled with any other coolant instead of Cat ELC. This includes the following types of coolants.

- Commercial long life coolants that meet the Caterpillar Engine Coolant Specification -1 (Caterpillar EC-1)
- Cat® Diesel Engine Antifreeze/Coolant (DEAC)
- Commercial heavy-duty coolant/antifreeze

Note: A level 1 analysis may indicate the need for a Level 2 analysis.

Note: A Level 2 analysis is required after 500 hours of operation for the following reasons:

- The cooling system is new
- The cooling system has been refilled
- The cooling system has been converted to a new coolant

NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

NOTICE

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

Refer to Special Publication, PERJ1017, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

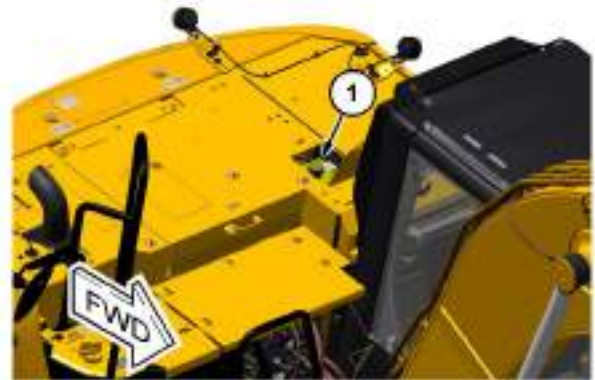


Illustration 487

g06761821

(1) Shunt tank

Use a vacuum pump to obtain a sample from shunt tank (1). Refer to the Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. To receive the full effect of S·O·S analysis, a consistent trend of data must be established. To establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Cat dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample to avoid contamination.
- Never collect samples from expansion bottles.

- Never collect samples from the drain for a system.
Submit the sample for the appropriate analysis.

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

i07686579

Engine Air Filter Primary and/or Secondary Element - Replace

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

Primary Air Filter Element - Replace

NOTICE

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

NOTICE

Service the engine air filter elements only when a message or a warning is displayed on the monitor display. Do not open the filter compartment unless service is indicated. Opening the filter compartment when not necessary to do so increases the chance of dirt contamination in engine air intake system components.

NOTICE

Short air filter life can result if the pre-cleaner system malfunctions. If air filter life is drastically reduced from typical for the operating conditions, consult your Cat dealer.

NOTICE

Do not use the air filter elements longer than 1 year.

The engine air cleaner assembly is located behind the access door on the left side of the machine.

1. Park the machine on a level surface. Stop the engine.



Illustration 488

g06395741

2. Open the access door on the left side of the machine.

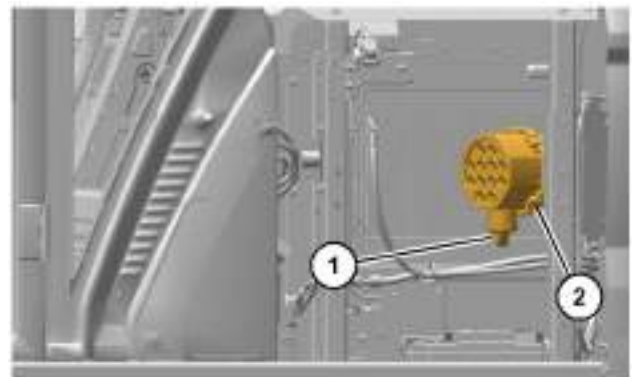


Illustration 489

g06396299

3. Squeeze outlet tube (1) to purge the dirt from the outlet tube.
4. Release latches (2) that secure pre-cleaner (3) to engine air filter housing (6).

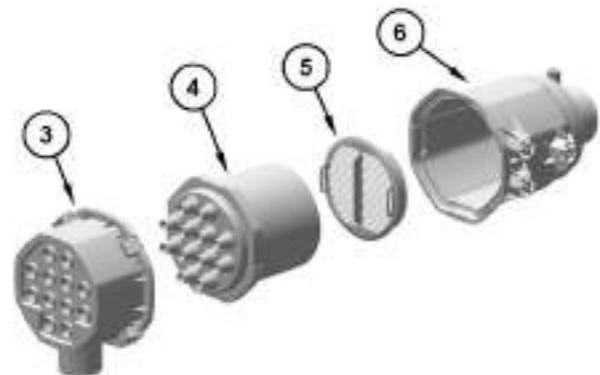


Illustration 490

g06396301

5. Remove pre-cleaner (3).

Maintenance Section

Engine Air Filter Primary and/or Secondary Element - Replace

6. Clean inside the air filter housing where the pre-cleaner was removed.

NOTICE

Caterpillar does not recommend cleaning the primary air filter element. Caterpillar only recommends to replace the primary air filter element. Caterpillar does not cover costs for damage to engine components caused by cleaning the primary air filter element.

Observe the following guidelines if you attempt to clean the primary 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 clean the air filter element more than three times. The air filter element must be replaced if the filter has been in use for one year, regardless of the number of times the filter has been cleaned.

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.

7. Remove primary air filter element (4). Replace the filter element as necessary.

Note: Replace the primary filter if the filter has been in use for 1 year.

8. Clean inside the air filter assembly housing.

Note: Do not allow any dirt or debris to contact the secondary air filter element (5).

9. Inspect the seal area ensure that no foreign debris has fallen into the seal area. Clean the air cleaner interior to remove remaining dust or debris

10. Without removing secondary air filter element (5), inspect the filter element for damage. Replace if necessary or dirty. Refer to Secondary Air Filter Element - Replace.

11. Install the secondary air filter element.

12. Install the primary filter.

Note: Filters must be fully installed before the pre-cleaner can be attached. If the pre-cleaner cannot be fully latched, verify that the filter elements are properly seated.

13. Install the pre-cleaner and secure the latches that hold the pre-cleaner to the air filter housing.

14. Close the access door.

Secondary Air Filter Element - Replace

NOTICE

Always replace the secondary element. Do not attempt to reuse it by cleaning. Engine damage could result.

NOTICE

Do not use the air filter elements longer than 1 year.

NOTICE

Replace the secondary filter element when you service the primary element for the third time. If a clean primary element has been installed and the filter element indicator is still flashing, replace the secondary filter element. Also if the exhaust smoke remains black and a clean primary filter element has been installed, replace the secondary filter element.

-
1. Open the access door on the left side of the machine.
 2. Refer to the section "Primary Air Filter Element - Replace". Remove the pre-cleaner from the engine air filter housing. Remove the primary air filter element from the air filter housing.

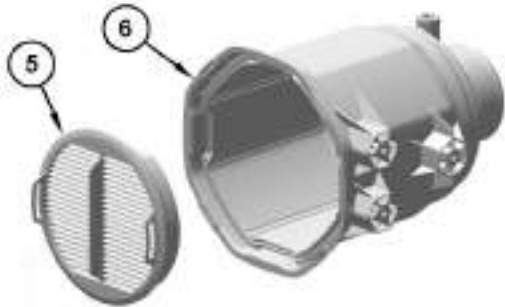


Illustration 491

g06396302

3. Secondary air filter element (5) is pressed into the rear portion of engine air filter housing (6). Pull forward on the secondary air filter element to remove the element from the engine air filter housing.
 4. Cover the air inlet opening. Clean inside the air cleaner housing.
 5. Clean all surfaces of the pre-cleaner cover and body.
 6. Uncover the air inlet opening.
 7. Carefully press the secondary air filter element into the rear portion of the engine air filter housing.
- Note:** Be certain that the new secondary air filter element is properly seated in the filter housing. Also, check to see that no damage to the filter element has occurred during installation.
8. Install the primary air filter element and the pre-cleaner.
 9. Close the access door.

i09703359

Engine Oil Level - Check

SMCS Code: 1000-535

WARNING

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

NOTICE

Do not overfill the crankcase. Engine damage can result.

In addition to an engine oil dipstick, your machine may be equipped with an automated system for checking fluid levels. Refer to Operation and Maintenance Manual, "Engine Starting" for information regarding the automated system. If the machine is on an incline or the engine has been stopped only for a short time, all engine oil may not be in the crankcase. The fluid level cannot be properly checked by either method during these instances. Park the machine on level ground. The engine oil level can be checked after the engine has been stopped for at least 30 minutes. Do not check the oil level while the engine is running.

The machine is equipped with a ground level dipstick and a dipstick on top of the engine.



Illustration 492

g06395646

1. Open the access door on top of the machine.

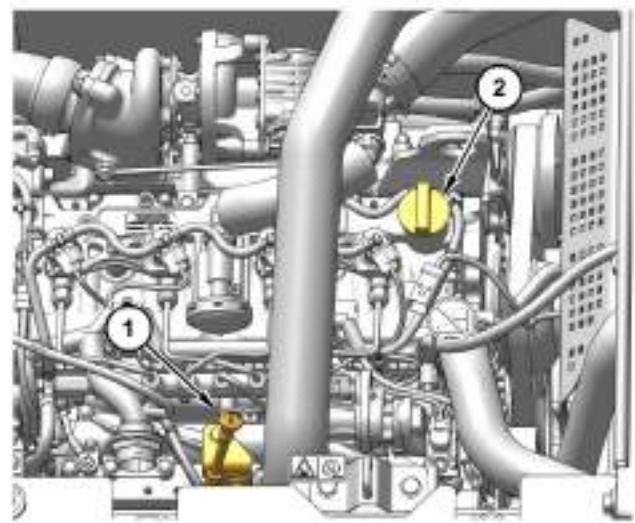


Illustration 493

g06499079

2. Remove dipstick (1). Wipe the oil off the dipstick and reinsert the dipstick.



Illustration 494

g06183475

- Remove the dipstick and check the dipstick. The oil level should be between the "L" mark and the "H" mark.

NOTICE

Operating your engine when the oil level is above the "H" mark could cause the crankshaft to dip into the oil. This could lead to excessively high oil temperatures which can reduce the lubricating characteristics of the oil, lead to bearing damage, and could result in loss of engine power.

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

- Remove oil filler plug (2) to add oil, if necessary. See Operation and Maintenance Manual, "Lubricant Viscosities".

Note: If the oil is deteriorated or badly contaminated, change the oil regardless of the maintenance interval.

- Clean the oil filler plug. Install the oil filler plug.
- Close the access door.

Ground Level Dipstick



Illustration 495

g06395150

Typical Example

To access the ground level dipstick, open the right access door.

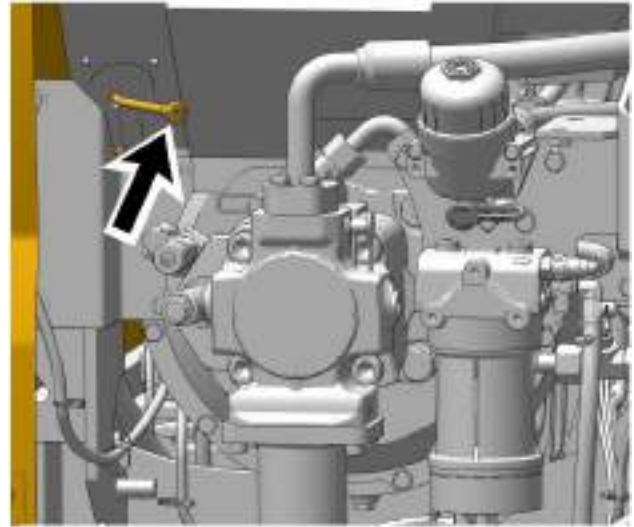


Illustration 496

g06395743

The ground level dipstick is located near the engine oil filter and main hydraulic pump.

i07686041

Engine Oil Sample - Obtain

SMCS Code: 1000-008; 1000; 1348-554-SM; 1348-008; 7542-554-OC; 7542-554-SM; 7542-008

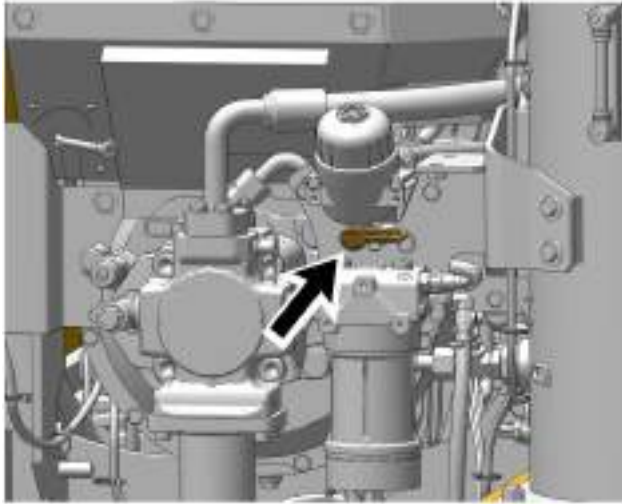


Illustration 497

g06395749

Obtain a sample of the engine oil from the engine oil sampling valve that is located on the engine oil filter housing. Refer to Special Publication, SEBU6250, "S-O-S Oil Analysis" for information that pertains to obtaining a sample of the engine oil. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining a sample of the engine oil.

i08779300

Engine Oil and Filter - Change

SMCS Code: 1318-510

WARNING

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

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

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

WARNING

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

WARNING

Access to this service point may require climbing on the equipment. Slipping or falling while climbing on the equipment could result in personal injury or death. Refer to the Operation and Maintenance Manual, "Mounting and Dismounting" topic, for safety information.

