



M0111427-02 (en-us)
February 2021



Operation and Maintenance Manual

330 GC Excavator

FEK 1-UP (330 GC)
SYH 1-UP (330 GC)

Language: Original Instructions

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:

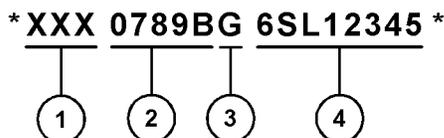


Illustration 1

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

i07473534

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.

Safety Section
Safety Messages

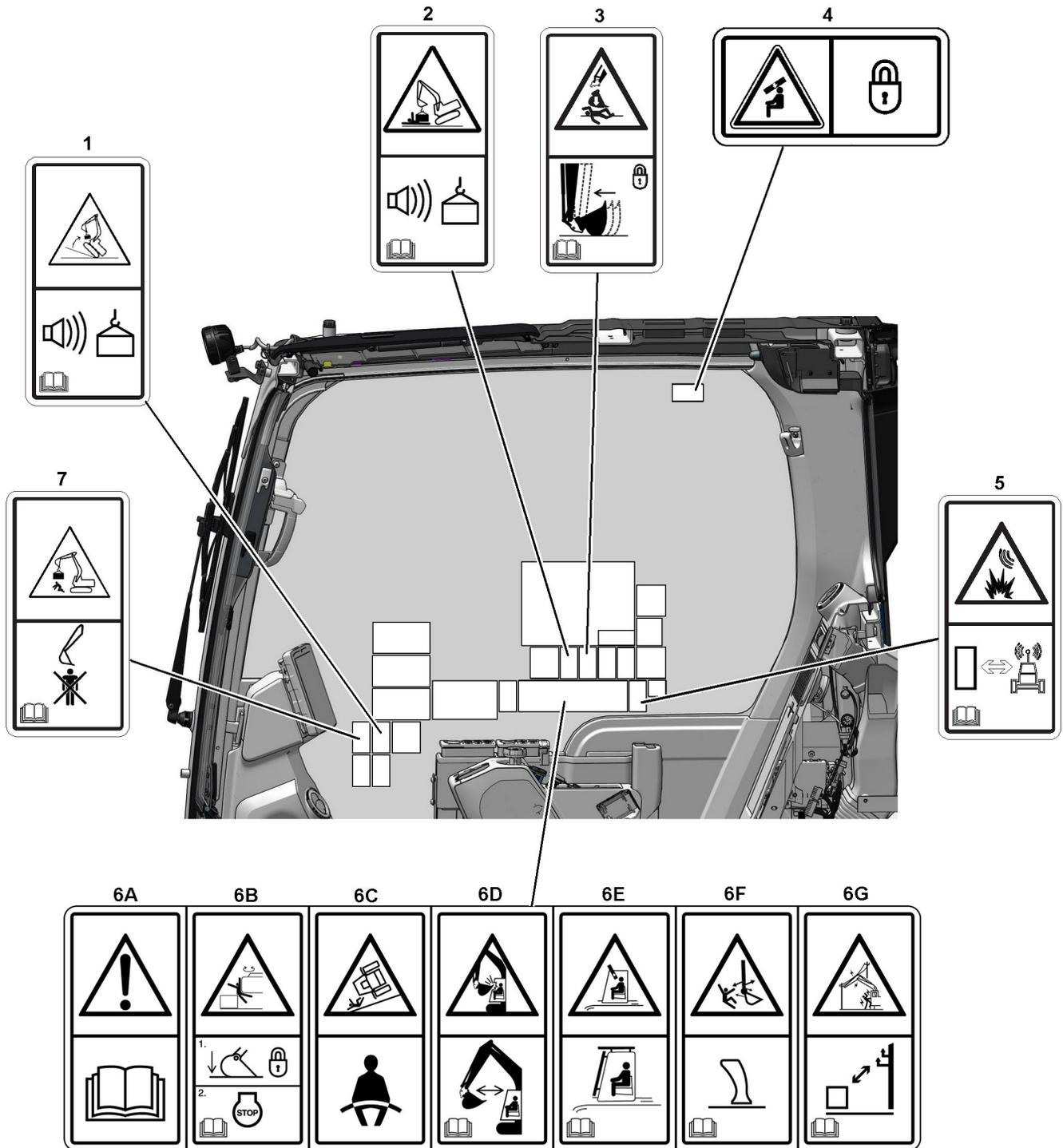


Illustration 2

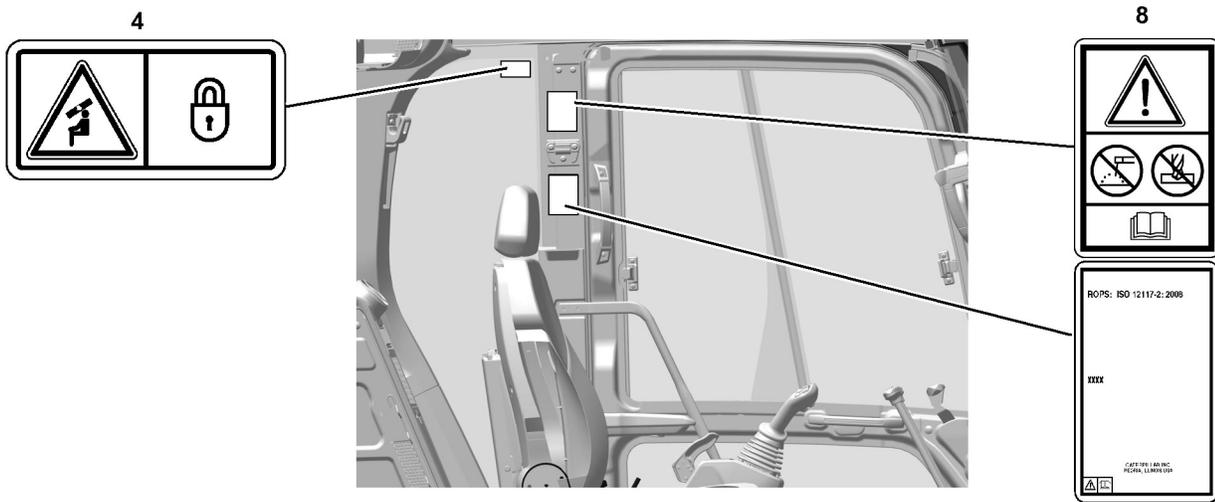


Illustration 3

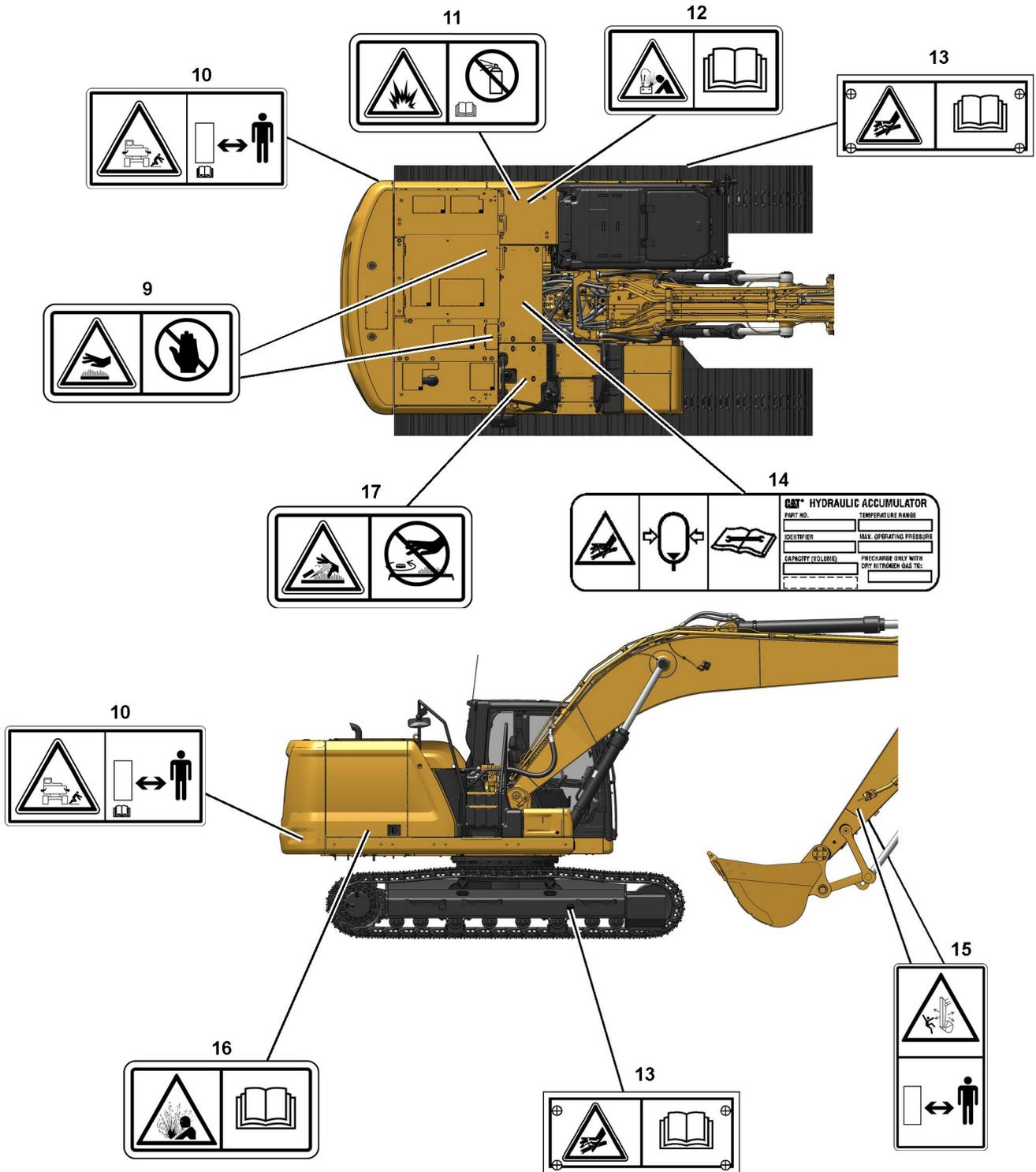


Illustration 4

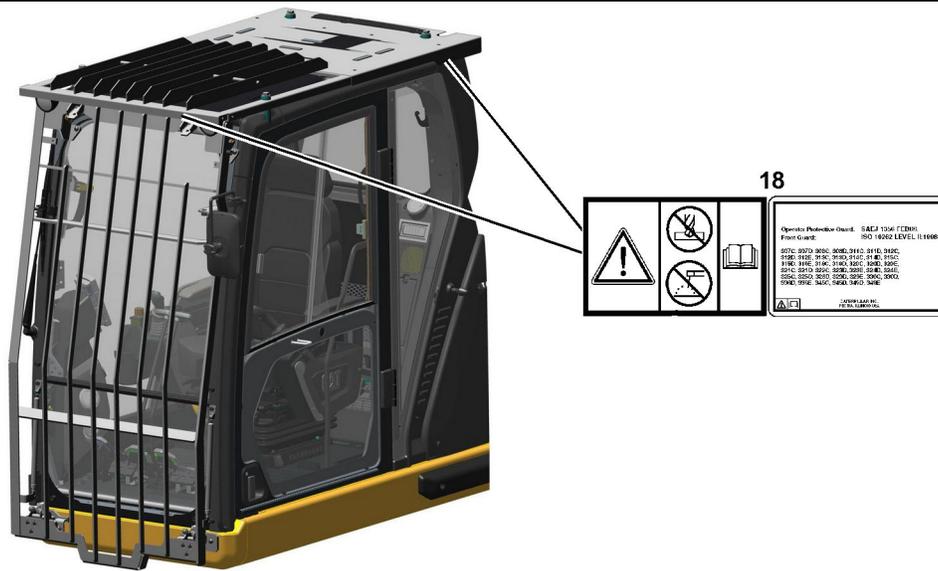


Illustration 5

g06332249

Lifting Level Warning (1)

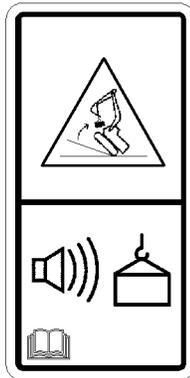


Illustration 6

g06188532

Overload Warning Device (2)

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



Illustration 7

g06224998

WARNING

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

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

Crushing Injury (3)

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

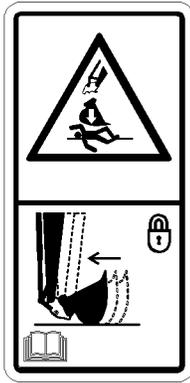


Illustration 8

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

Product Link (5)

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



Illustration 10

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

Do Not Operate (6A)

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

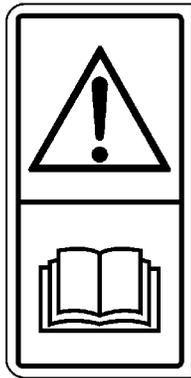


Illustration 11

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.

Crushing Hazard (6B)

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

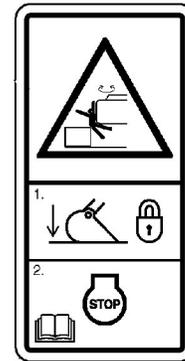


Illustration 12

g02282255

⚠ WARNING

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

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

Seat Belt (6C)

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

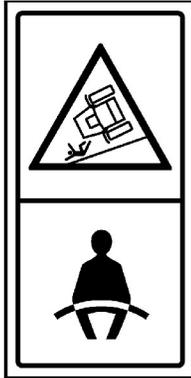


Illustration 13

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 (6D)

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 (6E)

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

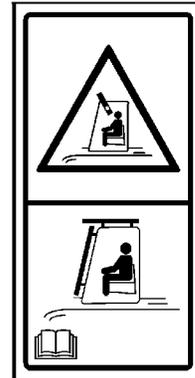


Illustration 15

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

Joystick Controls Alternate Patterns (6F)

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

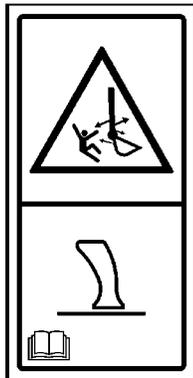


Illustration 16

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

Electrical Power Lines (6G)

This safety message is located in the cab.

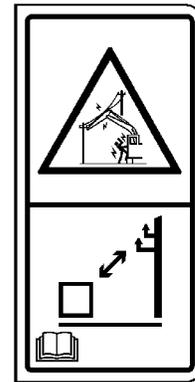


Illustration 17

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

Do Not Lift Over Personnel (7)

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

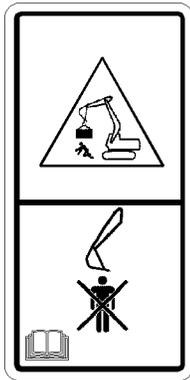


Illustration 18

g06188697

Do not lift

Do Not Weld or Drill on ROPS (8)

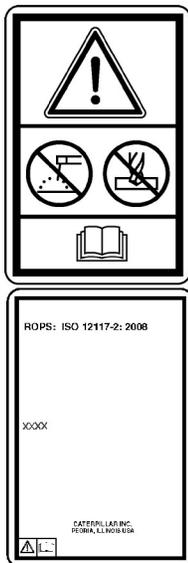


Illustration 19

g06207749

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.

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

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

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 each side of the rear of the machine.

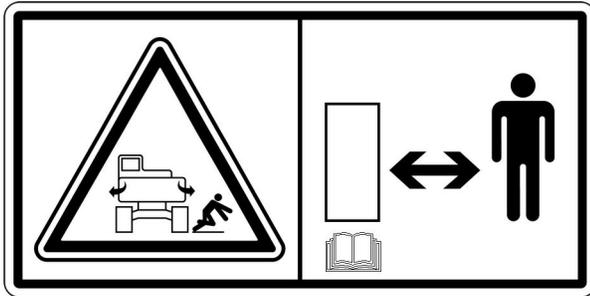


Illustration 21

g06219420

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

Aerosol Starting Aid (11)

This safety message is located near 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 Operation and Maintenance Manual, "Engine Starting" for the proper starting procedure.

Jump-Start Cables (12)

This safety message is positioned on the circuit breaker panel.

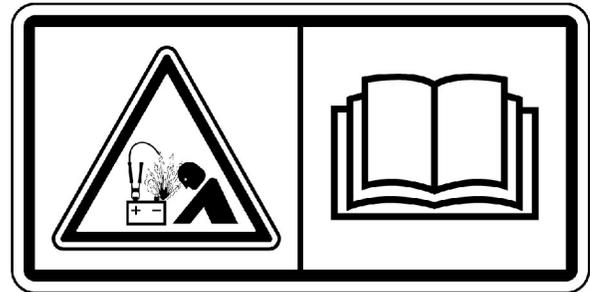


Illustration 23

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

High-Pressure Cylinder (13)

This safety message is on the back of both the track adjuster covers.

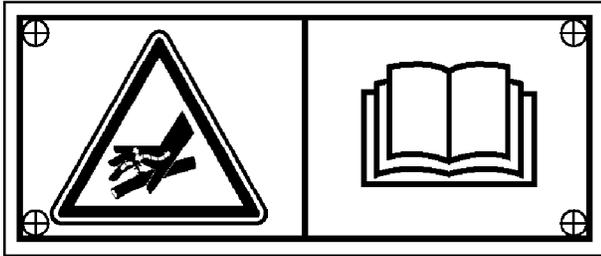


Illustration 24

g01076729

! 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 Cat dealer.

! WARNING

Recoil system contains high-pressure nitrogen cylinder. Parts can separate with explosive force if proper care is not used during disassembly.

This action can cause serious injury or death.

Do not disassemble any part of this cylinder until you have read and understand the instructions given in the service manual. Observe the instructions given in the service manual.

High-Pressure Gas (14)

This safety message is positioned on the accumulator.

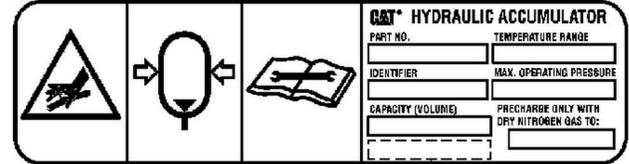


Illustration 25

g06236155

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

Crushing Hazard (15)

This safety message is on both sides of the stick.

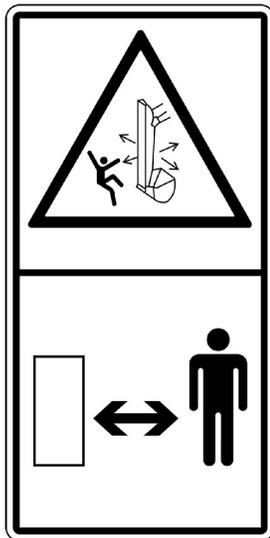


Illustration 26

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.

Vapor Explosion (16) (If Equipped)

If equipped, this safety message is inside the rear storage compartment on the right side, near the fuel transfer pump.

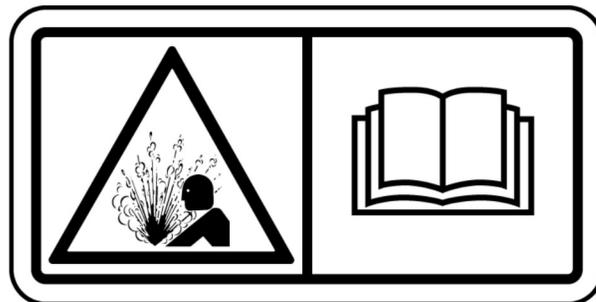


Illustration 27

g01407639

WARNING

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

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

Relieve Hydraulic Tank Pressure (17)

This safety message is on top of the hydraulic tank.



Illustration 28

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 (18)

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.

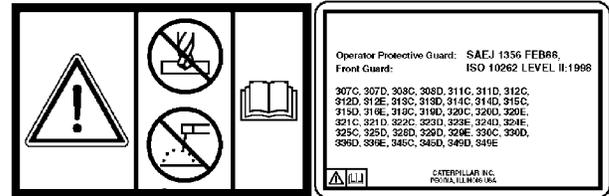


Illustration 29

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.

i07856403

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.

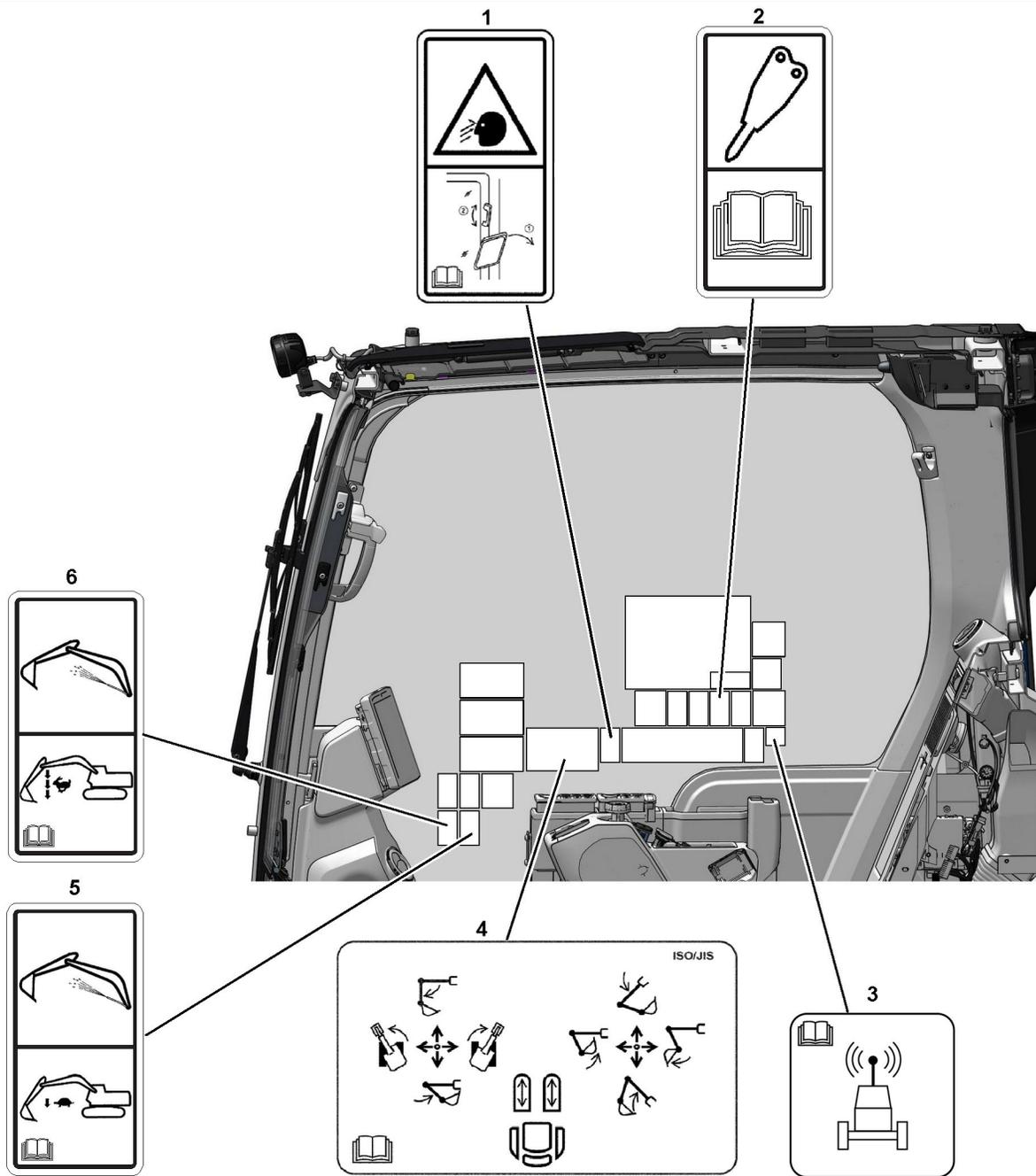


Illustration 30



Illustration 33

g06214810

Hammer Operation(2)

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

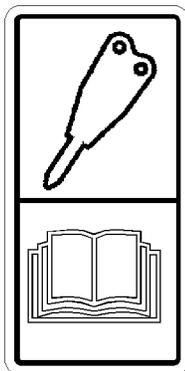


Illustration 34

g06189240

See Operation and Maintenance Manual, “Hammer Operation” within Operation and Maintenance Manual, “Work Tool Control (One-Way Flow)” for instructions on hammer operation.