WARNING

Crush Hazard!

Machine access doors can pinch, trap, or crush personnel when being closed.

Use caution while closing machine access doors. Ensure that all personnel are clear of the machine before closing the access doors.

NOTICE

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

Refer to Special Publication, PERJ1017, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat[®] products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

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

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

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

NOTICE

When operating in any of the conditions or environments outlined in this Operation and Maintenance Manual, Severe Service Application, use S·O·S Services oil analysis to determine the best oil and filter change interval.

When S·O·S Services are not used in severe service applications, the oil and filter change interval should be every 250 hours..

If you select an interval for oil and filter change that is too long, you may damage the engine.

Reference: Operation and Maintenance Manual, "Lubricant Viscosities"

Reference: Operation and Maintenance Manual, "Maintenance Interval Schedule"

Reference: Operation and Maintenance Manual, "Severe Service Application"

Reference: Operation and Maintenance Manual, "S·O·S Information"

Use the table below to determine the appropriate oil and filter change interval.

Prepare the machine for maintenance. Refer to "Prepare the Machine for Maintenance".

Procedure for Changing Engine Oil and Filter

WARNING

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

Note: If the sulfur content in the fuel is greater than 1.5 percent by weight, use an oil that has a TBN of 30 and reduce the oil change interval by one-half.

Note: Drain the crankcase while the oil is warm. This allows waste particles that are suspended in the oil to drain. As the oil cools, the waste particles will settle to the bottom of the crankcase. The particles will not be removed by draining the oil and the particles will recirculate in the engine lubrication system with the new oil.

1. Park the machine on a level surface. Stop the engine. Refer to "Stopping the Engine".

Note: Refer to "General Hazard Information" for information on Containing Fluid Spillage.



Illustration 498

g06771372

(1) Crankcase drain valve

2. Open crankcase drain valve (1). Allow the oil to drain into a suitable container.

Note: Discard any drained fluids according to local regulations.

3. Close crankcase drain valve (1).



Illustration 499

g06395150

4. Open the access door at the right side of the machine. Refer to Operation and Maintenance Manual, "Access Door and Cover Locations".

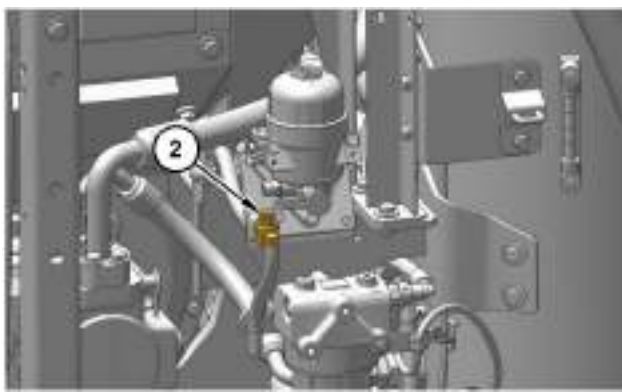


Illustration 500

g06771377

(2) Drain valve

5. Loosen drain valve (2) and allow the oil to drain out of the housing.
6. After all the oil has been removed, tighten drain valve (2).
7. Remove the oil filter housing. Refer to "Oil Filter - Inspect". Dispose of the used filter according to local regulations.

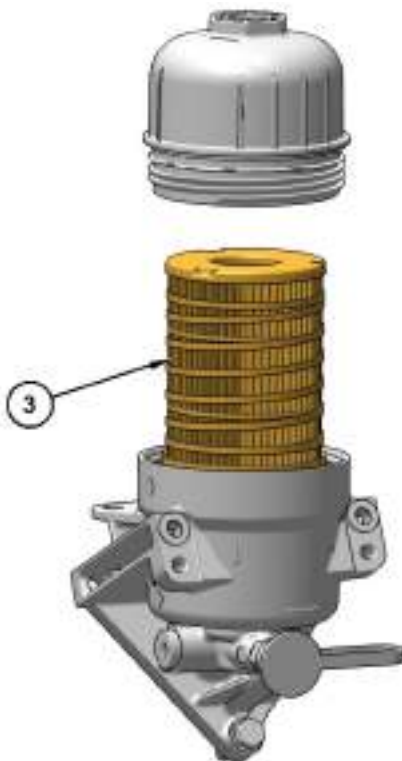


Illustration 501

g06771378

(3) Oil filter element

8. Remove oil filter element (3) from the housing.

9. Clean the filter housing and the base.
10. Install the new oil filter element (3) into the housing.
11. Apply a thin coat of engine oil to the gasket of oil filter.
12. Install the engine oil filter by hand until the filter housing contacts the base.
Tighten the filter housing to a torque of 24 N·m (212 lb in).
13. Close the access door. Refer to Operation and Maintenance Manual, "Access Door and Cover Locations".



Illustration 502

g06395646

Typical example

14. Open the access door on top of the machine. Refer to Operation and Maintenance Manual, "Access Door and Cover Locations".

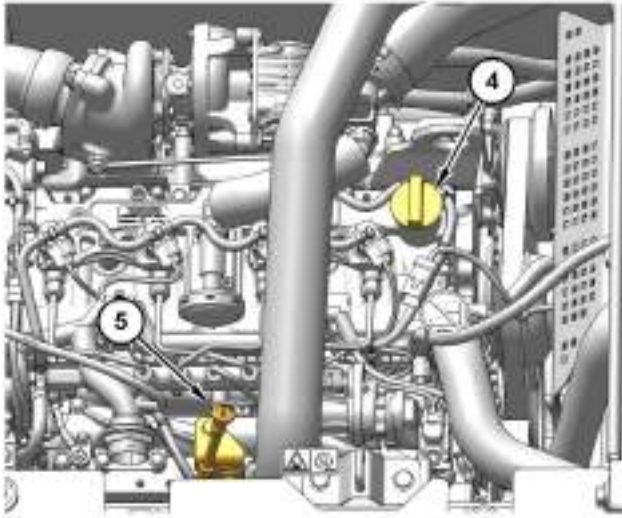


Illustration 503

g06771381

- (4) Oil filler cap
 (5) Oil level gauge

- 15.** Remove oil filler cap (4). Fill the crankcase with new oil. Refer to Operation and Maintenance Manual, “Capacities (Refill)”. Clean oil filler cap (4) and install oil filler cap (4).

NOTICE

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

- 16.** Start the engine and allow the oil to warm. Check the engine for leaks. Stop the engine. Refer to Operation and Maintenance Manual, “Stopping the Engine”.



Illustration 504

g06183475

- 17.** Wait for 30 minutes to allow the oil to drain back into the crankcase. Check the oil level with oil level gauge (5). Maintain the oil between the “L” and “H” marks on oil level gauge (5). If necessary, add oil.

- 18.** Close the access door. Refer to Operation and Maintenance Manual, “Access Door and Cover Locations”.

i07786001

Film (Product Identification) - Clean

SMCS Code: 7405-070; 7557-070



Illustration 505

g06435629

Cleaning of the Films

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

Hand Washing

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

Power Washing

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

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

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

- Use a spray nozzle with a wide spray pattern.
- A maximum pressure of 83 bar (1200 psi)
- A maximum water temperature of 50° C (120° F)
- Hold the nozzle perpendicular to the product identification film at a minimum distance of 305 mm (12 inch).
- Do not direct a stream of water at a sharp angle to the edge of the product identification film.

i06969803

Final Drive Oil - Change

SMCS Code: 4050-044-FLV

WARNING

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

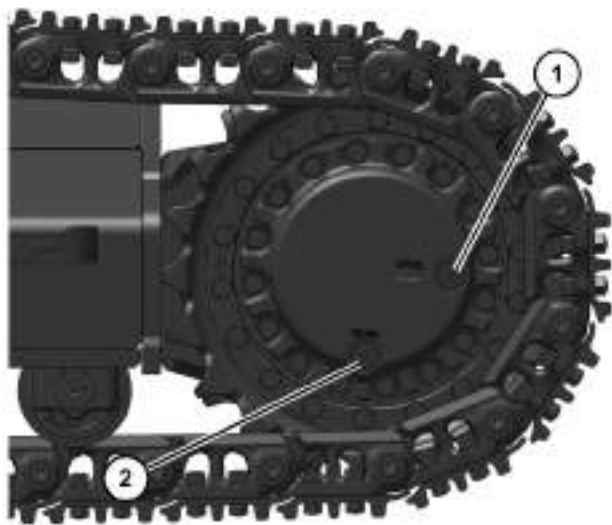


Illustration 506

g06182944

- (1) Oil level plug
- (2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

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

2. Remove drain plug (2) and level plug (1). Allow the oil to drain into a suitable container.
3. Clean the plugs and inspect the O-ring seals. If wear or damage is evident, replace the drain plug, the level plug, and/or the O-ring seals.
4. Install drain plug (2).
5. Fill the final drive to the bottom of the opening on level plug (1). See Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill)”.

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

6. Install level plug (1).
7. Perform Step 1 to Step 6 on the other final drive. Use a different container for the oil so that the oil samples from the final drives will be separate.
8. Completely remove the oil that has spilled onto surfaces.
9. Start the machine and allow the final drives to run through several cycles.
10. Stop the machine. Check the oil level.
11. Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Cat dealer.
12. Properly dispose of the drained material. Obey local regulations for the disposal of the material.

i06969810

Final Drive Oil Level - Check

SMCS Code: 4050-535-FLV

WARNING

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

i06969816

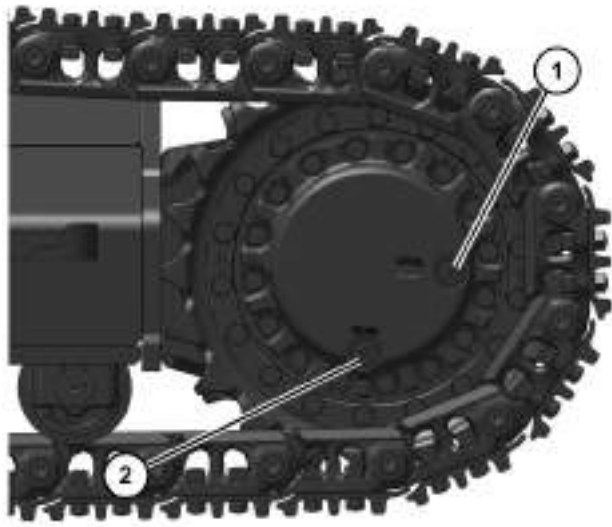


Illustration 507

g06182944

- (1) Oil level plug
(2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

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

2. Remove oil level plug (1).
3. Check the oil level. The oil should be near the bottom of the level plug opening.
4. Add oil through the level plug opening, if necessary. See Operation and Maintenance, "Lubricant Viscosities".

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

5. Clean oil level plug (1). Inspect the O-ring seal. Replace the O-ring seal if the O-ring seal is worn or damaged.
6. Install oil level plug (1).
7. Repeat the procedure for the other final drive.

Final Drive Oil Sample - Obtain

SMCS Code: 4011-008; 4050-SM; 4050-008; 7542-008

WARNING

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

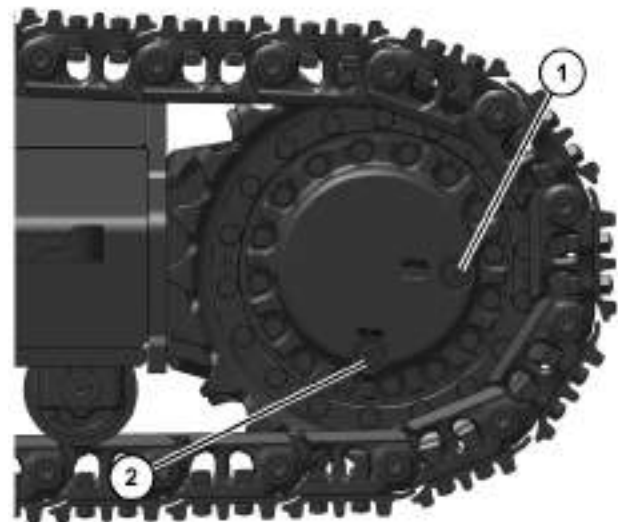


Illustration 508

g06182944

- (1) Oil level plug
(2) Oil drain plug

1. Position the final drive so that oil drain plug (2) is at the bottom.

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

2. Remove oil level plug (1).
3. Obtain a sample of the final drive oil through the hole for the oil level plug.
4. Install oil level plug (1).