Also, see Operation and Maintenance Manual, “Hydraulic Hammer Control (Foot Switch)” within Operation and Maintenance Manual, “Work Tool Control (One-Way Flow)” for instructions on hammer operation.

Data Privacy (3)

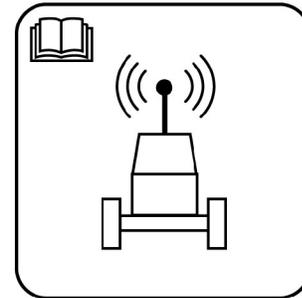


Illustration 35

g01418953

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

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

Joystick Controls Alternate Patterns (4)

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

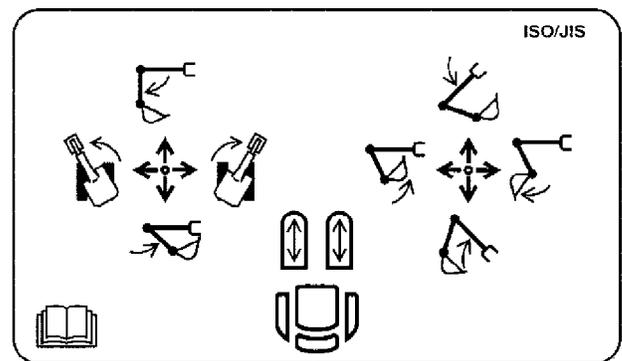


Illustration 36

g06214805

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

Hose Burst (5)

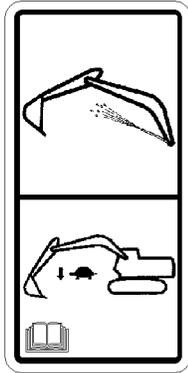


Illustration 37

g06189238

Hose Burst (6)

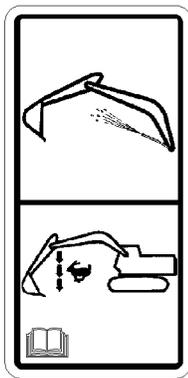


Illustration 38

g06189239

Alternate Exit (7)

If equipped, this message is on the rear window of the cab in the lower left-hand corner.

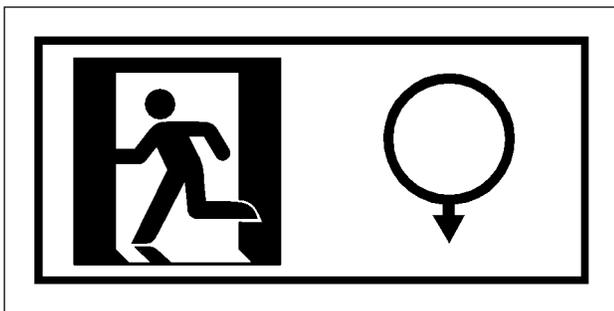


Illustration 39

g06189112

Pull the ring to pull out the seal. Push the window out of the cab and exit through the opening.

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

No Step (8)

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

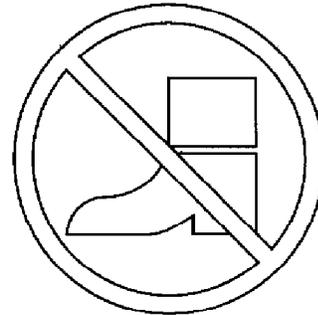


Illustration 40

g00911158

Do not step in this area.

Air Conditioner (9)

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

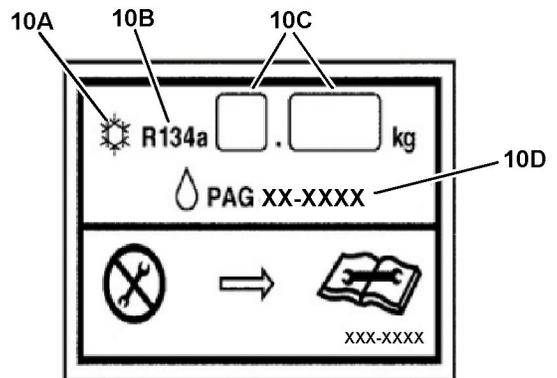


Illustration 41

g06214936

- (10A) Air conditioning symbol
- (10B) R134a (Refrigerant type common name)
- (10C) Refrigerant quantity
- (10D) PAG (polyalkylene glycol) lubricating oil part number

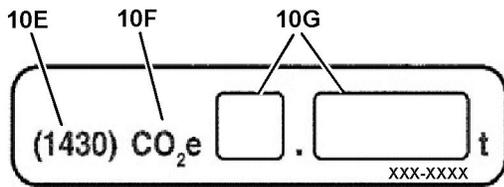


Illustration 42 g06214938

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

- (10E) (1430) - This is the Global Warming Potential of R134a
- (10F) CO₂ equivalent
- (10G) The system contains 1.430 metric tonne of CO₂ equivalent

10H



Illustration 43 g06214940

(10H) If equipped, this film provides the required language translations of the text "Contains fluorinated greenhouse gases" for the European Union greenhouse gas regulation.

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

Engine Oil Requirements (10)

This message is on top of the engine.

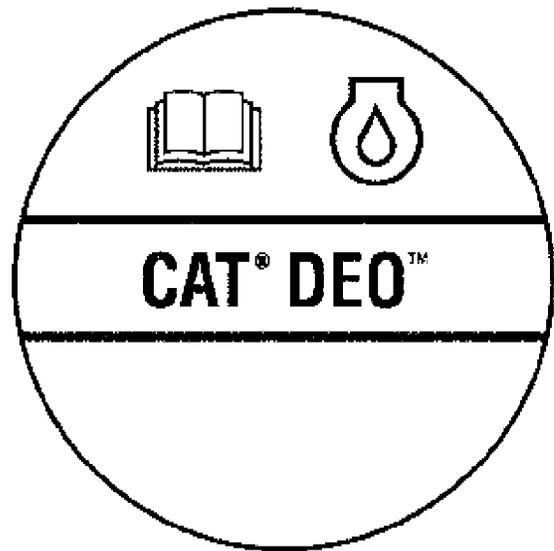


Illustration 44 g06217215

Tier 3 Engines

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

Diesel Fuel Requirements (11)

This message is located by the fuel tank.

i08313103

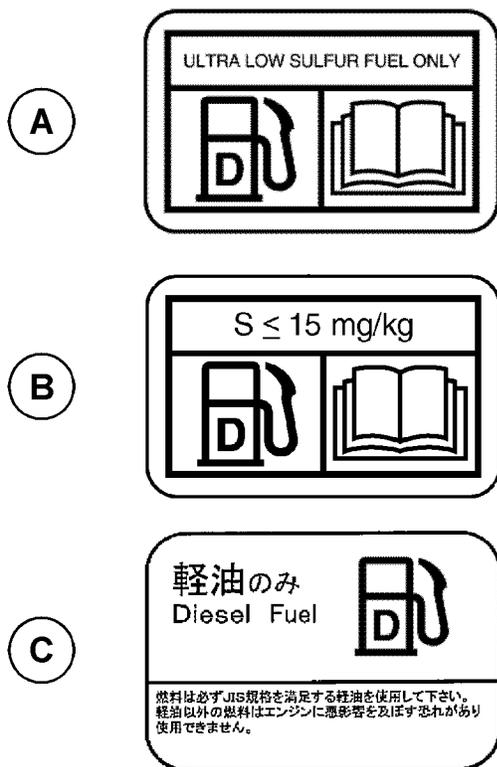


Illustration 45 g03218956

- (A) North America film
- (B) Europe, Africa, Middle East film
- (C) Japan film

Hydraulic Oil Level Check (12)

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

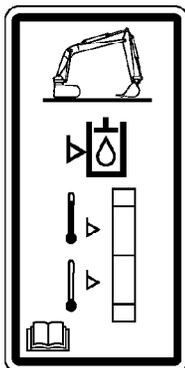


Illustration 46 g01069075

Check hydraulic oil level daily. See Operation and Maintenance Manual, “Hydraulic System Oil Level - Check” for details.

General Hazard Information

SMCS Code: 7000

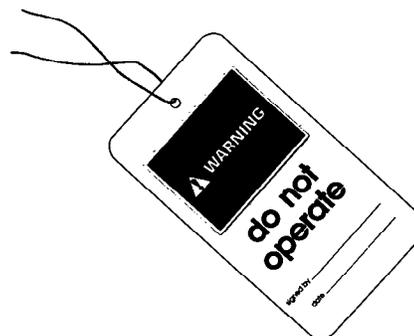


Illustration 47 g00104545

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.



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.

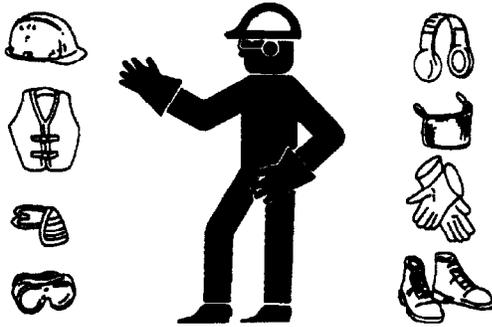


Illustration 48

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.

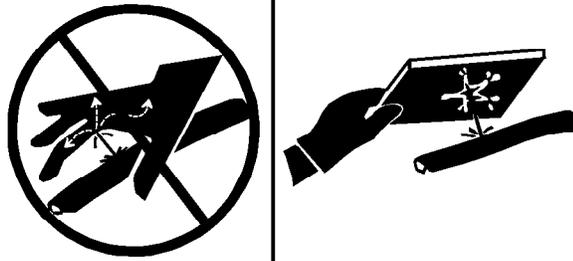


Illustration 49

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

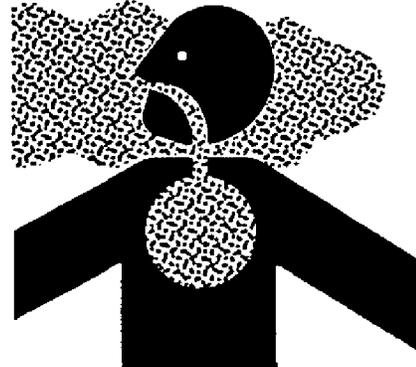


Illustration 50

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

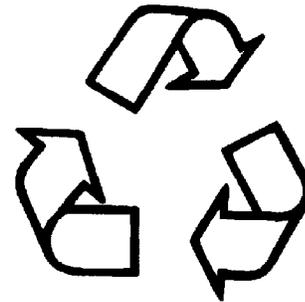


Illustration 51

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 52

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 53

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 54

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.

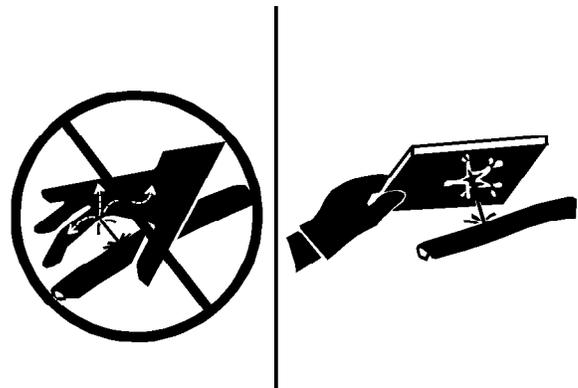


Illustration 55

g00687600

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

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

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

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

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

Ether

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

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

WARNING

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

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

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

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

Fire Extinguisher

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

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

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

i07041871

Fire Safety

SMCS Code: 7000

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

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

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

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

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

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

Notify emergency personnel of the fire and your location.

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

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

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

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

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

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

i02546320

Fire Extinguisher Location

SMCS Code: 7000; 7419

i06952417

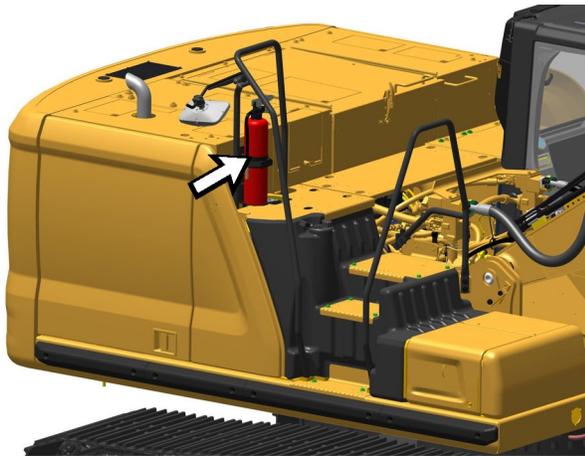


Illustration 56

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.

High Pressure Fuel Lines

SMCS Code: 1000; 1274; 7000

WARNING

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

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

This is because of the following differences:

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

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

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

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

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

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

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

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

i01122596

Electrical Storm Injury Prevention

SMCS Code: 7000

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

- Mount the machine.
- Dismount the machine.

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

i00771840

Before Starting Engine

SMCS Code: 1000; 7000

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

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

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

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

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

i07746368

Visibility Information

SMCS Code: 7000

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

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

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

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

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

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

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 57 to 59 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 60 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 57 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.

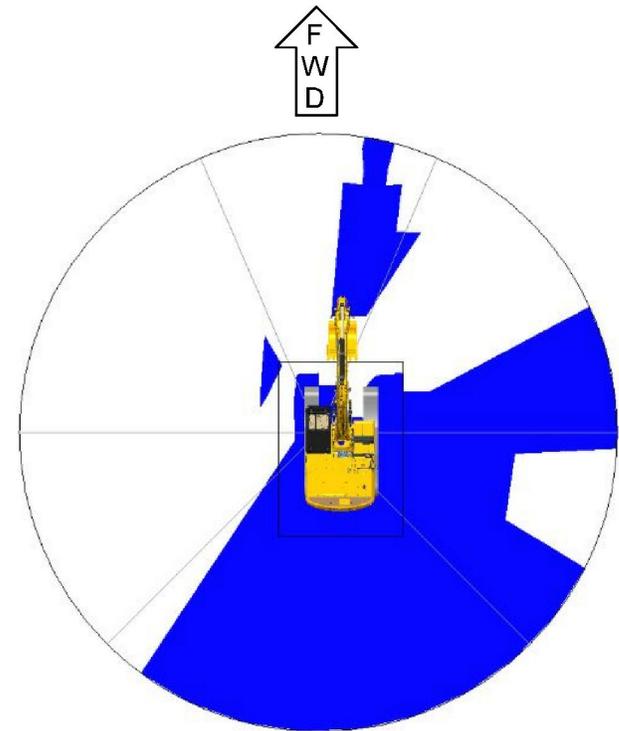


Illustration 57

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

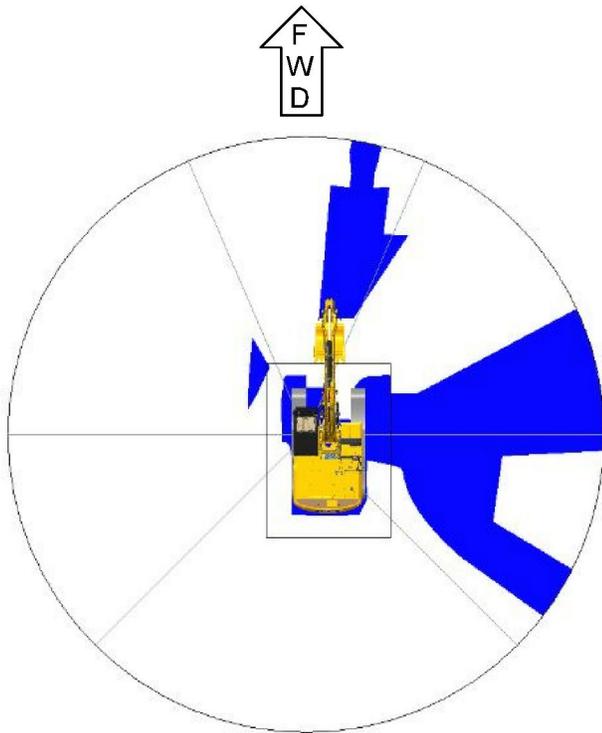


Illustration 58 g06366568
Top view of the machine, ground level visibility with available camera, left side mirror and right side mirror
(A) 12 m (39 ft)

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

Illustration 59 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.

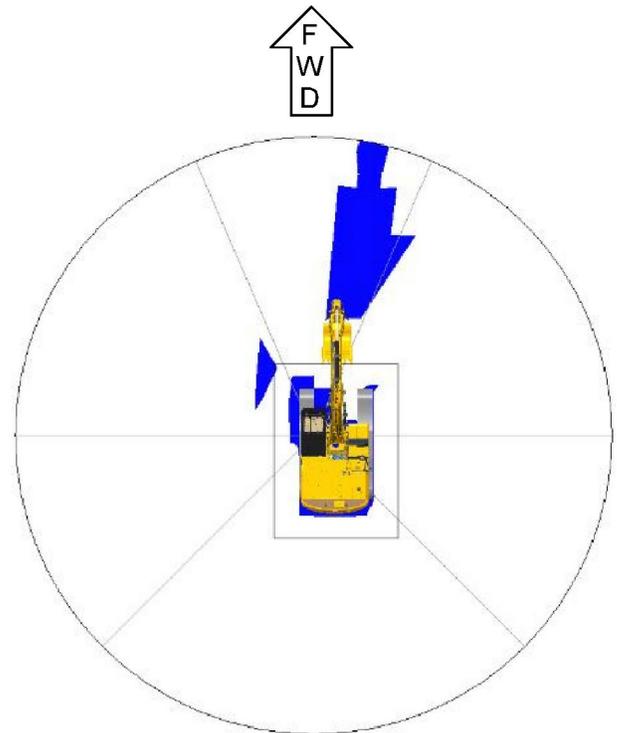


Illustration 59 g06356105
Top view of the machine, ground level visibility with rear camera, right side camera, left side mirror, and left side second mirror.
(A) 12 m (39 ft)

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 60 shows the machine in the travel position.

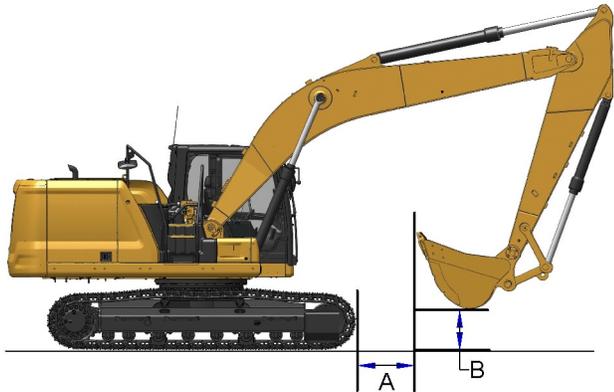


Illustration 60

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.

i07889511

Operation

SMCS Code: 7000

Machine Operating Temperature Range

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

Limiting Conditions and Criteria

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

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

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

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

Critical Failures

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

Table 1

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

(continued)

(Table 1, contd)

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

Machine Operation

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

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

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

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

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

Never use the work tool for a work platform.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Know the maximum dimensions of your machine.

Watch the load at all times.

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

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

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

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

Machine Operation when the Machine is not Completely Assembled

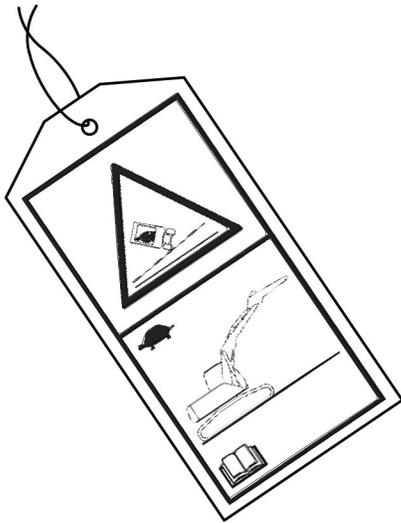


Illustration 61

g02202544

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

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

i06299648

Engine Stopping

SMCS Code: 1000; 7000

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

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

i06304391

Lifting Objects

SMCS Code: 7000

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

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

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

Contact your Cat dealer for additional information

i07749631

Demolition

SMCS Code: 6700

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

Note: Obey all local and government regulations.

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

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

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

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

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

i07857348

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 62

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.

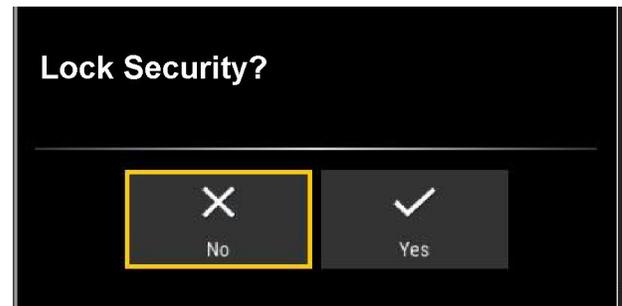


Illustration 63

g06217247

Note: Do not turn off the battery disconnect switch until 5 seconds have elapsed after turning the engine start switch to the OFF position. Do not turn off the battery disconnect switch while the "Lock Security?" screen is displayed on the monitor.

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:

i08229294

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.

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

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

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

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

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

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

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

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

Sound Level Information for Machines in Eurasian Economic Union Countries

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

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

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

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

Vibration Data for Track Type Excavator

Information Concerning Hand/Arm Vibration Level

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

Information Concerning Whole Body Vibration Level

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

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

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

It is not possible to get precise vibration levels for this machine. The expected vibration levels can be estimated with the information in Table 2 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 2

"ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment."							
Machine Type	Typical Operating Activity	Vibration Levels			Scenario Factors		
		X axis	Y axis	Z axis	X axis	Y axis	Z axis
Track Type Excavators	excavating	0,44	0,27	0,30	0,24	0,16	0,17
	hydraulic breaker application	0,53	0,31	0,55	0,30	0,18	0,28
	mining application	0,65	0,42	0,61	0,21	0,15	0,32
	transfer	0,48	0,32	0,79	0,19	0,20	0,23

Note: Refer to "ISO/TR 25398 Mechanical Vibration - Guideline for the assessment of exposure to whole body vibration of ride on operated earthmoving machines" for more information about vibration. This publication uses data that is measured by international institutes, organizations, and manufacturers. This document provides information about the whole body exposure of operators of earthmoving equipment. Refer to Operation and Maintenance Manual, SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC" for more information about machine vibration levels.

The Caterpillar suspension seat meets the criteria of "ISO 7096". This represents vertical vibration level under severe operating conditions.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

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

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer 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 it is necessary to go over rough terrain.
8. Minimize vibrations for a long work cycle or a long travel distance.
 - a. Use machines that are equipped with suspension systems.
 - b. Use the ride control system on track type excavators.
 - c. If no ride control system is available, reduce speed 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.

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Sources

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

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

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

Refer to Operation and Maintenance Manual, SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC" for more information about vibration.

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

Use the following web site to find your local dealer:

Caterpillar, Inc.
www.cat.com

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Operator Station

SMCS Code: 7300; 7301; 7325

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

Guards (Operator Protection)

SMCS Code: 7000; 7150

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

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

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

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

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

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

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

Other Guards (If Equipped)

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

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

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

- Demolition applications
- Rock quarries
- Forestry products

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

Product Information Section

General Information

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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 Operation and Maintenance Manual, "Decommissioning and Disposal".

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

- Perform regular preventive maintenance procedures as described in the Operation and Maintenance Manual.
- Perform machine inspections as described in the Operation and Maintenance Manual and correct any problems discovered.
- Perform system testing as described in the Operation and Maintenance Manual and correct any problems discovered.

- Ensure that machine application conditions comply with Caterpillar's recommendations.
- Ensure that the operating weight does not exceed limits set by manufacturer.
- Ensure that all frame cracks are identified, inspected, and repaired to prevent further development.

Application/Configuration Restrictions

The maximum travel operating slope for machine lubrication is 35 degrees

The operator station is ROPS certified up to a mass of 36100 kg (79587 lb) per ISO 12117-2:2008.