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "S·O·S Oil Analysis" for more information on obtaining a sample of the final drive oil. For additional information about taking an oil sample, refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample".

i06674757

Fuel System - Prime

SMCS Code: 1250-548



Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

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

Refer to Special Publication, PERJ1017, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not loosen the fuel lines at the fuel manifold. The fittings may be damaged and/or a loss of priming pressure may occur when the fuel lines are loosened.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over disconnected fuel system component.

Prime the fuel system in order to fill the fuel filter, and prime the fuel system in order to purge trapped air. The fuel system should be primed under the following conditions:

- The fuel tank is running low.
 - The machine has been stored.
 - The fuel filter is being replaced.
1. Turn the engine start switch to the ON position. Leave the engine start switch in the ON position for 2 minutes.
 2. Verify that the water separator is full of fuel.
 3. If the water separator is not full of fuel, turn the engine start switch OFF and then turn the engine start switch ON. Turning the engine start switch off and on will cycle the fuel priming pump again.

4. When the water separator is full of fuel, attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate at low idle until the engine is running smoothly. If the engine cannot be started, or if the engine continues to misfire or smoke, repeat Step 1.

i08022547

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1263-510-FQ



Personal injury or death may result from failure to adhere to the following procedures.

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

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

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

NOTICE

Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

The primary filter/water separator is located behind the access door on the right side of the machine.

Maintenance Section
 Fuel System Primary Filter (Water Separator) Element - Replace



Illustration 509

g06394899



Illustration 510

g06516051

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



Illustration 511

g06497195

2. Close the fuel shutoff valve.

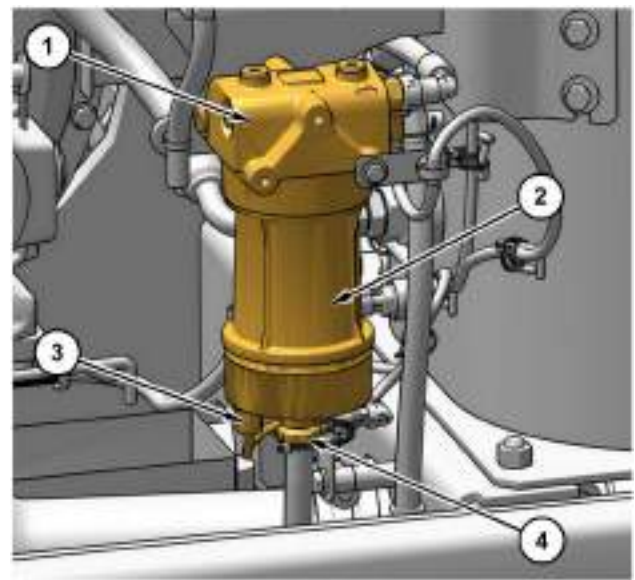


Illustration 512

g06516057

Primary filter water separator

- (1) Filter base
- (2) Filter housing
- (3) Sensor
- (4) Drain valve

3. Turn drain valve (4) counterclockwise to open. The drain valve is on the bottom of the water separator.

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

4. Drain the water and the sediment into a suitable container.

Note: Dispose of used fluids according to local regulations.

5. Close the drain valve (4).

6. Disconnect the water sensor (3) from the harness.

Note: Do not attempt to remove the sediment bowl from the housing. The sediment bowl is permanently attached to the housing. Attempting to remove the sediment bowl may damage the bowl.

7. Unscrew filter housing (2) and remove primary filter. A filter wrench may be used to loosen the filter housing. Properly discard the used filter.

8. Clean the mounting base (1).

9. Lubricate the seal of the new filter with clean diesel fuel.

10. Install the new filter into the housing.

11. Tighten the filter housing approximately 1/6 of a turn. Do not use tools to tighten the filter housing to the filter base.
12. Ensure that sensor (3) is in the correct position and connect to the wiring harness. If the sensor was removed from the bowl, install the sensor and tighten to $2.5 \pm 0.5 \text{ N}\cdot\text{m}$ ($22 \pm 4 \text{ lb in}$).
13. Open the fuel shutoff valve.
14. Close the access door.

i08022560

Fuel System Water Separator - Drain

SMCS Code: 1263

NOTICE

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

Refer to Special Publication, PERJ1017, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.



Illustration 513

g06395732

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

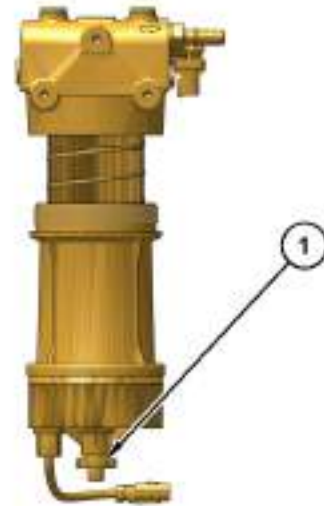


Illustration 514

g06515742

(1) Drain valve

2. Open drain valve (1) on the bottom of the fuel/water separator element. Drain the water into a suitable container.
3. Close the drain valve when all the water has been drained.

Note: When water is not drained from the primary filter sufficiently, water will collect in the secondary fuel filter. Trapped water will eventually overflow. Draining water from the secondary fuel filter will prevent water damaging the fuel system. The procedure for the secondary filter is the same as the primary filter.

4. Close the access door.

i08187518

Fuel Tank Cap Filter - Replace

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

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

i06969894

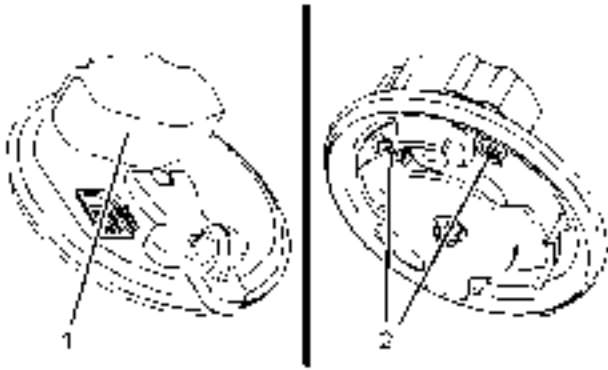


Illustration 515

g02612539

2. Remove the fuel cap.
3. Remove filter element screws (2) from the underside of the fuel cap and remove old filter element (1).
4. Wash the fuel tank cap in a clean, nonflammable solvent.
5. Install a new fuel cap filter element.
6. Install filter element screws (2) to secure filter element (1) to the fuel cap.
7. Install the fuel tank cap

Fuel Tank Strainer - Clean

SMCS Code: 1273-070-STR

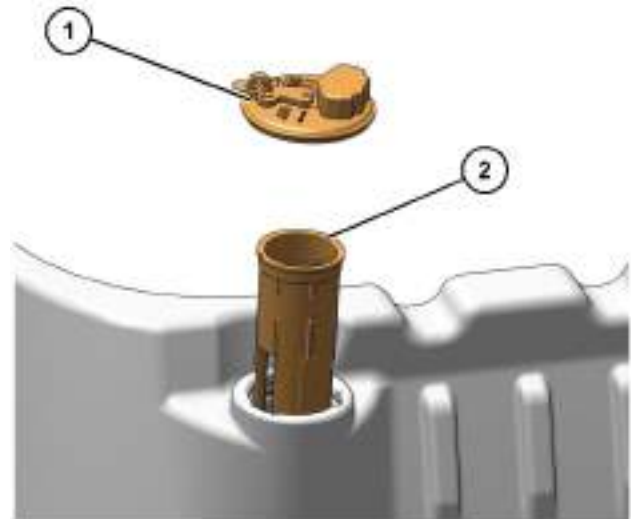


Illustration 516

g06183008

1. Remove fuel tank cap (1).
2. Remove strainer (2) from the filler opening.
3. Wash the strainer in a clean, nonflammable solvent.
4. Install the strainer into the filler opening.
5. Install the fuel tank cap.

i06954978

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543

The drain valve for the fuel tank is located in the right compartment.

i08286501



Illustration 517

g06182545

1. Open the right compartment door.

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

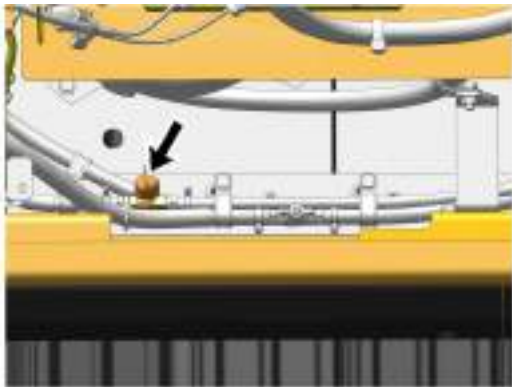


Illustration 518

g06182139

2. Open the drain valve by turning the valve counterclockwise. Allow the water and the sediment to drain into a suitable container.

Note: Dispose of drained fluids according to local regulations.

3. Close the drain valve by turning the valve clockwise.
4. Close the compartment door.

Fuses - Replace

SMCS Code: 1417-510

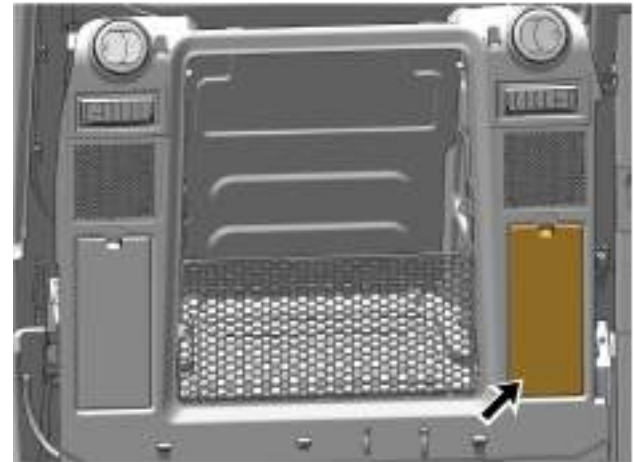


Illustration 519

g06181624

The fuse panel is on the left side of the interior storage box. Remove the cover to access the fuses.



Fuses – Fuses protect the electrical system from damage that is caused by overloaded circuits. Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and/or repair the circuit.

NOTICE

Always replace fuses with the same type and capacity fuse that was removed. Otherwise, electrical damage could result.

NOTICE

If it is necessary to replace fuses frequently, an electrical problem may exist.

Contact your Cat dealer.

To replace a fuse, use the puller that is stored in the fuse panel.

The following list identifies the circuits that are protected by each fuse. The amperage for each fuse is included with each circuit.

- (14) Hydraulic Lockout – 5 Amp
- (15) Keep Alive System Relay – 5 Amp
- (16) Spare – 10 Amp
- (17) Spare – 10 Amp
- (18) Quick Coupler – 10 Amp
- (19) 24V Auxiliary Circuit – 15 Amp
- (20) 24V Auxiliary Circuit – 20 Amp
- (21) Spare – 25 Amp
- (22) Display and ET Connector – 10 Amp
- (23) Body Control Module, PTS, and MSS – 15 Amp
- (24) Advanced Diesel Engine Management – 30 Amp
- (25) Cab, Chassis, Dome, and Rear Lights – 15 Amp
- (26) Primary Electronic Control Module – 15 Amp
- (27) Secondary Electronic Control Module – 15 Amp
- (28) Boom Lamp – 10 Amp
- (29) Spare – 25 Amp
- (30) Network Manager – 5 Amp
- (31) Air Conditioner and Heater Blower – 20 Amp
- (32) Horn – 10 Amp
- (33) Spare – 15 Amp
- (34) Spare – 15 Amp
- (35) Spare – 10 Amp
- (36) Cat Grade Control – 15 Amp
- (37) Fuel Lifting Pump – 5 Amp
- (38) Spare – 25 Amp
- (39) Auxiliary Circuit – 10 Amp
- (40) Spare – 30 Amp

Relays

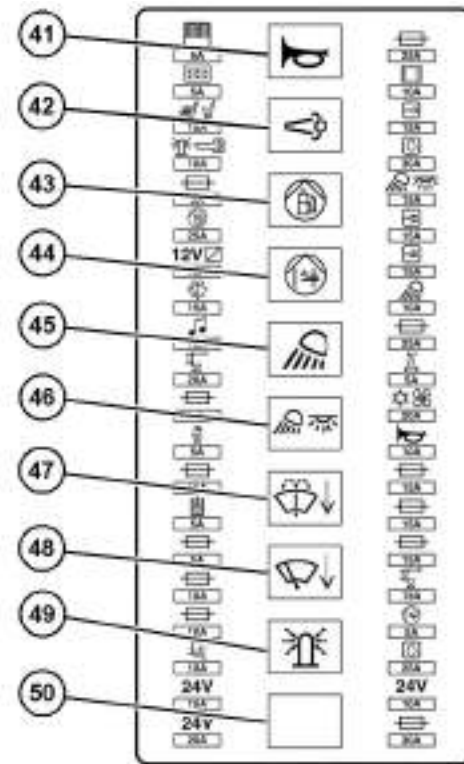


Illustration 521

g06611354

- (41) Horn – Relay
- (42) Spare – Relay
- (43) Electric Refueling Pump – Relay
- (44) Lifting Pump – Relay
- (45) Boom Light – Relay
- (46) Cab, Chassis, Dome, and Rear Lights – Relay
- (47) Lower Washer – Relay
- (48) Lower Wiper – Relay
- (49) Caution and Beacon Lamp – Relay
- (50) Spare – Relay

Power Fuse Module

i07956151



Illustration 522

g06514857

The power fuse module is located behind the rear access door on the left side of the machine. Remove the cover to access the fuses.