Specification Data

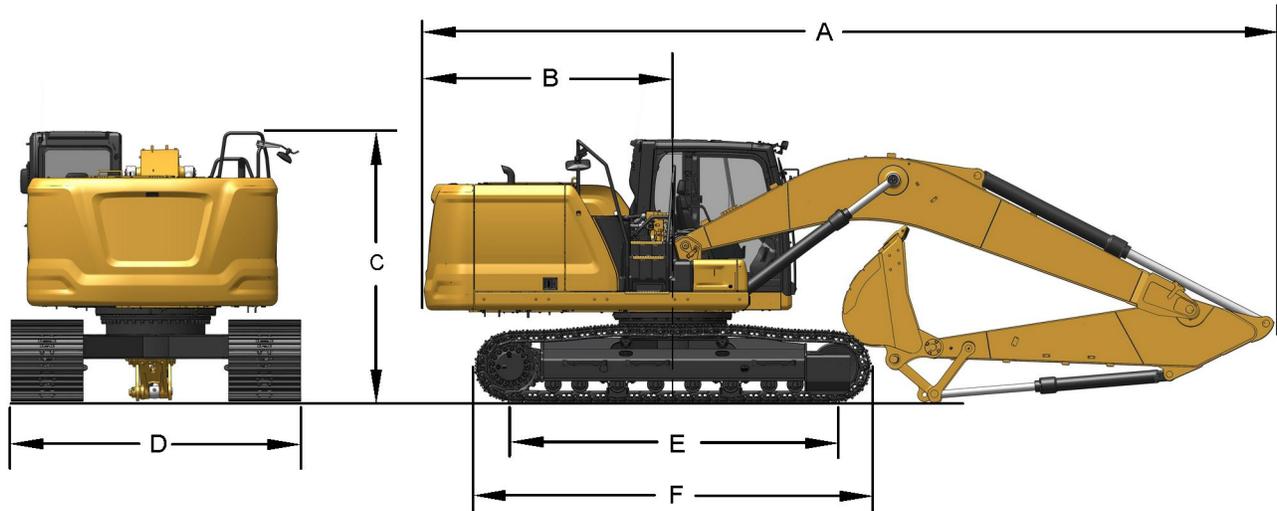


Illustration 64

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Table 3

330 GC Specifications			
Boom	Reach Boom		Mass Boom
Stick	3.2 m (10 ft 6 inch)	2.65 m (8 ft 8 inch)	2.5 m (8 ft 2 inch)
Bucket	1.54 m ³ (2.01 yd ³)	1.54 m ³ (2.01 yd ³)	2.12 m ³ (2.80 yd ³)
Weight	27219 kg ⁽¹⁾ (60890 lb)	27119 kg ⁽¹⁾ (60669 lb)	27988 kg ⁽¹⁾ (62585 lb)
Overall Length (A)	10390 mm (34 ft 1 inch)	10400 mm (34 ft 1 inch)	9830 mm (32 ft 3 inch)
Swing Radius (B)	3090 mm (10 ft 2 inch)		
Overall Height ⁽²⁾ (C)	3370 mm (11 ft 1 inch)	3450 mm (11 ft 4 inch)	3520 mm (11 ft 7 inch)
Overall Width (D)	600 mm (24 inch)	2990 mm (9 ft 10 inch)	
	700 mm (30 inch)	3090 mm (10 ft 2 inch)	
	800 mm (32 inch)	3190 mm (10 ft 6 inch)	

(continued)

Product Information Section
Specifications

(Table 3, contd)

330 GC Specifications			
Boom	Reach Boom		Mass Boom
Stick	3.2 m (10 ft 6 inch)	2.65 m (8 ft 8 inch)	2.5 m (8 ft 2 inch)
Bucket	1.54 m³ (2.01 yd³)	1.54 m³ (2.01 yd³)	2.12 m³ (2.80 yd³)
Length to Centers of Rollers (E)	3490 mm (11 ft 5 inch)		
Length of Track (F)	4350 mm (14 ft 3 inch)		

- (1) Approximate weight for machines equipped with 700 mm (30 inch) triple grouser track shoes, a 5800 kg (12787 lb) counterweight, and without a quick coupler.
 (2) Including track shoe lug height

Working Ranges

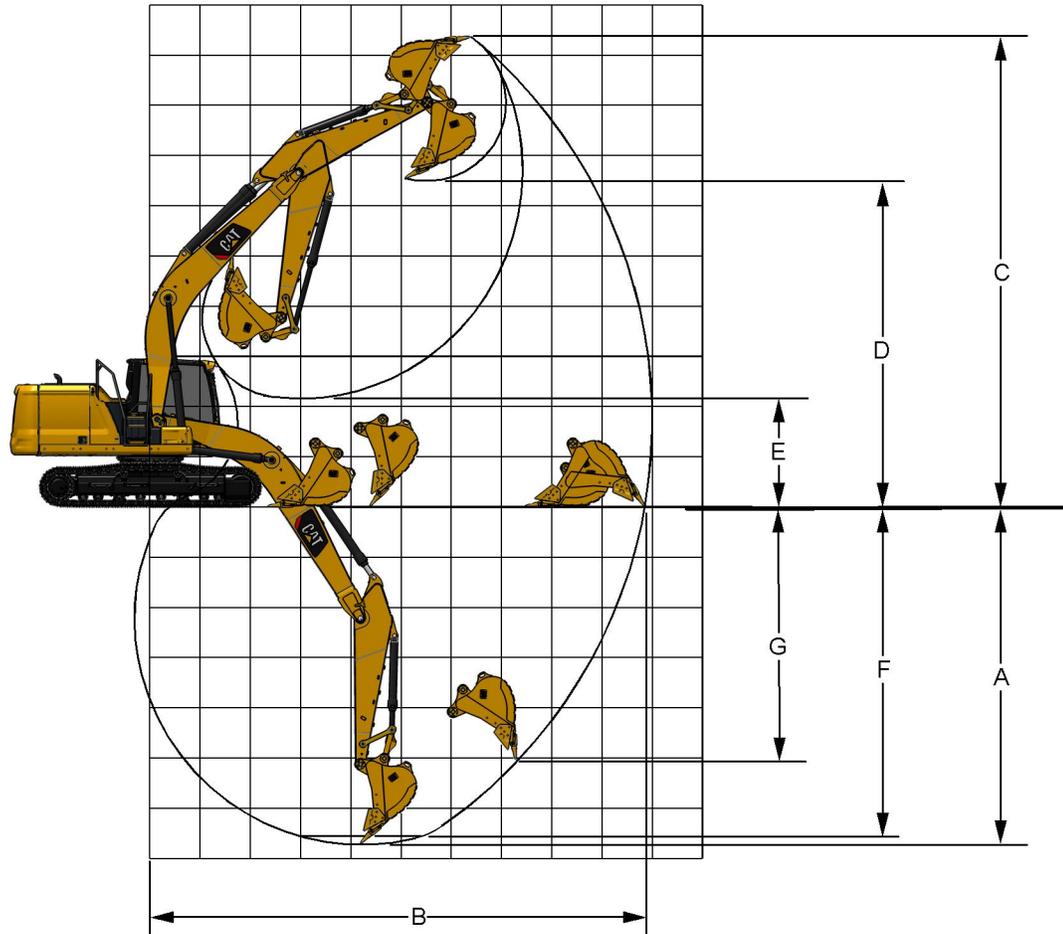


Illustration 65

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Table 4

330 GC			
Boom	Reach Boom		Mass Boom
Stick	3.2 m (10 ft 6 inch)	2.65 m (8 ft 8 inch)	2.5 m (8 ft 2 inch)
Bucket	1.54 m ³ (2.01 yd ³)	1.54 m ³ (2.01 yd ³)	2.12 m ³ (2.80 yd ³)
Maximum Digging Depth (A)	7250 mm (23 ft 9 inch)	6700 mm (22 ft 0 inch)	6100 mm (20 ft 0 inch)
Maximum Reach at Ground Level (B)	10680 mm (35 ft 0 inch)	10200 mm (33 ft 6 inch)	9430 mm (30 ft 11 inch)
Maximum Cutting Height (C)	10010 mm (32 ft 10 inch)	9900 mm (32 ft 6 inch)	9130 mm (29 ft 11 inch)

(continued)

(Table 4, contd)

330 GC			
Boom	Reach Boom		Mass Boom
Stick	3.2 m (10 ft 6 inch)	2.65 m (8 ft 8 inch)	2.5 m (8 ft 2 inch)
Bucket	1.54 m ³ (2.01 yd ³)	1.54 m ³ (2.01 yd ³)	2.12 m ³ (2.80 yd ³)
Maximum Loading Height (D)	6950 mm (22 ft 10 inch)	6800 mm (22 ft 4 inch)	6000 mm (19 ft 8 inch)
Minimum Loading Height (E)	2290 mm (7 ft 6 inch)	2840 mm (9 ft 4 inch)	2470 mm (8 ft 1 inch)
Maximum Cut Depth (F) ⁽¹⁾	7090 mm (23 ft 3 inch)	6520 mm (21 ft 5 inch)	5910 mm (19 ft 5 inch)
Maximum Digging Depth (Vertical Wall) (G)	5980 mm (19 ft 7 inch)	5680 mm (18 ft 8 inch)	4250 mm (13 ft 11 inch)

⁽¹⁾ 2440 mm (8 ft) level bottom

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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 in order to meet the needs of various applications.

Buckets are grouped into families according to the capacity of the bucket. Generally, 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.

Contact 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.

330 GC

Table 5

330 GC Excavator without a quick coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
General Duty (GD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	659 kg (1454 lb)	100	(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	731 kg (1611 lb)		(1)	(1)
		1000 mm (40 inch)	1.03 m ³ (1.35 yd ³)	835 kg (1841 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	865 kg (1906 lb)		(1)	(1)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	928 kg (2047 lb)		(1)	(1)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1011 kg (2228 lb)		(2)	(3)
		1400 mm (55 inch)	1.54 m ³ (2.02 yd ³)	1125 kg (2480 lb)		(2)	(3)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1075 kg (2370 lb)		(3)	(3)
		1600 mm (63 inch)	1.86 m ³ (2.43 yd ³)	1099 kg (2423 lb)		(3)	(4)
General Duty Capacity (GDC)	CB	600 mm (24 inch)	0.63 m ³ (0.83 yd ³)	724 kg (1597 lb)	100	(1)	(1)
		750 mm (30 inch)	0.86 m ³ (1.13 yd ³)	811 kg (1788 lb)		(1)	(1)
		900 mm (36 inch)	1.09 m ³ (1.43 yd ³)	908 kg (2002 lb)		(1)	(1)
		1050 mm (42 inch)	1.34 m ³ (1.75 yd ³)	980 kg (2161 lb)		(1)	(2)
		1200 mm (48 inch)	1.58 m ³ (2.07 yd ³)	1072 kg (2363 lb)		(2)	(3)
		1350 mm (54 inch)	1.83 m ³ (2.40 yd ³)	1166 kg (2570 lb)		(3)	(4)
Heavy Duty (HD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	733 kg (1616 lb)	100	(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	851 kg (1876 lb)		(1)	(1)
		900 mm (36 inch)	0.91 m ³ (1.19 yd ³)	945 kg (2084 lb)		(1)	(1)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 5, contd)

330 GC Excavator without a quick coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	1041 kg (2295 lb)		(1)	(1)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	1159 kg (2556 lb)		(1)	(2)
		1250 mm (49 inch)	1.33 m ³ (1.74 yd ³)	1158 kg (2554 lb)		(1)	(2)
		1300 mm (51 inch)	1.36 m ³ (1.78 yd ³)	1173 kg (2587 lb)		(1)	(2)
		1350 mm (53 inch)	1.45 m ³ (1.90 yd ³)	1194 kg (2633 lb)		(2)	(3)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1212 kg (2672 lb)		(2)	(3)
		1400 mm (55 inch)	1.54 m ³ (2.02 yd ³)	1263 kg (2784 lb)		(2)	(3)
		1450 mm (57 inch)	1.57 m ³ (2.16 yd ³)	1308 kg (2884 lb)		(3)	(3)
		1500 mm (60 inch)	1.65 m ³ (2.30 yd ³)	1306 kg (2879 lb)		(3)	(4)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1306 kg (2879 lb)		(3)	(4)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1383 kg (3048 lb)		(4)	(5)
Heavy Duty Power (HDP)	CB	1050 mm (42 inch)	1.12 m ³ (1.47 yd ³)	1070 kg (2360 lb)	100	(1)	(1)
		1200 mm (48 inch)	1.33 m ³ (1.73 yd ³)	1148 kg (2532 lb)		(1)	(2)
		1350 mm (54 inch)	1.53 m ³ (2.01 yd ³)	1253 kg (2762 lb)		(2)	(3)
Heavy Duty Excavation (HDX)	CB	1300 mm (51 inch)	1.10 m ³ (1.44 yd ³)	1110 kg (2447 lb)	100	(1)	(1)
		1450 mm (57 inch)	1.30 m ³ (1.70 yd ³)	1213 kg (2674 lb)		(1)	(2)
Severe Duty (SD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	755 kg (1665 lb)	90	(1)	(1)
		600 mm (24 inch)	0.51 m ³ (0.66 yd ³)	832 kg (1835 lb)		(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	915 kg (2017 lb)		(1)	(1)