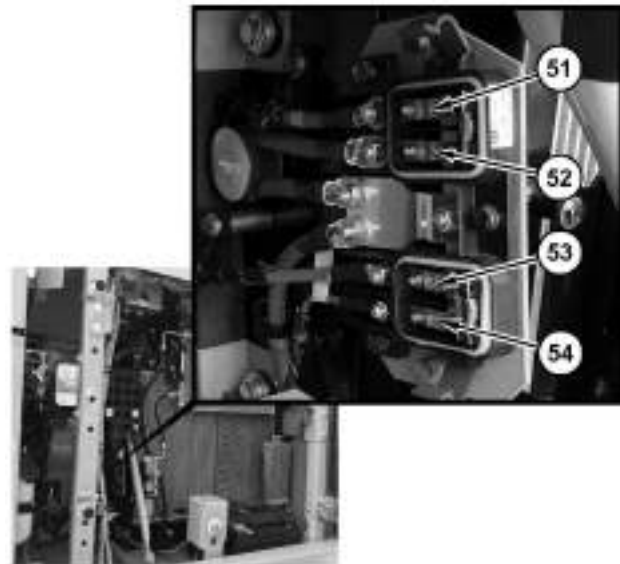


Illustration 523

g06514833

(51) Electric Fan – 125 Amps

(52) Alternator Circuit – 150 Amps

(53) Machine Circuit – 100 Amps

(54) Glow Plug Circuit – 50 Amps

Hydraulic System Oil - Change

SMCS Code: 5056-044

Cat HYDO Advanced 10 Oil Change Interval

The standard Cat HYDO Advanced 10 oil change interval is every 6000 service hours or 3 years. But a 6000 service hour or 3-year maintenance interval for hydraulic oil (change) is strongly recommended with S·O·S monitoring of the hydraulic oil after 3000 service hours. The interval for S·O·S monitoring is every 500 hours. The Oil change is strongly recommended when the oil deterioration or contamination is detected. The maintenance interval for the hydraulic oil filter is not changed.

Machines with hammers are not included in the 6000 service hour or 3-year maintenance interval. Machines with hammers must use the intervals that are listed in the Maintenance Interval Schedule. Machines that are used in severe conditions are not included in the 6000 service hour or 3-year maintenance interval. Machines that are used in severe conditions must use the interval in the Maintenance Interval Schedule.

Hydraulic Hammer Use

The use of hydraulic hammers shortens the life of hydraulic oil. If a hydraulic hammer is used, the maintenance interval is shortened, refer to Table 45 for the intervals.

Table 45

Percentage of Hammer Use	Hydraulic System Oil - Change
50%	Every 1000 service hours
100%	Every 600 service hours

Procedure to Change the Hydraulic Oil

WARNING

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

NOTICE

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

Refer to Special Publication, PERJ1017, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.

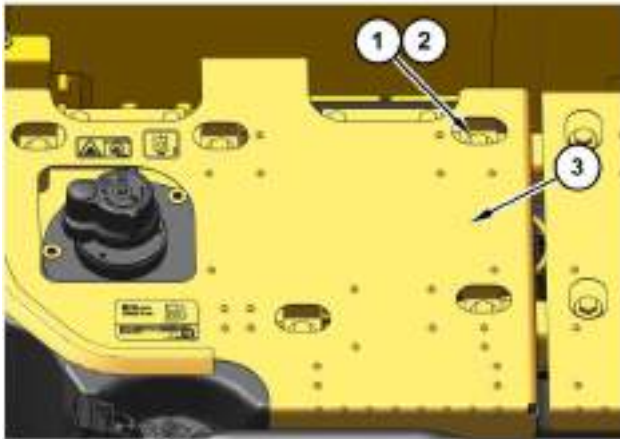


Illustration 524

g06396534

2. Remove five bolts (1) and washers (2). Remove cover (3) from the top of the hydraulic tank.

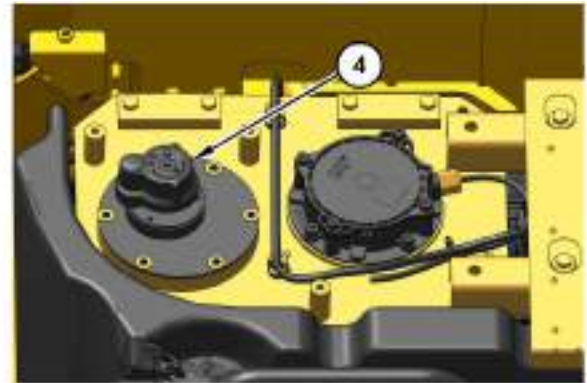


Illustration 525

g06396544

3. Clean the area thoroughly to keep dirt out of the screen cover and filler cap (4).

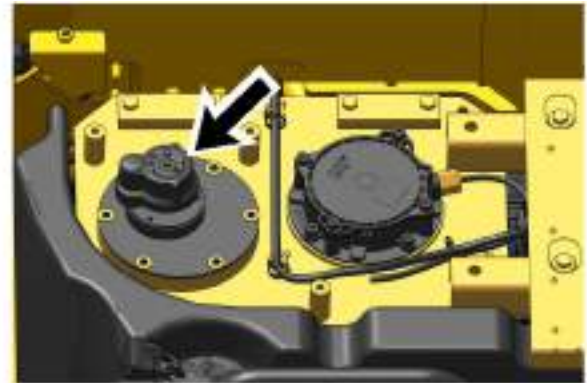


Illustration 526

g06396539

Hydraulic tank filler cap location

**WARNING****Pressurized system!**

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off. Relieve pressure by slowly turning the cap until the cap reaches the secondary stop.

Maintenance Section
Hydraulic System Oil - Change

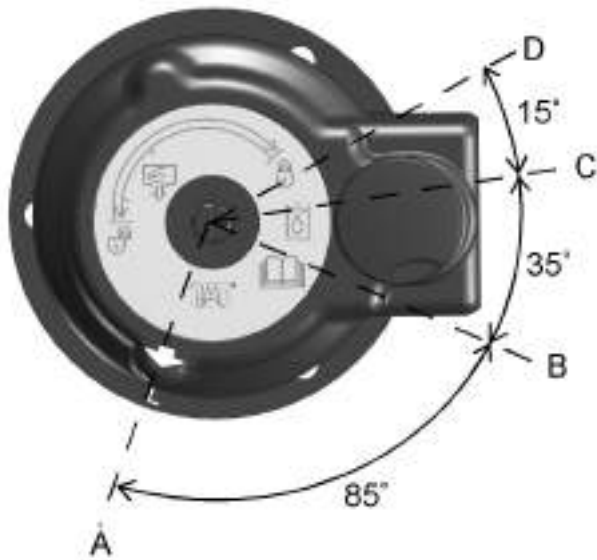


Illustration 527

g06184990

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

4. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 527 for filler cap positions.
 - a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
 - b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, tighten the filler cap.



Illustration 528

g06182179

5. Remove the hydraulic tank access cover that is located under the upper structure. Removing the cover will allow access to the drain plug.

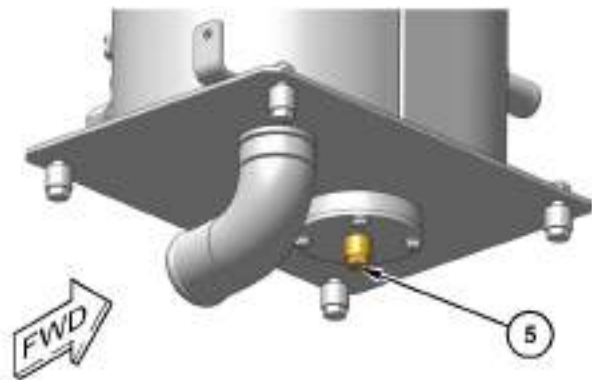


Illustration 529

g06511093

(5) Plug

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

6. Remove plug (5).
 7. Inspect the O-ring. Replace the O-ring if wear or damage is evident.
 8. Drain the oil into a suitable container.
- Note:** Dispose of used fluids according to local regulations.
9. After the oil has been drained, clean drain plug (5) and install. Tighten the plug to $68 \pm 7 \text{ N}\cdot\text{m}$ ($50 \pm 5 \text{ lb ft}$).
 10. Open the access door on the right side of the machine.
 11. Clean the pump, the hydraulic lines, and the hydraulic tank.

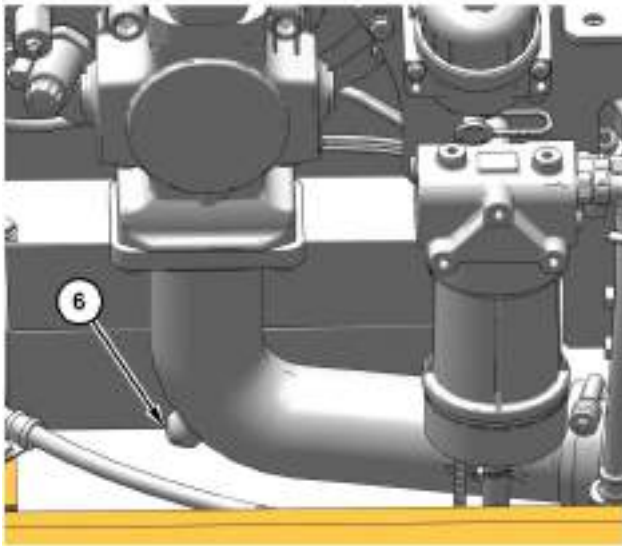


Illustration 530

g06396547

- 12. Remove plug (6) from the tube. Allow the oil to drain into a container.
- 13. Inspect the O-ring. Replace the O-ring if wear or damage is evident.
- 14. Clean the plug. Install the plug and the O-ring into the drain port.

Hydraulic Tank Screen - Clean

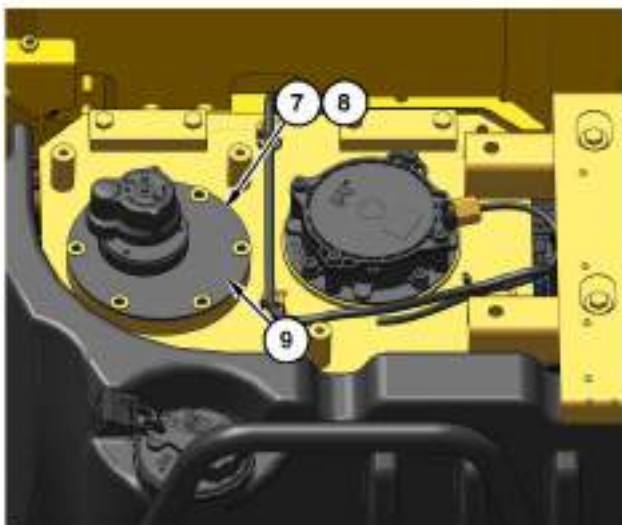


Illustration 531

g06396553

- (7) Bolts
- (8) Washers
- (9) Cover

- 1. Remove bolts (7), washers (8), and cover (9).