(continued)

(Table 5, contd)

330 GC Excavator without a quick coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		900 mm (36 inch)	0.91 m ³ (1.19 yd ³)	1000 kg (2204 lb)		(1)	(1)
		900 mm (36 inch)	0.88 m ³ (1.16 yd ³)	1062 kg (2341 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	1099 kg (2424 lb)		(1)	(1)
		1050 mm (42 inch)	1.08 m ³ (1.42 yd ³)	1170 kg (2580 lb)		(1)	(1)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	1177 kg (2596 lb)		(1)	(1)
		1200 mm (48 inch)	1.28 m ³ (1.68 yd ³)	1257 kg (2772 lb)		(1)	(1)
		1300 mm (51 inch)	1.36 m ³ (1.78 yd ³)	1321 kg (2911 lb)		(1)	(2)
		1350 mm (54 inch)	1.56 m ³ (2.04 yd ³)	1239 kg (2731 lb)		(2)	(3)
		1350 mm (54 inch)	1.45 m ³ (1.90 yd ³)	1346 kg (2967 lb)		(2)	(2)
		1400 mm (56 inch)	1.54 m ³ (2.02 yd ³)	1421 kg (3133 lb)		(2)	(3)
Maximum load pin-on (payload + bucket)						3945 kg (8697 lb)	3585 kg (7904 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 6

330 GC Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
General Duty (GD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	659 kg (1454 lb)	100	(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	731 kg (1611 lb)		(1)	(1)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 6, contd)

330 GC Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		1000 mm (40 inch)	1.03 m ³ (1.35 yd ³)	835 kg (1841 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	865 kg (1906 lb)		(1)	(2)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	928 kg (2047 lb)		(2)	(3)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1011 kg (2228 lb)		(3)	(4)
		1400 mm (55 inch)	1.54 m ³ (2.02 yd ³)	1125 kg (2480 lb)		(3)	(4)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1075 kg (2370 lb)		(4)	(5)
		1600 mm (63 inch)	1.86 m ³ (2.43 yd ³)	1099 kg (2423 lb)		(4)	(5)
General Duty Capacity (GDC)	CB	600 mm (24 inch)	0.63 m ³ (0.83 yd ³)	724 kg (1597 lb)	100	(1)	(1)
		750 mm (30 inch)	0.86 m ³ (1.13 yd ³)	811 kg (1788 lb)		(1)	(1)
		900 mm (36 inch)	1.09 m ³ (1.43 yd ³)	908 kg (2002 lb)		(1)	(2)
		1050 mm (42 inch)	1.34 m ³ (1.75 yd ³)	980 kg (2161 lb)		(2)	(3)
		1200 mm (48 inch)	1.58 m ³ (2.07 yd ³)	1072 kg (2363 lb)		(3)	(4)
		1350 mm (54 inch)	1.83 m ³ (2.40 yd ³)	1166 kg (2570 lb)		(4)	(5)
Heavy Duty (HD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	733 kg (1616 lb)	100	(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	851 kg (1876 lb)		(1)	(1)
		900 mm (36 inch)	0.91 m ³ (1.19 yd ³)	945 kg (2084 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	1041 kg (2295 lb)		(1)	(2)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	1159 kg (2556 lb)		(3)	(3)
		1250 mm (49 inch)	1.33 m ³ (1.74 yd ³)	1158 kg (2554 lb)		(3)	(3)

(continued)

(Table 6, contd)

330 GC Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		1300 mm (51 inch)	1.36 m ³ (1.78 yd ³)	1173 kg (2587 lb)		(3)	(4)
		1350 mm (53 inch)	1.45 m ³ (1.90 yd ³)	1194 kg (2633 lb)		(3)	(4)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1212 kg (2672 lb)		(3)	(4)
		1400 mm (55 inch)	1.54 m ³ (2.02 yd ³)	1263 kg (2784 lb)		(4)	(4)
		1450 mm (57 inch)	1.57 m ³ (2.16 yd ³)	1308 kg (2884 lb)		(4)	(5)
		1500 mm (60 inch)	1.65 m ³ (2.30 yd ³)	1306 kg (2879 lb)		(4)	(5)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1306 kg (2879 lb)		(4)	(5)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1383 kg (3048 lb)		(5)	(6)
Heavy Duty Power (HDP)	CB	1050 mm (42 inch)	1.12 m ³ (1.47 yd ³)	1070 kg (2360 lb)	100	(1)	(2)
		1200 mm (48 inch)	1.33 m ³ (1.73 yd ³)	1148 kg (2532 lb)		(2)	(3)
		1350 mm (54 inch)	1.53 m ³ (2.01 yd ³)	1253 kg (2762 lb)		(4)	(4)
Heavy Duty Excavation (HDX)	CB	1300 mm (51 inch)	1.10 m ³ (1.44 yd ³)	1110 kg (2447 lb)	100	(1)	(2)
		1450 mm (57 inch)	1.30 m ³ (1.70 yd ³)	1213 kg (2674 lb)		(3)	(4)
Severe Duty (SD)	CB	600 mm (24 inch)	0.52 m ³ (0.68 yd ³)	755 kg (1665 lb)	90	(1)	(1)
		600 mm (24 inch)	0.51 m ³ (0.66 yd ³)	832 kg (1835 lb)		(1)	(1)
		750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	915 kg (2017 lb)		(1)	(1)
		900 mm (36 inch)	0.91 m ³ (1.19 yd ³)	1000 kg (2204 lb)		(1)	(1)
		900 mm (36 inch)	0.88 m ³ (1.16 yd ³)	1062 kg (2341 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	1099 kg (2424 lb)		(1)	(2)

(continued)

Product Information Section
Boom/Stick/Bucket Combinations

(Table 6, contd)

330 GC Excavator with Pin Grabber Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		1050 mm (42 inch)	1.08 m ³ (1.42 yd ³)	1170 kg (2580 lb)		(1)	(2)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	1177 kg (2596 lb)		(2)	(3)
		1200 mm (48 inch)	1.28 m ³ (1.68 yd ³)	1257 kg (2772 lb)		(2)	(3)
		1300 mm (51 inch)	1.36 m ³ (1.78 yd ³)	1321 kg (2911 lb)		(2)	(4)
		1350 mm (54 inch)	1.56 m ³ (2.04 yd ³)	1239 kg (2731 lb)		(3)	(4)
		1350 mm (54 inch)	1.45 m ³ (1.90 yd ³)	1346 kg (2967 lb)		(3)	(4)
		1400 mm (56 inch)	1.54 m ³ (2.02 yd ³)	1421 kg (3133 lb)		(3)	(4)
Maximum load pin-on (payload + bucket)						3419 kg (7537 lb)	3059 kg (6743 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

Table 7

330 GC Excavator with CW-40 Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
General Duty (GD)	CB	750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	634 kg (1399 lb)	100	(1)	(1)
		900 mm (36 inch)	0.91 m ³ (1.19 yd ³)	730 kg (1610 lb)		(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	806 kg (1777 lb)		(1)	(1)
		1200 mm (48 inch)	1.33 m ³ (1.74 yd ³)	870 kg (1918 lb)		(1)	(2)

(continued)

(Table 7, contd)

330 GC Excavator with CW-40 Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
		1200 mm (48 inch)	1.29 m ³ (1.69 yd ³)	894 kg (1971 lb)		(1)	(2)
		1300 mm (51 inch)	1.44 m ³ (1.88 yd ³)	960 kg (2117 lb)		(2)	(3)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	951 kg (2097 lb)		(2)	(3)
		1400 mm (55 inch)	1.57 m ³ (2.05 yd ³)	1003 kg (2211 lb)		(3)	(3)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1017 kg (2242 lb)		(3)	(4)
		1500 mm (59 inch)	1.71 m ³ (2.24 yd ³)	1047 kg (2308 lb)		(3)	(4)
		1600 mm (63 inch)	1.86 m ³ (2.43 yd ³)	1113 kg (2453 lb)		(4)	(4)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1099 kg (2422 lb)		(4)	(5)
Heavy Duty (HD)	CB	1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	945 kg (2083 lb)	100	(1)	(1)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1088 kg (2398 lb)		(3)	(3)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1258 kg (2774 lb)		(4)	(5)
Severe Duty (SD)	CB	1050 mm (42 inch)	1.13 m ³ (1.48 yd ³)	1013 kg (2233 lb)	100	(1)	(1)
		1350 mm (54 inch)	1.56 m ³ (2.04 yd ³)	1201 kg (2647 lb)		(3)	(4)
Maximum load pin-on (payload + bucket)						3652 kg (8051 lb)	3292 kg (7258 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.

Product Information Section
Boom/Stick/Bucket Combinations

Table 8

330 GC Excavator with CW-45 Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
General Duty (GD)	CB	1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1075 kg (2370 lb)	100	(1)	(1)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1159 kg (2555 lb)		(1)	(2)
Heavy Duty (HD)	CB	1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1148 kg (2530 lb)	100	(3)	(1)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1245 kg (2746 lb)		(1)	(2)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1318 kg (2906 lb)		(2)	(2)
Maximum load pin-on (payload + bucket)						3510 kg (7738 lb)	3150 kg (6945 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) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.

Table 9

330 GC Excavator with CW-45S Coupler							
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Reach Boom	
						5800 kg (12785 lb) Counterweight	
						2.65 m (8 ft 10 inch) Stick	3.2 m (10 ft 6 inch) Stick
General Duty (GD)	CB	750 mm (30 inch)	0.71 m ³ (0.93 yd ³)	693 kg (1529 lb)	100	(1)	(1)
		1050 mm (42 inch)	1.12 m ³ (1.46 yd ³)	948 kg (2090 lb)		(1)	(2)
		1350 mm (54 inch)	1.54 m ³ (2.02 yd ³)	1144 kg (2521 lb)		(3)	(4)
		1500 mm (60 inch)	1.76 m ³ (2.30 yd ³)	1243 kg (2741 lb)		(4)	(5)
		1650 mm (66 inch)	1.97 m ³ (2.58 yd ³)	1316 kg (2902 lb)		(5)	(5)
Maximum load pin-on (payload + bucket)						3540 kg (7804 lb)	3180 kg (7011 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 10

330 Excavator without a quick coupler						
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Long Undercarriage
						Mass Boom
						5800 kg (12785 lb) Counterweight
						2.5 m (8 ft 2 inch) Stick
General Duty (GD)	DB	1350 mm (53 inch)	1.64 m ³ (2.14 yd ³)	1186 kg (2614 lb)	100	(1)
		1650 mm (65 inch)	2.12 m ³ (2.77 yd ³)	1366 kg (3012 lb)		(2)
		1800 mm (71 inch)	2.36 m ³ (3.08 yd ³)	1445 kg (3186 lb)		(3)
Heavy Duty (HD)	DB	1350 mm (54 inch)	1.64 m ³ (2.14 yd ³)	1461 kg (3220 lb)	100	(1)
		1400 mm (55 inch)	1.64 m ³ (2.14 yd ³)	1523 kg (3358 lb)		(1)
		1500 mm (60 inch)	1.88 m ³ (2.46 yd ³)	1646 kg (3629 lb)		(2)
		1500 mm (61 inch)	1.88 m ³ (2.46 yd ³)	1633 kg (3601 lb)		(2)
		1550 mm (61 inch)	1.88 m ³ (2.46 yd ³)	1621 kg (3574 lb)		(2)
		1650 mm (66 inch)	2.12 m ³ (2.77 yd ³)	1690 kg (3726 lb)		(3)
		1650 mm (67 inch)	2.12 m ³ (2.77 yd ³)	1731 kg (3817 lb)		(3)
		1700 mm (67 inch)	2.12 m ³ (2.77 yd ³)	1719 kg (3790 lb)		(3)
Severe Duty (SD)	DB	1500 mm (60 inch)	1.91 m ³ (2.50 yd ³)	1677 kg (3696 lb)	90	(2)
		1650 mm (66 inch)	2.15 m ³ (2.81 yd ³)	1815 kg (4002 lb)		(3)
Extreme Duty (XD)	DB	1400 mm (56 inch)	1.64 m ³ (2.14 yd ³)	1892 kg (4171 lb)	90	(1)
Maximum load pin-on (payload + bucket)						5000 kg (11023 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 11