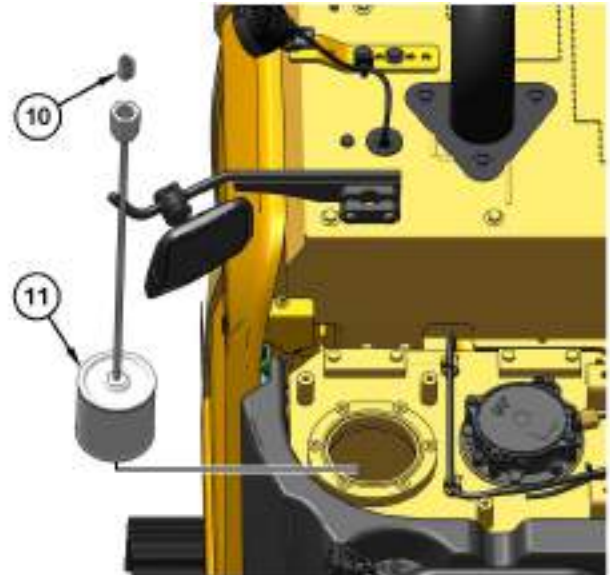


Illustration 532

g06396566

- (10) Spring
- (11) Screen

- 2. Remove spring (10) and screen (11).

Note: Do not allow spring (10) to fall back into the tank.

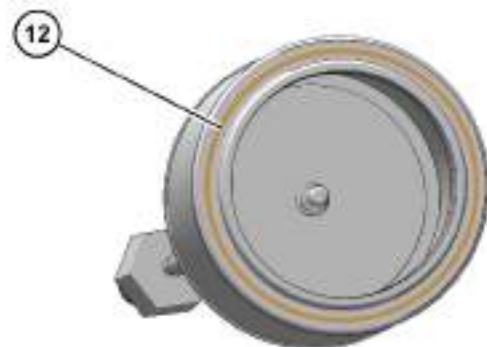


Illustration 533

g06182515

- (12) O-ring seal

- 3. Remove O-ring seal (12) from the screen.

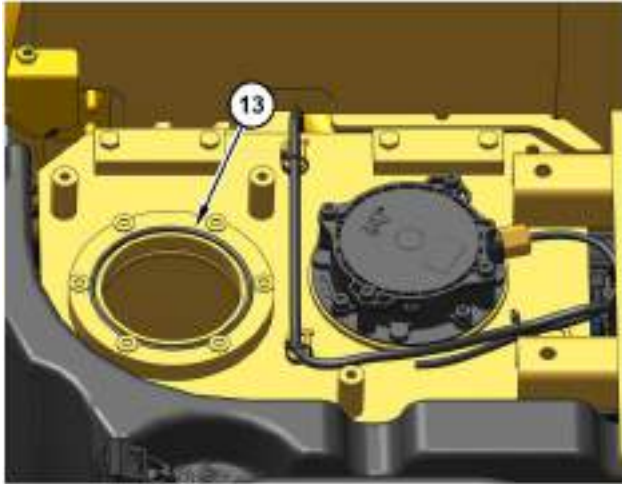


Illustration 534

g06396570

(13) O-ring seal

4. Remove O-ring seal (13) from the tank.
5. Inspect O-ring seals (12) and (13). Replace the O-ring seals if wear or damage is evident.
6. Wash the screen in a clean nonflammable solvent. Allow the screen to dry. Inspect the screen. Replace the screen, if the screen is damaged.
7. Install O-ring seal (12) on screen (11).
8. Install screen (11) and spring (10). Then install cover (9), washers (8), and bolts (7).

Note: Make sure that the O-ring seals and the spring are properly positioned during installation.

Case Drain Filter - Clean

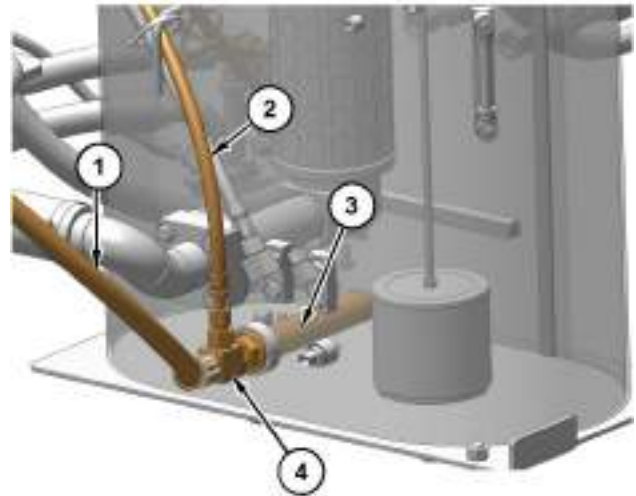


Illustration 535

g06396625

- (1) Hose
- (2) Hose
- (3) Case drain filter
- (4) Tee

1. Remove hose (1) and hose (2) from tee (4). Remove tee (4).
2. Remove case drain filter (3) from the hydraulic tank.
3. Wash the screen of the case drain filter in a clean nonflammable solvent. Allow the filter to dry. Inspect the filter. Replace the filter if the filter is damaged.
4. Inspect the O-ring seal on the filter. Replace the O-ring seal if wear or damage is evident.
5. Install the filter in the hydraulic tank. Tighten the filter to $175 \pm 26 \text{ N}\cdot\text{m}$ ($129 \pm 19 \text{ lb ft}$).
6. Install the tee onto the filter. Tighten the tee to $65 \pm 10 \text{ N}\cdot\text{m}$ ($48 \pm 7 \text{ lb ft}$).
7. Install the two hoses onto the tee.

Hydraulic System Oil - Fill

1. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, "Capacities (Refill)".
2. Inspect the O-ring seal on the filler cap for damage. Replace the O-ring, if necessary. Clean the filler cap. Install the filler cap.

Note: Make no attempt to start the engine until the pump has been filled with hydraulic oil. Serious damage to the hydraulic components can result.

Main Pump and Hydraulic System Air Purge

1. Access the hydraulic pump. The hydraulic pump is located behind the right access door.

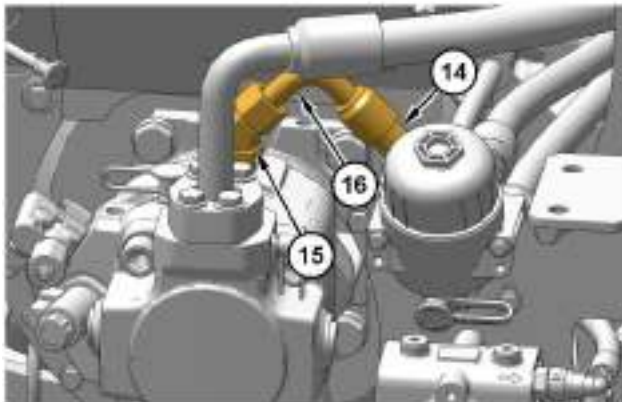


Illustration 536

g06396581

- (14) Hose
(15) Connector
(16) Elbow

2. While the engine is stopped, remove hose (14), elbow (15), and connector (16) from the top of the pump. Add hydraulic oil through the opening.
3. Check the condition of the seals. If a seal is damaged, replace the seal.
4. After the pump has been filled with oil, install drain hose (14), connector (15), and seal (16) to the original locations.
5. Start the engine. When the engine is at low idle, raise the boom. Hold the boom in this position.
6. Stop the engine. Slowly lower the boom until the work tool is on the ground. The hydraulic tank will pressurize.
7. Slowly loosen hose (14) until hydraulic oil flows from the connection. Oil flowing from the connection indicates that the air has been released from the pump.
8. Tighten hose (14).

9. Start the engine. Operate the engine at idling speed for 5 minutes.



Illustration 537

g06181120

10. Operate the joysticks to circulate the hydraulic oil. Lower the bucket to the ground so that the stick is vertical to the ground. Stop the engine.
 11. Check the hydraulic oil level.
- Reference:** For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".
12. Close the access door.
 13. Close the engine hood and latch the engine hood.

i07956162

Hydraulic System Oil Filter (Return) - Replace

SMCS Code: 5068-510-RJ

WARNING

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

The return filter is a cartridge type filter. The amount of foreign material that enters the hydraulic system is reduced when the filter element is replaced.

Two different filters are available for the return filter. One filter is used for standard applications such as digging and normal use of a hammer. The second filter is used for an application such as demolishing a ceiling in a tunnel with a hammer.

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace

Note: If the message display shows that the hydraulic return filter is plugged, turn off the machine. After you make sure that the warning has disappeared, start the machine and run the machine on level ground for approximately 10 minutes. If the warning still appears in the message display, inspect the filter and replace the filter, if necessary.

Hydraulic Hammer Use

The use of hydraulic hammers shortens the life of hydraulic oil. If a hydraulic hammer is used, the maintenance interval is shortened, refer to Table 46 for the intervals.

Table 46

Percentage of Hammer Use	Hydraulic System Oil Filter (Return) - Replace
50%	Every 500 service hours
100%	Every 250 service hours

Return Filter Replacement Procedure

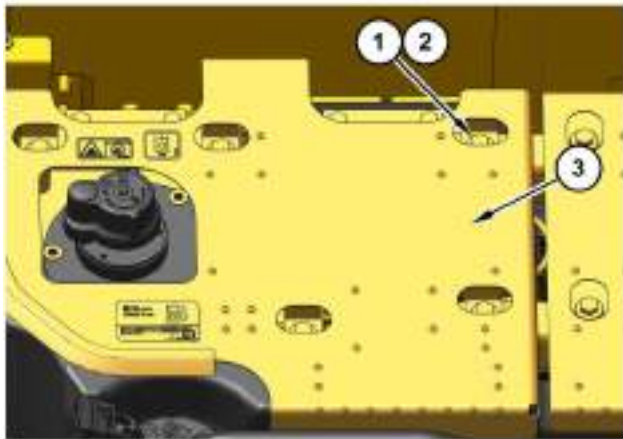


Illustration 538

g06396534

1. Remove five bolts (1) and washers (2). Remove cover (3) from the top of the hydraulic tank.
2. Clean the area thoroughly to keep dirt out of the return filter and filler cap.



Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off. Relieve pressure by slowly turning the cap until the cap reaches the secondary stop.

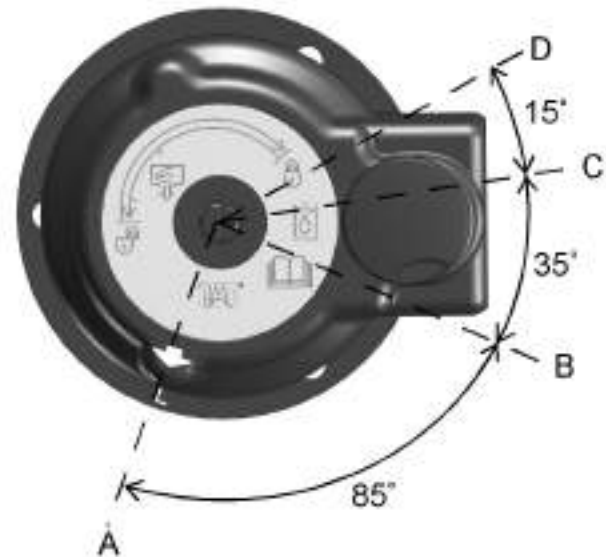


Illustration 539

g06184990

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

3. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 539 for filler cap positions.
 - a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
 - b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, tighten the filler cap on the hydraulic tank to position (A).
4. Check the hydraulic system oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

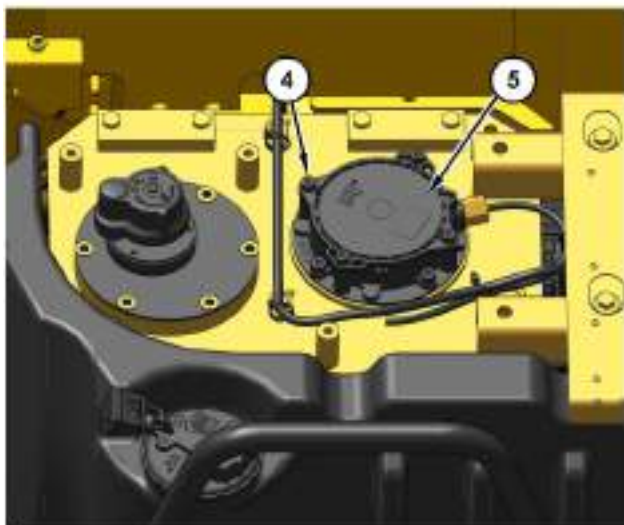


Illustration 540

g06396653

5. Remove four bolts (4), disconnect the harness connector from the filter bypass switch, and remove cover assembly (5) from the tank. Inspect the O-ring on the cover for damage and replace as necessary.

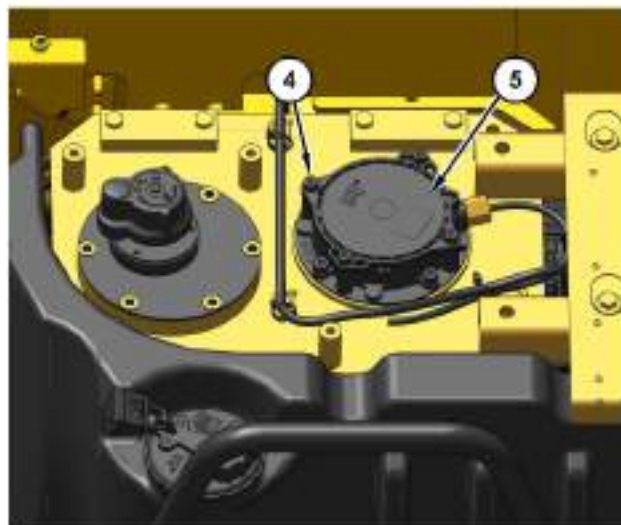


Illustration 542

g06396653

7. Place cover assembly (5) into position in the tank. Install four bolts (4) and tighten to 30 ± 7 N·m (22 ± 5 lb ft). Install the harness connector on the filter bypass switch.

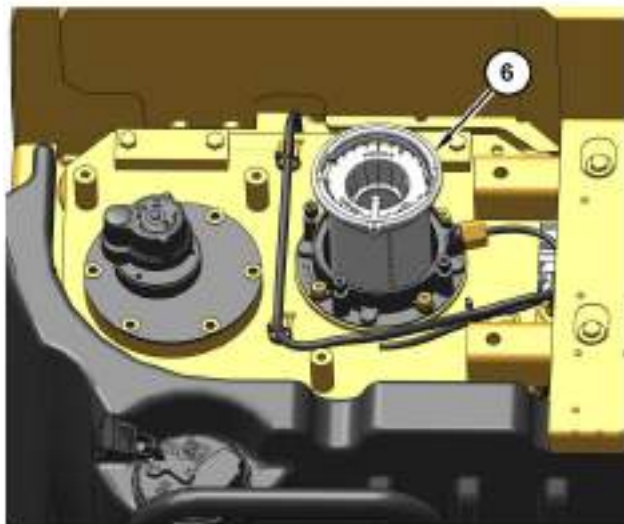


Illustration 541

g06396670

6. Remove filter element (6) and discard. Install a new element into the filter case.

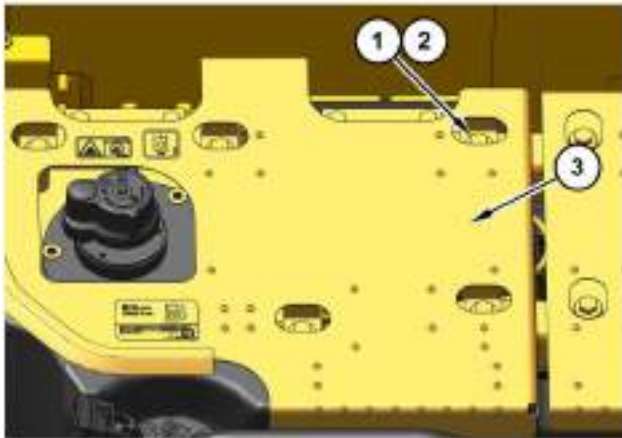


Illustration 543

g06396534

8. Position cover (3) in place on the top of the hydraulic tank. Install five bolts (1) and washers (2).

i07174987

Hydraulic System Oil Level - Check

SMCS Code: 5050-535

WARNING

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

NOTICE

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

Air can enter the system and cause pump damage.



Illustration 544

g06181120

1. Park the machine on level ground. Lower the bucket to the ground with the stick in a vertical position, as shown.



Illustration 545

g06219991

2. Open the access door on the right side of the machine.

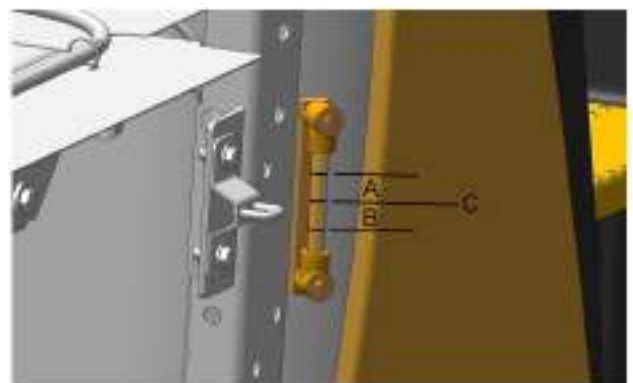


Illustration 546

g06182648

- (A) High temperature range
(B) Low temperature range
(C) Mid temperature range

3. If the hydraulic oil temperature is between 10° to 30° C (50° to 86° F), maintain the oil level in low temperature range (B). If the hydraulic oil temperature is between 50° to 80° C (122° to 187° F), maintain the oil level in high temperature range (A). If the hydraulic oil temperature is between 31° to 49° C (87° to 121° F), maintain the oil level in mid temperature range (C).

4. Close the access door.

Note: Perform Step 5 through Step 8 if the oil level is low.

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



Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off. Relieve pressure by slowly turning the cap until the cap reaches the secondary stop.

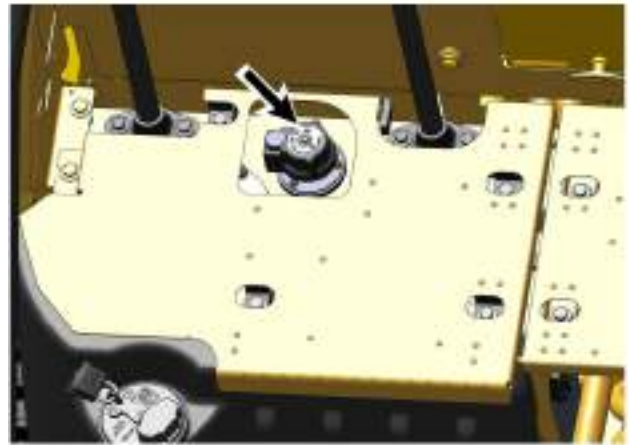


Illustration 547

g06182653

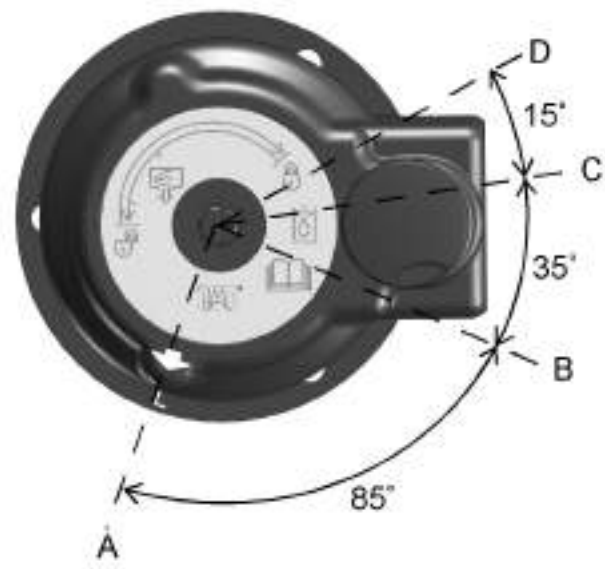


Illustration 548

g06184990

Filler cap

- (A) LOCK position
- (B) PRESSURE RELEASE - START position
- (C) PRESSURE RELEASE - END position
- (D) OPEN position

5. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 548 for filler cap positions.

- a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

Maintenance Section
Hydraulic System Oil Sample - Obtain

- b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
 - c. Move the arrow from position (C) to position (D).
 - d. After the tank pressure is relieved, remove the filler cap.
6. Add oil if necessary. See Operation and Maintenance, "Lubricant Viscosities"
 7. Check the O-ring seal on the filler cap. Replace the O-ring seal if the seal is damaged.
 8. Clean the filler cap and install on the tank. Tighten the filler cap on the hydraulic tank to position (A).

i08022629

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008-OC; 5095-008; 5095-SM; 7542; 7542-008

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 6000 hours. S·O·S services after 3,000 hours is strongly recommended. Consult your Cat dealer for details.

The hydraulic oil sampling valve is located on the swing motor lines group.

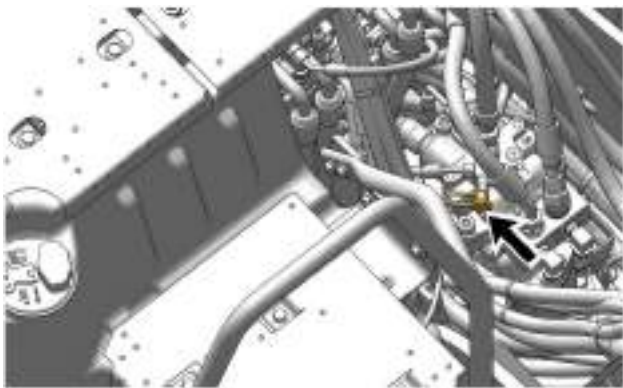


Illustration 549

g06511111

Obtain a sample of the hydraulic oil from the hydraulic oil sampling valve on the swing motor.

Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the hydraulic oil. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining a sample of the hydraulic oil.

i03753191

Indicators and Gauges - Test

SMCS Code: 7450-081; 7490-081

1. Look for broken lenses on the gauges, broken indicator lights, broken switches, and other broken components in the cab.
2. Start the engine.
3. Look for inoperative gauges.
4. Turn on all machine lights. Check for proper operation.
5. Move the machine forward. Release the travel levers and the travel pedals. The machine should stop.
6. Stop the engine.
7. Make any repairs that are required before operating the machine.

i08066994

Light Emitting Diode Lamp (LED) - Replace

SMCS Code: 1434-510

1. Remove the electrical power from the light emitting diode (LED) lamp.
2. Disassemble the housing for the LED lamp to have access to the bulb.

Note: On some LED lamps, the bulb is a part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these LED lamps.

3. Remove the bulb from the LED lamp.
4. Install the replacement bulb in the LED lamp.
If the bulb is a part of the lens assembly, install the replacement lens assembly in the LED lamp.
5. Reassemble the housing for the LED lamp. Ensure that any printing on the lens is oriented correctly for the LED lamp mounting position on the machine.
6. Reattach the electrical power to the LED lamp.
7. Check the LED lamp for proper operation.

Note: Consult your Cat dealer for additional information on LED lamps.

i07349186

Oil Filter - Inspect

SMCS Code: 1308-507; 5068-507

Inspect a Used Filter for Debris



Illustration 550

g06224663

The element is shown with debris.

Use a filter cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals.

Ferrous metals can indicate wear from steel parts and on cast iron parts.

Nonferrous metals can indicate wear from 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 debris could be caused by friction and by normal wear. Consult your Cat dealer 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.

i06972489

Radiator, Aftercooler and Oil Cooler Cores - Clean

SMCS Code: 1063-070-KO; 1353-070-KO; 1374-070-KO

WARNING

Personal injury can result from air pressure.

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

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



Illustration 551

g06179792

1. Open the access door on the left side of the machine.

i08192239

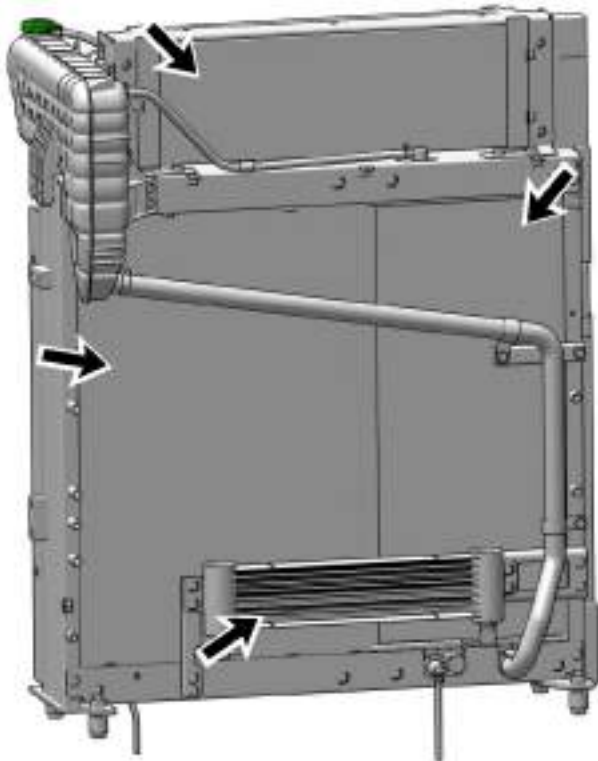


Illustration 552

g06183814

2. Remove dust and debris from all the core fins.

Compressed air is preferred, but high-pressure water or steam can be used to remove dust and general debris from a core.

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

3. Close the access door on the left side of the machine.

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-710; 7322-510

WARNING

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

NOTICE

If the refrigerant system has been open to the outside air (without being plugged) for more than 30 minutes, the receiver-dryer must be replaced. Moisture will enter an open refrigerant system and cause corrosion which will lead to component failure.