330 Excavator with Pin Grabber Coupler						
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Long Undercarriage
						Mass Boom
						5800 kg (12785 lb) Counterweight
						2.5 m (8 ft 2 inch) Stick
General Duty (GD)	DB	1350 mm (53 inch)	1.64 m ³ (2.14 yd ³)	1186 kg (2614 lb)	100	(1)
		1650 mm (65 inch)	2.12 m ³ (2.77 yd ³)	1366 kg (3012 lb)		(2)
		1800 mm (71 inch)	2.36 m ³ (3.08 yd ³)	1445 kg (3186 lb)		(3)
Heavy Duty (HD)	DB	1350 mm (54 inch)	1.64 m ³ (2.14 yd ³)	1461 kg (3220 lb)	100	(4)
		1400 mm (55 inch)	1.64 m ³ (2.14 yd ³)	1523 kg (3358 lb)		(2)
		1500 mm (60 inch)	1.88 m ³ (2.46 yd ³)	1646 kg (3629 lb)		(2)
		1500 mm (61 inch)	1.88 m ³ (2.46 yd ³)	1633 kg (3601 lb)		(2)
		1550 mm (61 inch)	1.88 m ³ (2.46 yd ³)	1621 kg (3574 lb)		(3)
		1650 mm (66 inch)	2.12 m ³ (2.77 yd ³)	1690 kg (3726 lb)		(3)
		1650 mm (67 inch)	2.12 m ³ (2.77 yd ³)	1731 kg (3817 lb)		(3)
		1700 mm (67 inch)	2.12 m ³ (2.77 yd ³)	1719 kg (3790 lb)		(2)
Severe Duty (SD)	DB	1500 mm (60 inch)	1.91 m ³ (2.50 yd ³)	1677 kg (3696 lb)	90	(2)
		1650 mm (66 inch)	2.15 m ³ (2.81 yd ³)	1815 kg (4002 lb)		(2)
Extreme Duty (XD)	DB	1400 mm (56 inch)	1.64 m ³ (2.14 yd ³)	1892 kg (4171 lb)	90	(4)
Maximum load pin-on (payload + bucket)						4474 kg (9863 lb)

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

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

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

(4) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.

Table 12

330 Excavator with CW-45S Coupler						
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	Long Undercarriage
						Mass Boom
						5800 kg (12785 lb) Counterweight
						2.5 m (8 ft 2 inch) Stick
General Duty (GD)	DB	1200 mm (47 inch)	1.40 m ³ (1.84 yd ³)	1077 kg (2374 lb)	100	(1)
		1500 mm (59 inch)	1.88 m ³ (2.46 yd ³)	1261 kg (2781 lb)		(2)
		1650 mm (65 inch)	2.12 m ³ (2.77 yd ³)	1340 kg (2955 lb)		(3)
Heavy Duty (HD)	DB	1350 mm (54 inch)	1.64 m ³ (2.14 yd ³)	1430 kg (3152 lb)	100	(2)
		1500 mm (60 inch)	1.88 m ³ (2.46 yd ³)	1527 kg (3366 lb)		(3)
		1650 mm (66 inch)	2.12 m ³ (2.77 yd ³)	1663 kg (3667 lb)		(4)
		1800 mm (72 inch)	2.36 m ³ (3.08 yd ³)	1763 kg (3887 lb)		(4)
Severe Duty (SD)	DB	1500 mm (60 inch)	1.91 m ³ (2.50 yd ³)	1648 kg (3632 lb)	100	(3)
		1650 mm (66 inch)	2.15 m ³ (2.81 yd ³)	1788 kg (3942 lb)		(4)
Maximum load pin-on (payload + bucket)						4595 kg (10130 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.

i08368764

Lifting Capacities (330 GC)

SMCS Code: 7000



WARNING

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

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

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

The lifting capacities are defined by "ISO 10567 2007". The lifting capacities are defined as the lower value of 75% of the static tipping capacity or 87% of the hydraulic lift capacity. Lifting capacities should be within 5% of the below values for machines with different shoes.

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
- Complete cab with a 75 kg (165 lb) operator

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

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

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

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 13

Configuration Identification		
Component	Configuration	Abbreviation
Front	Reach Boom	R
	Mass Boom	M
	Variable Angle Boom	VA
	Super Long Reach Boom	SLR
	Standard	STD
	Short Reach Stick	SR
	Severe Duty Bucket	SD
	Heavy Duty	HD
	Semi-Heavy Duty	S-HD
	Extreme Special	ES
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⁾

(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) **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 3.2 m (10 ft 6 inch) Reach Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
								
7500 300							* 5150 * 5150	7270 290
6000 240					* 7200 5150		* 11350 * 11350	4400 8230 330
4500 180				* 8400 7050 7100 5000	* 15300 11000		* 10750 * 9750	8830 350
3000 120			* 12950 10150	9700 6700 6900 4850 5250 3650	6700 6350 6700 4650 5150 3600		* 5000 * 3550 * 10950 * 7850	9140 360
1500 60			14550 9450 31250 20400	9300 6350 20050 13700 14450 10000 11050 7700	6700 4650 5150 3600		5000 3450 10950 7650	9190 370
0 0			14150 9150 30400 19650	9050 6150 19500 13200 14100 9750	6550 4500		5100 3550 11200 7750	8990 360
-1500 -60	* 6350 * 6350	* 10000 * 10000	14050 9050 30150 19450	8950 6000 19250 12950 14000 9600	6500 4450		5450 3800 12050 8300	8530 340
-3000 -120	* 11450 * 11450	* 16150 * 16150	14150 9100 30300 19600	8950 6050 19250 13000 14100 9700	6550 4500		6300 4350 13900 9600	7740 310
-4500 -180		* 18050 * 18050	* 13250 * 9300 * 28450 20050	9150 6200 19700 13400			8150 5600 18250 12500	6520 260

Illustration 66

g06475148

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

Product Information Section
330 GC

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 5200 * 15300 11100			* 4900 4450 * 10750 9850
4500 180				* 8400 7100 * 18250 15350	7150 5050			* 4850 3900 * 10650 8600
3000 120			* 12950 10250 * 27850 22050	9800 6750	7000 4900	5300 3700		* 5000 3600 * 10950 7950
1500 60			14700 9550 31550 20600	9400 6400	6800 4700	5200 3600		5050 3500 11100 7700
0			14300 9200 30700 19850	9150 6200	6650 4550			5150 3550 11300 7850
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	14200 9150	9050 6100	6550 4500			5500 3800 12150 8400
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	14250 9200	9050 6100	6600 4550			6350 4400 14050 9700
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 9400 * 28450 20250	9250 6250				8250 5650 18450 12600

Illustration 67

g06475152

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 5300 * 15300 11350			* 4900 4500 * 10750 10050
4500 180				* 8400 7250 * 18250 15600	7300 5150			* 4850 3950 * 10650 8800
3000 120			* 12950 10450 * 27850 22500	* 9800 6900 * 21250 14850	7100 5000	5400 3800		* 5000 3700 * 10950 8100
1500 60			15000 9750 32250 21000	9600 6550	6950 4800	5300 3700		5150 3600 11350 7900
0			14600 9400 31350 20250	9350 6300	6800 4650			5250 3650 11550 8000
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	14500 9350	9250 6200	6700 4600			5650 3900 12450 8600
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	14600 9400	9250 6250	6750 4650			6500 4450 14350 9900
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 9600 * 28450 20700	9450 6400				8400 5750 18850 12900

Illustration 68

g06475156

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Reach Boom with a 2.65 m (8 ft 8 inch) Reach Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)				
											
7500 300				* 17450 15700		* 6700 * 14900	6150 13850 6670 260				
6000 240				* 8150 * 17750	7250 15550	7150 * 14350	5050 10850 * 13950	6300 4850 10750 7700 300			
4500 180			* 11200 * 24000	10700 23100	* 9100 * 19750	6950 15000	7050 15150	5000 10700 13150 9300 4200 8340 330			
3000 120			* 14100 * 30300	9950 21450	9600 20700	6650 14300	6900 14800	4800 10350 5550 12200	3900 8660 8550 340		
1500 60			14450 31000	9350 20200	9300 19950	6350 13650	6700 14450	4650 10050	5400 11900	3750 8300 8720 350	
0 0			14200 30400	9150 19700	9100 19500	6150 13250	6600 14200	4550 9800	5550 12200	3850 8450 8510 340	
-1500 -60		* 9750 * 22250	* 9750 * 22250	14150 30350	9150 19850	9000 19400	6100 13100	6550 14150	4550 9750	6000 13250	4150 9200 8020 320
-3000 -120		* 18300 * 41700	18100 38750	14300 30650	9250 19900	9100 19550	6150 13250			7100 15700	4900 10850 7180 290
-4500 -180		* 15700	* 15700	* 11900 * 25400	9550 20550					* 8650 * 19000	6650 14950 5830 230

Illustration 69

g06475157

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)				
											
7500 300				* 17450 15850		* 6700 * 14900	6200 14000 6670 260				
6000 240				* 8150 * 17750	7300 15700	7200 * 14350	5100 10950 * 13950	6300 4900 10850 7700 300			
4500 180			* 11200 * 24000	10800 23300	* 9100 * 19750	7050 15150	7100 15300	5000 10800	6000 13300	4250 9400 8340 330	
3000 120			* 14100 * 30300	10000 21650	9700 20900	6700 14400	6950 14950	4850 10450	5600 12300	3900 8650 8660 340	
1500 60			14550 31300	9450 20400	9350 20150	6400 13800	6800 14600	4700 10150	5450 12000	3800 8400 8720 350	
0 0			14300 30750	9250 19900	9150 19700	6200 13350	6650 14350	4600 9900	5600 12300	3900 8550 8510 340	
-1500 -60		* 9750 * 22250	* 9750 * 22250	14300 30650	9250 19850	9100 19600	6150 13250	6650 14300	4600 9850	6100 13400	4200 9300 8020 320
-3000 -120		* 18300 * 41700	18250 39100	14450 30950	9350 20100	9150 19750	6200 13400			7150 15850	4950 10950 7180 290
-4500 -180		* 15700	* 15700	* 11900 * 25400	9600 20750					* 8650 * 19000	6700 15100 5830 230

Illustration 70

g06475158

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 6700 6300 6670 * 14900 14250 260
6000 240				* 8150 7450 7350 5200 * 17750 16000 * 14350 11150	* 6300 5000 7700 * 13950 11100 300		
4500 180			* 11200 11000 * 9100 7150 7250 5150 * 24000 23750 * 19750 15450 15600 11000	* 6150 4350 8340 * 13600 9550 330			
3000 120			* 14100 10200 9900 6850 7100 4950 * 30300 22050 21300 14700 15250 10700	* 5700 4000 8660 * 12600 8800 340			
1500 60			14900 9650 9600 6550 6950 4800 31950 20800 20600 14050 14900 10350	* 5600 3900 8720 * 12300 8550 350			
0			14650 9450 9350 6350 6800 4700 31400 20300 20150 13650 14650 10150	* 4000 8510 * 12600 8750 340			
-1500 -60		* 9750 * 9750 14600 9450 9300 6300 6800 4700 * 22250 * 22250 31350 20250 20000 13550 14600 10100	* 6200 4300 8020 * 13700 9500 320				
-3000 -120		* 18300 * 18300 14750 9550 9350 6350 * 41700 39900 31650 20500 20150 13650	* 7300 5050 7180 * 16200 11200 290				
-4500 -180		* 15700 * 15700 * 11900 9800 * 25400 21150	* 8650 6850 5830 * 19000 15450 230				