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

Refer to Service Manual, "Air Conditioning and Heating R-134a for All Caterpillar Machines" for the proper procedure to change the receiver-dryer assembly and for the procedure to reclaim the refrigerant gas.

i07349192

i07103309

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040; 7325-040



Illustration 553

g06184357

Consult your Cat dealer for repair of any cracks in the ROPS.

Inspect the ROPS for loose bolts or for damaged bolts. Replace any damaged bolts or missing bolts with original equipment parts only. Tighten the M24 bolt (1) to $425 \pm 50 \text{ N}\cdot\text{m}$ ($315 \pm 40 \text{ lb ft}$).

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

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

Consult your Cat dealer for inspection of any potential damage or repair of any damage to any operator protective structure. (Including ROPS, FOPS, TOPS, OPS, and OPG) Refer to Special Instruction, SEHS6929, "Inspection, Maintenance, and Repair of Operator Protective Structures (OPS) and Attachment Installation Guidelines for All Earthmoving Machinery"

Seat Belt - Inspect

SMCS Code: 7327-040

Always inspect the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.



Illustration 554

g06224278

Typical example

Inspect buckle (2) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect seat belt (1) for webbing that is worn or frayed. Replace the seat belt if the webbing is worn or frayed.

Inspect all seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

Contact your Cat dealer for the replacement of the seat belt and the mounting hardware.

Note: The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

i06970675

Seat Belt - Replace

SMCS Code: 7327-510

The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace the belt within 3 years from the year of manufacture as indicated on the belt webbing label, buckle housing, or installation tags (non-retractable belts).

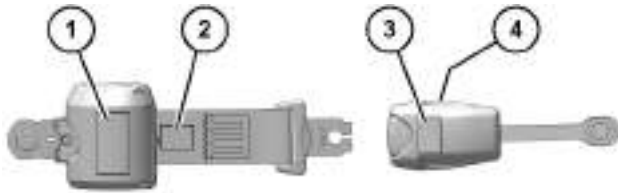


Illustration 555

g06183390

- (1) Date of installation (retractor)
- (2) Year of manufacture (tag) (fully extended web)
- (3) Date of installation (buckle)
- (4) Year of manufacture (underside) (buckle)

Consult your Cat dealer for the replacement of the seat belt and the mounting hardware.

Determine the age of a new seat belt before installing on seat. A manufacture label is on the belt webbing and imprinted on the belt buckle. Do not exceed the install by date on the label.

A complete seat belt system should be installed with new mounting hardware.

Date of installation labels should be marked and affixed to the seat belt retractor and buckle.

Note: Date of installation labels should be permanently marked by punch (retractable belt) or stamp (non-retractable belt).

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i06991878

Shovel Crane - Inspect (If Equipped)

SMCS Code: 6500-040

WARNING

Do not operate the shovel crane with a hook that has cracks or deformities. Failure to follow these instructions may cause the load to fall and result in injury or death. Replace the shovel crane hook if there are any signs of cracks or deformities.

1. Position the machine on a level surface and retract the bucket. Lower the bucket to the ground.
2. Move the hydraulic lockout control to the LOCKED position. Stop the engine.

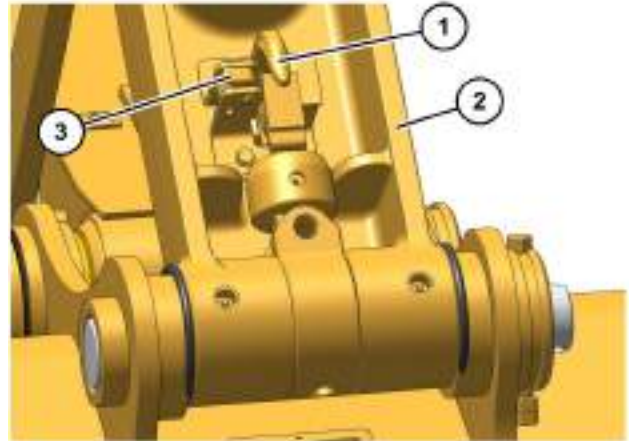


Illustration 556

g06191360

Type 2

- (1) Shovel crane hook
- (2) Bucket linkage
- (3) Latch assembly

3. Unlock shovel crane hook (1) from latch assembly (3) for inspection.
4. Inspect the shovel crane hook and the hook latch. Make any repairs before operation of the shovel crane.

Inspect Shovel Crane Hook

Ensure that the shovel crane is properly lubricated. Refer to this Operation and Maintenance Manual, "Shovel Crane - Lubricate" for the correct procedure.



Illustration 557 g06191406

Inspect for notable scratches, tears, or welded parts.

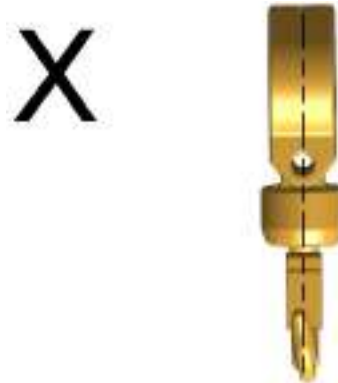


Illustration 560 g06191411

Inspect the tip of shovel crane hook and ensure that the tip is not bent to either side.



Illustration 558 g06191407

Visually inspect for corrosion and rust. If corrosion or rust is found, polish the area with a grinder and lubricate the hook with oil.

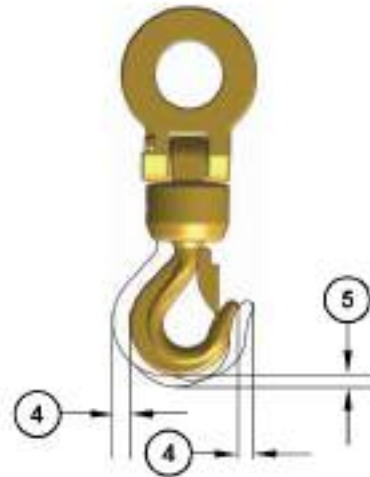


Illustration 561 g06191428

(4) Horizontal movement
(5) Vertical movement

Inspect the shovel crane hook for excessive movement. The horizontal movement (4) of the hook should not exceed 5 mm (0.2 inch). The vertical movement (5) of the hook should not exceed 4 mm (0.2 inch.) vertically .



Illustration 559 g06191409

Inspect the shovel crane swivel. The swivel should rotate smoothly and not rattle.

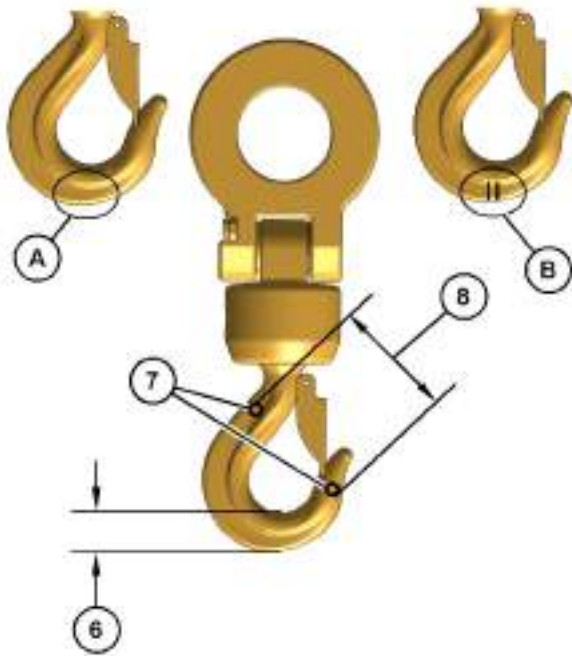


Illustration 562

g06191434

- (6) Width
- (7) Punch marks
- (8) Length

There are two types of hooks:

Hook (A) – This type of hook will not have a mark to indicate the area intended to bear the weight of a suspended load.

Hook (B) – This type of hook will have a mark to indicate the area intended to bear the weight of a suspended load.

Measure the shovel crane hook to ensure that the specifications do not exceed the thresholds found in the table below.

Table 47

Disposal Reference Chart				
Hook Type	New Shovel Hook Specifications for Reference		Shovel Hook Specification Threshold	
	Length (8)	Width (6)	Length (8)	Width (6)
A	66 mm (2.60 inch)	31.8 mm (1.25 inch)	69.3 mm (2.73 inch)	30.2 mm (1.19 inch)
B	65 mm (2.55 inch)	31.8 mm (1.25 inch)	68.2 mm (2.69 inch)	30.2 mm (1.19 inch)

Note: Length (8) is the distance between punch marks (7).

Replace shovel crane hook for any of the following reasons:

- Deep scratches, tears, or welded parts
- Corrosion or rust that cannot be removed with a grinder
- Hook swivel does not rotate smoothly
- Tip of the hook is bent to either side
- Hook has excessive movement in the swivel
- Hook exceeds the specification thresholds found in the disposal reference chart.

Inspect the Shovel Crane Hook Latch



Illustration 563

g06191466

- (C) Open
- (D) Closed
- (E) Operating range

Inspect the latch to ensure that the latch moves smoothly in operating range (E).

X



Illustration 564

g06191481

Inspect the latch for excessive play (F). Ensure that the spring is not broken and the latch does not rattle.

X



Illustration 565

g06191492

Inspect the latch to ensure that the latch closes completely and there is no gap between the latch and the hook. The latch should rest firmly on the tip of the hook.

X



Illustration 566

g06191696

Inspect the latch to ensure that the latch is not bent or deformed. The latch should be centered on the tip of the hook.

Replace shovel crane latch for any of the following reasons:

- Latch does not move smoothly within the operating range
- Latch has excessive movement or rattles
- Latch does not fully close
- Latch is bent or deformed

i06995214

Shovel Crane - Lubricate (If Equipped)

SMCS Code: 6500

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the shovel crane linkage. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on molybdenum grease.

Wipe all fittings before you apply lubricant.

Maintenance Section
Swing Bearing - Lubricate

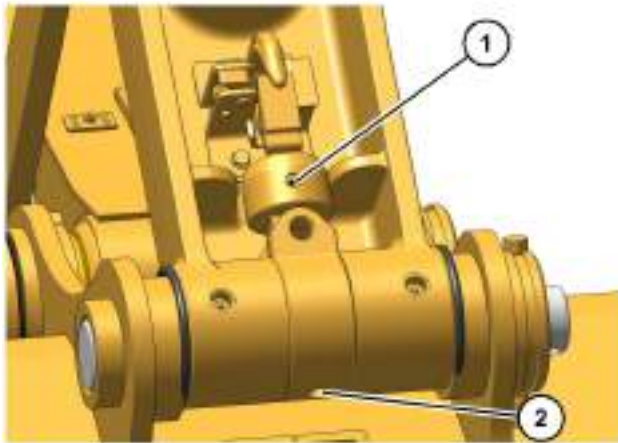


Illustration 567

g06191976

1. Apply lubricant through fittings (1) and (2). Continue to fill with grease until the grease is visible.

Note: Service the above fittings after you operate the shovel crane under water.

2. Check the hook for cracks and deformities. Replace the hook if necessary.

Note: Refer to this Operation and Maintenance Manual, "Shovel Crane - Inspect"

i08022634

Swing Bearing - Lubricate

SMCS Code: 7063-086

Note: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on grease.

Note: Do not overgrease the swing bearings. Do not grease more than the recommended maintenance interval. Refer to Operation and Maintenance Manual, "Maintenance Interval Schedule" for more information.

Wipe the fittings before you lubricate the swing bearing.

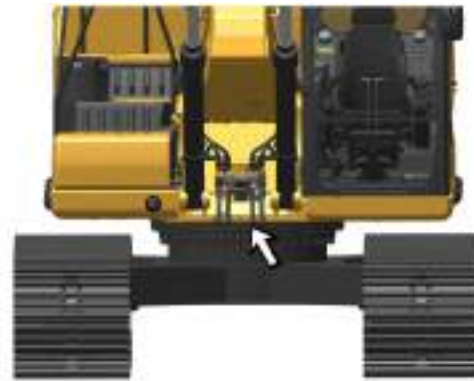


Illustration 568

g06210366

The swing bearing grease zerks are located at the front and rear of the swing drive housing.



Illustration 569

g06511132

- (1) Front grease fitting
- (2) Rear grease fitting

Apply lubricant through the fittings until the lubricant overflows the bearing seals.

i08536336

Swing Gear - Lubricate

SMCS Code: 7063-086

Prepare the machine for maintenance. Refer to "Prepare the Machine for Maintenance".

Note: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information on grease.

NOTICE

Improper lubrication can cause damage to machine components.

To avoid damage, make sure that the proper amount of grease is applied to the swing drive.

When the amount of grease in the compartment becomes too large, the agitation loss becomes large, thereby accelerating grease deterioration.

Grease deterioration can cause damage to the pinion gear of the swing drive and swing internal gear.

Not enough grease will result in poor gear lubrication.

Remove the inspection cover that is located near the boom base. Inspect the grease.

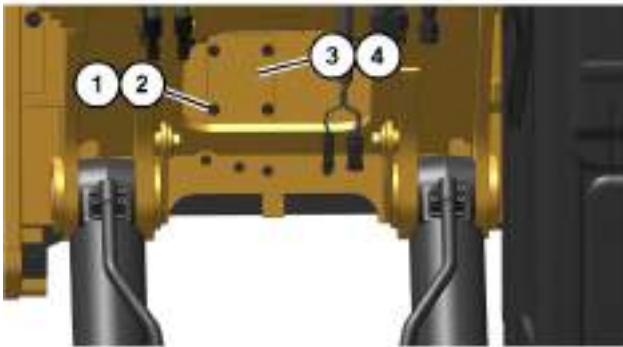


Illustration 570

g06188728

- (1) Bolts
- (2) Washers
- (3) Cover
- (4) Gasket

1. Remove bolts (1) and washers (2). Remove cover (3) and gasket (4).
2. Inspect gasket (4). Replace the gasket if damage is evident.

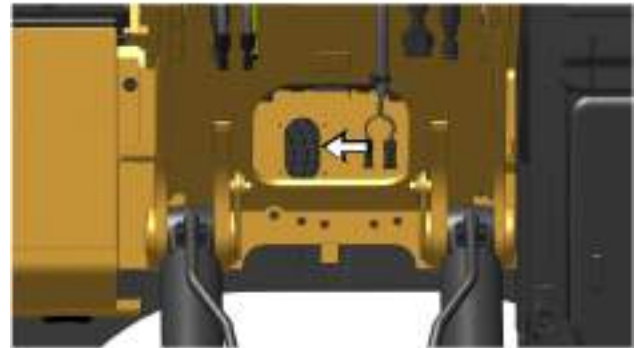


Illustration 571

g06188736

3. Check the level of grease. The level of grease is correct when:

- Waves of grease are present from the rotating swing drive pinion.
- The grease is evenly distributed on the floor of the pan.

Note: Smearred or waveless areas are evidence for a lack of grease.

Note: Add grease, as needed. Remove grease, as needed. Too much grease will result in the deterioration of the grease because of excessive movement of the grease. Too little grease will result in poor lubrication of the swing gear.

Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the size of the pan.

4. Check for contamination and for discolored grease.
5. If the grease is contaminated or discolored with water, change the grease.

i06988628

Track Adjustment - Adjust

SMCS Code: 4170-025

WARNING

Personal injury or death can result from grease under pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve one turn only.

If track does not loosen, close the relief valve and contact your Caterpillar dealer.

NOTICE

Keeping the track properly adjusted will increase the service life of the track and drive components.

Note: The track tension must be adjusted according to the current operating conditions. Keep the track as slack as possible if the soil is heavy.

Measuring Track Tension

1. Operate the machine in the direction of the idlers.



Illustration 572

g06188816

2. Stop with one track pin directly over the front carrier roller. Park the machine and turn off the engine.



Illustration 573

g06208711

3. Place a straight edge on top of the track grousers between the front carrier roller and the idler. The straight edge should be long enough to reach from the front carrier roller to the idler.

Note: If your machine is equipped with three carrier rollers, place a straight edge on the tracks between the carrier rollers. The straight edge should be long enough to reach from one carrier roller to another carrier roller.

4. Measure the maximum amount of sag in the track. The sag is measured from the highest point of the track grouser to the bottom of the straight edge. A track that is properly adjusted will have a sag of 40.0 to 55.0 mm (1.57 to 2.17 inch).

5. If the track is too tight, or if the track is too loose, adjust the track tension according to the appropriate procedure below.

Adjusting Track Tension



Illustration 574

g06188820

Typical example

The track adjuster is located on the track frame.

Tightening the Track

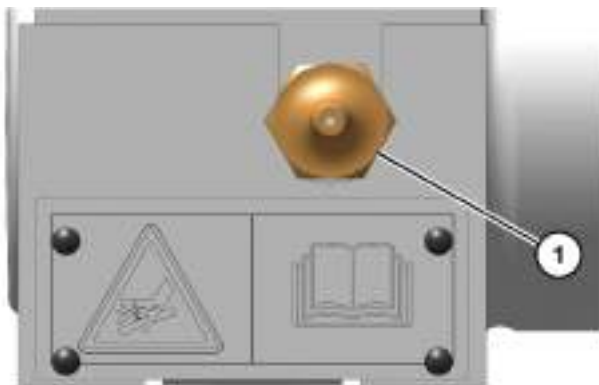


Illustration 575

g06188830

(1) Grease valve

Wipe the fitting before you add grease.

1. Add grease through grease valve (1) until the correct track tension is reached.
2. Operate the machine back and forth in order to equalize the pressure.
3. Check the amount of sag. Adjust the track, as needed.

Loosening the Track

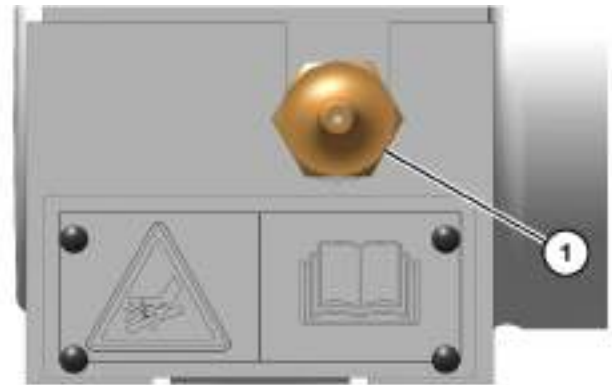


Illustration 576

g06188830

(1) Grease valve

1. Loosen grease valve (1) carefully until the track begins to loosen. One turn should be the maximum.
2. Tighten grease valve (1) to 34 ± 5 N·m (25 ± 4 lb ft) when the desired track tension is reached.
3. Operate the machine back and forth in order to equalize the pressure.
4. Check the amount of sag. Adjust the track, as needed.

i06969791

Track Adjustment - Inspect

SMCS Code: 4170-040

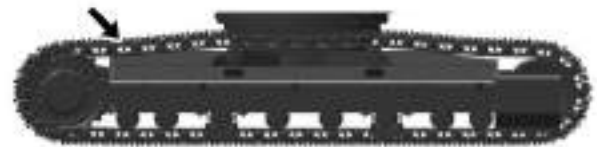


Illustration 577

g06182929

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

If the track appears to be too tight or too loose, refer to Operation and Maintenance Manual, "Track Adjustment - Adjust".

i06954313

Travel Alarm - Test (If Equipped)

SMCS Code: 7429-081

Move the machine to test the travel alarm.

1. Start the engine. Move the hydraulic lockout control to the UNLOCKED position.
2. Raise the work tool to avoid any obstacles. Make sure that there is adequate overhead clearance.



Illustration 578

g06181402

3. Use the travel levers or the travel pedals to move the machine forward. The travel alarm should sound.
4. Release the travel levers and the travel pedals to stop the machine.
5. Use the travel levers and the travel pedals to move the machine backward. The travel alarm should sound.



Illustration 579

g06181631

6. Press the alarm mute button. The travel alarm should shut off.
7. Stop the machine. Lower the work tool to the ground. Move the hydraulic lockout control to the LOCKED position. Stop the engine.

i08233399

Undercarriage - Check

SMCS Code: 4150-535



Illustration 580

g06182923

1. Check the carrier rollers, the track rollers, and the idler wheels for possible leakage.
2. Check the surface of the track, the carrier rollers, the track rollers, the idler wheels, the track shoes, and the drive sprockets. Look for signs of wear and loose mounting bolts.
3. Listen for any abnormal noises while you are moving slowly in an open area.
4. If required, clean the undercarriage to keep excess material from building up and solidifying.
5. If abnormal wear exists or abnormal noises or leaks are found, consult your Cat[®] dealer.

i06954326

Window Washer Reservoir - Fill

SMCS Code: 7306-544-KE

NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.



Illustration 581

g06181546

1. Open the access door on the left side of the machine.

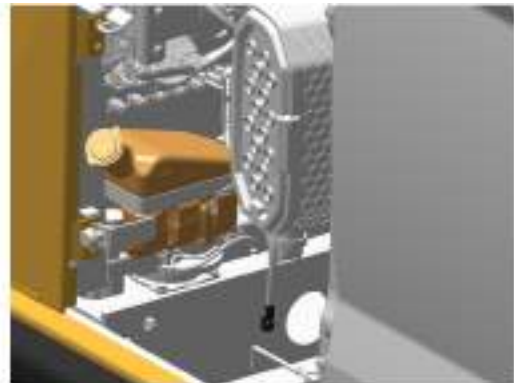


Illustration 582

g06181644

2. Remove the filler cap.
3. Fill the window washer reservoir with washer fluid through the filler opening.
4. Install the filler cap.
5. Close the access door.

i01258249

Window Wiper - Inspect/Replace

SMCS Code: 7305-040; 7305-510

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i07103291

Windows - Clean

SMCS Code: 7310-070; 7340-070

Clean the outside of the windows from the ground, unless handholds are available.



Illustration 583

g06224268

Typical example

Cleaning Methods

Aircraft Window Cleaner

Apply the cleaner with a soft cloth. Rub the window with moderate pressure until all the dirt is removed. Allow the cleaner to dry. Wipe off the cleaner with a clean soft cloth.

Soap and Water

Use a clean sponge or a soft cloth. Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water. Rinse the windows thoroughly. Dry the windows with a moist chamois or with a moist cellulose sponge.

Stubborn Dirt and Grease

Wash the windows with a good grade of naphtha, of isopropyl alcohol, or of Butyl Cellosolve. Then, wash the windows with soap and with water.

Polycarbonate Windows (If equipped)

Special care is needed to clean polycarbonate windows.

Wash polycarbonate windows with mild soap and warm water that does not exceed 50° C (122° F). Use a soft sponge, or damp cloth. Never use a dry cloth or paper towels on polycarbonate windows. Rinse the windows with a sufficient amount of clean cold water.

Note: Naphtha or kerosene can be used to remove labels, films, paint, or marking pen from polycarbonate windows.

Note: Do not use abrasive, or highly alkaline cleaners. Do not use sharp instruments, such as squeegees or razor blades on polycarbonate windows. Do not clean polycarbonate windows in the hot sun or at elevated temperatures.

Warranty Section

Warranty Information

i08769122

Emissions Warranty Information

SMCS Code: 1000

The certifying engine manufacturer warrants to the ultimate purchaser and each subsequent purchaser that:

1. New non-road diesel engines and stationary diesel engines less than 10 L per cylinder (including Tier 1 and Tier 2 marine engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the United States and Canada, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed by the United States Environmental Protection Agency (EPA) by way of regulation.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
2. New non-road diesel engines (including Tier 1 and Tier 2 marine propulsion engines < 37 kW and Tier 1 through Tier 4 marine auxiliary engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the state of California, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, to all applicable regulations adopted by the California Air Resources Board (ARB).
 - b. Free from defects in materials and workmanship which cause the failure of an emission-related component to be identical in all material respects to the component as described in the engine manufacturer's application for certification for the warranty period.
3. New non-road diesel engines installed in construction machines conforming to the South Korean regulations for construction machines manufactured after January 1, 2015, and operated and serviced in South Korea, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed in the Enforcement Rule of the Clean Air Conservation Act promulgated by South Korea MOE.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
4. New China non-road 4 mobile diesel engines operated and serviced in China, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of manufacture, sale, and import with applicable emission standards in the promulgated by Enforcement Rule of the Clean Air Conservation Act Ministry of Ecology and Environment (MEE).
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in the Emission Control Warranty statement available at the Cat Warranty website. Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty, and to obtain a copy of the applicable warranty publication.

Reference Information Section

Reference Materials

i08292374

Reference Material

SMCS Code: 1000; 7000

Additional literature regarding your product may be purchased from your local Cat dealer or by visiting publications.cat.com. Use the product name, sales model, and serial number to obtain the correct information for your product.

publications.cat.com

i08292382

Decommissioning and Disposal

SMCS Code: 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations.

Improperly disposing of waste can threaten the environment. Obey all local regulations for the decommissioning and disposal of materials.

Utilize appropriate personal protective equipment when decommissioning and disposing product.

Consult the nearest Cat dealer for additional information. Including information for component remanufacturing and recycling options.

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Product and Dealer Information

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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