Illustration 71

g06475159

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Mass Boom with a 2.5 m (8 ft 2 inch) Mass Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 7900 * 7900 5500 * 17550 * 17550 220
6000 240				* 8750 7100 * 19250 15200	* 7350 5850 6720 * 16200 13100 270		
4500 180			* 11150 10750 * 9450 6900 * 24000 23150 * 20500 14800	* 7000 4900 7440 15450 10800 300			
3000 120			* 13800 10000 9550 6550 6750 4700 * 29700 21550 20550 14100 14500 10050	* 6350 4400 7810 * 14000 9700 310			
1500 60			14500 9400 9250 6250 6600 4550 31100 20200 19850 13450 14200 9800	* 6150 4250 7870 * 13550 9350 310			
0			14150 9100 9000 6050 6500 4450 30350 19550 19400 13050 14050 9600	* 6350 4350 7640 * 14000 9600 300			
-1500 -60		* 16300 * 16300 14100 9050 8950 6000 * 37150 * 37150 30250 19450 19250 12950	* 7100 4850 7080 * 15600 10650 280				
-3000 -120		* 19200 18000 * 14100 9200 * 41500 38550 * 30350 19800	* 8900 6000 6110 * 19750 13350 240				

Illustration 72

g06475161

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

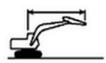
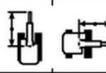
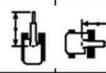
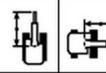
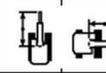
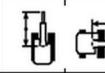
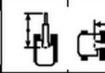
(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)	
								
7500 300						* 7900 * 17550	* 7900 * 17550 5500 220	
6000 240				* 8750 * 19250	7150 15350	* 7350 * 16200	5900 13250 6720 270	
4500 180			* 11150 * 24000	10850 23350	* 9450 * 20500	7050 15650	4900 10900 7440 300	
3000 120			* 13800 * 29700	10100 21750	9650 20750	6850 14250	4750 10150 6400 9800 7810 310	
1500 60			14650 31400	9450 20400	9300 20050	6300 13600	6700 14350	4600 9900 6250 13700 4300 9450 7870 310
0			14300 30650	9200 19750	9100 19600	6100 13200	6600 14200	4500 9700 6450 9700 4400 9700 7640 300
-1500 -60		* 16300 * 37150	* 16300 * 37150	14250 30550	9150 19650	9050 19450	6050 13050	7150 15800 4900 10750 7080 280
-3000 -120		* 19200 * 41500	18200 38950	* 14100 * 30350	9300 20000	9200 20000	6200	9000 19950 6050 13500 6110 240

Illustration 73

g06475162

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

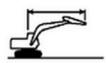
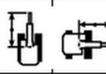
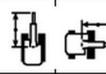
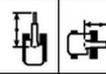
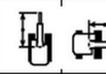
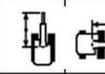
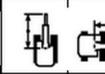
(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)	
								
7500 300						* 7900 * 17550	* 7900 * 17550 5500 220	
6000 240				* 8750 * 19250	7300 15650	* 7350 * 16200	6050 13500 6720 270	
4500 180			* 11150 * 24000	11050 23800	* 9450 * 20500	7200 15950	5050 11150 7440 300	
3000 120			* 13800 * 29700	10300 22150	9850 21200	6750 14550	7000 15000	4850 10400 6550 10000 7810 310
1500 60			14950 32050	9650 20800	9500 20450	6450 13900	6850 14700	4700 10100 6350 14000 4400 9650 7870 310
0			14600 31300	9400 20200	9300 20000	6250 13450	6750 14500	4600 9950 6600 9900 4500 9900 7640 300
-1500 -60		* 16300 * 37150	* 16300 * 37150	14550 31200	9350 20100	9250 19900	6200 13350	7300 16150 5000 11000 7080 280
-3000 -120		* 19200 * 41500	18550 39700	* 14100 * 30350	9500 20400	9400 20400	6350	9150 20400 6200 13800 6110 240

Illustration 74

g06475163

Lift Chart Above : 330 GC, 5800 kg (12790 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Reach Boom with a 3.2 m (10 ft 6 inch) Reach Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350 7270 290
6000 240					* 7200 5550 * 15300 11950			* 4900 4800 * 10750 10600 8230 330
4500 180				* 8400 7650 * 18250 16450	* 7600 5450 16400 11700			* 4850 4200 * 10650 9300 8830 350
3000 120			* 12950 11000 * 27850 23700	* 9800 7250 * 21250 15650	7450 5300 16000 11350	5650 4000		* 5000 3900 * 10950 8650 9140 360
1500 60			* 15450 10300 * 33350 22200	10050 6950 21550 14950	7250 5100 15550 10950	5550 3950 11950 8450		* 5300 3800 * 11650 8400 9190 370
0 0			15250 9950 32750 21450	9750 6700 21000 14450	7100 4950 15250 10650			5500 3900 12100 8550 8990 360
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	15150 9900 32500 21250	9900 6600 20750 14200	7000 4900 15100 10550			5900 4150 13000 9150 8530 340
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	15200 9950 32650 21400	9650 6600 20800 14250	7050 4950 15250 10650			6800 4750 15000 10500 7740 310
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 10150 * 28450 21900	* 9800 6800 * 20750 14650				* 8600 6100 * 18900 13650 6520 260

Illustration 75

g06475164

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350 7270 290
6000 240					* 7200 6200 * 15300 13300			* 4900 * 4900 * 10750 * 10750 8230 330
4500 180				* 8400 * 8400 * 18250 * 18250	* 7600 6050 * 16600 13050			* 4850 4700 * 10650 10400 8830 350
3000 120			* 12950 12350 * 27850 26650	* 9800 8100 * 21250 17500	* 8300 5900 * 18050 12650	* 5950 4500		* 5000 4400 * 10950 9650 9140 360
1500 60			* 15450 11650 * 33350 25150	* 11150 7800 * 24150 16750	8800 5700 18950 12300	6750 4400 * 12550 9450		* 5300 4300 * 11650 9400 9190 370
0 0			* 16600 11300 * 35950 24350	* 12050 7550 26000 16250	8650 5550 18650 12000			* 5850 4350 * 12800 9550 8990 360
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	16600 11250 35950 24150	12000 7450 25750 16000	8600 5500 18500 11850			* 6750 4650 * 14850 10250 8530 340
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	15600 11300 33700 24300	* 11700 7450 * 25300 16050	8650 5550 18600 11950			8300 5350 18350 11800 7740 310
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 11500 * 28450 24800	* 9800 7600 * 20750 16450				* 8600 6850 * 18900 15300 6520 260

Illustration 76

g06475167

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 5600 * 15300 12050			* 4900 4800 * 10750 10700
4500 180				* 8400 7700 * 18250 16550	* 7600 5500 * 16550 11800			* 4850 4250 * 10650 9400
3000 120			* 12950 11050 * 27850 23900	* 9800 7350 * 21250 15800	* 7500 5300 * 16150 11450	5700 4050		* 5000 3950 * 10950 8700
1500 60			* 15450 10400 * 33350 22400	10100 7000 21750 15050	7300 5150 15700 11050	5600 3950 12050 8550		* 5300 3850 * 11650 8450
0			15400 10050 33050 21650	9850 6750 21200 14550	7150 5000 15400 10800			5550 3900 12250 8600
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	15300 9950 32800 21450	9750 6650 20950 14350	7100 4950 15250 10650			5950 4200 13150 9250
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	15350 10050 32950 21600	9750 6650 21000 14400	7150 5000 15400 10750			6850 4800 15150 10600
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 10250 * 28450 22050	* 9800 6850 * 20750 14750				* 8600 6150 * 18900 13750

Illustration 77

g06475170

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 6250 * 15300 13400			* 4900 * 4900 * 10750 * 10750
4500 180				* 8400 * 8400 * 18250 * 18250	* 7600 6100 * 16600 13150			* 4850 4750 * 10650 10500
3000 120			* 12950 12500 * 27850 26900	* 9800 8200 * 21250 17650	* 8300 5950 * 18050 12800	* 5950 4550		* 5000 4450 * 10950 9750
1500 60			* 15450 11800 * 33350 25400	* 11150 7850 * 24150 16900	8900 5750 19150 12400	6800 4450 * 12550 9550		* 5300 4300 * 11650 9500
0			* 16600 11450 * 35950 24600	* 12050 7600 * 26050 16400	8750 5600 18850 12100			* 5850 4400 * 12800 9650
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	* 16600 11350 * 35950 24400	12100 7500 26000 16150	8700 5550 18700 11950			* 6750 4700 * 14850 10350
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	* 15600 11400 * 33700 24550	* 11700 7500 * 25300 16200	8750 5600 18800 12100			8350 5400 18500 11900
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 11650 * 28450 25000	* 9800 7700 * 20750 16600				* 8600 6900 * 18900 15450

Illustration 78

g06475172

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

Product Information Section
330 GC

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
								
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 5700 * 15300 12300			* 4900 * 4900 * 10750 * 10750
4500 180				* 8400 7850 * 18250 16850	* 7600 5600 * 16600 12050			* 4850 4350 * 10650 9550
3000 120			* 12950 11250 * 27850 24300	* 9800 7450 * 21250 16100	* 7650 5400 * 11650 8700	5800 4150		* 5000 4050 * 10950 8900
1500 60			* 15450 10600 * 33350 22850	10300 7150 22200 15350	7450 5250 16050 11300	5750 4050 12300 8700		* 5300 3950 * 11650 8650
0			15700 10250 33700 22100	10050 6900 21650 14850	7300 5100 15750 11000			5700 4000 12500 8800
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	15600 10150 33450 21900	9950 6800 21400 14600	7250 5050 15600 10850			6100 4300 13400 9400
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	* 15600 10250 33650 22000	9950 6800 21450 14650	7300 5100 15700 10950			7000 4900 15450 10800
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 10450 * 28450 22500	* 9800 6950 * 20750 15050				* 8600 6300 * 18900 14050

Illustration 79

g06475174

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300	9000 360		(mm) (inch)
								
7500 300								* 5150 * 5150 * 11350 * 11350
6000 240					* 7200 6350 * 15300 13650			* 4900 * 4900 * 10750 * 10750
4500 180				* 8400 * 8400 * 18250 * 18250	* 7600 6250 * 16600 13400			* 4850 4850 * 10650 * 10650
3000 120			* 12950 12700 * 27850 27350	* 9800 8350 * 21250 17950	* 8300 6050 * 18050 13000	* 5950 4600		* 5000 4500 * 10950 9950
1500 60			* 15450 12000 * 33350 25850	* 11150 8000 * 24150 17200	* 9050 5850 * 19550 12650	* 6800 4550 * 12550 9750		* 5300 4400 * 11650 9700
0			* 16600 11650 * 35950 25050	* 12050 7750 * 26050 16700	8950 5750 19200 12350			* 5850 4500 * 12800 9850
-1500 -60	* 6350 * 6350 * 14200 * 14200	* 10000 * 10000 * 22700 * 22700	* 16600 11550 * 35950 24850	* 12300 7650 * 26500 16450	8850 5650 19050 12200			* 6750 4800 * 14850 10550
-3000 -120	* 11450 * 11450 * 25650 * 25650	* 16150 * 16150 * 36750 * 36750	* 15600 11600 * 33700 25000	* 11700 7850 * 25300 16500	8900 5700 * 19100 12300			* 8450 5500 * 18750 12150
-4500 -180		* 18050 * 18050 * 38850 * 38850	* 13250 11850 * 28450 25500	* 9800 7850 * 20750 16900				* 8600 7050 * 18900 15750

Illustration 80

g06475177

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 3.2 m (10 ft 6 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Reach Boom with a 2.65 m (8 ft 8 inch) Reach Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
							
7500 300				* 17450	16950		* 6700 * 14900
6000 240				* 8150 * 17750	7800 16800	* 7650 * 14350	5500 11750
4500 180			* 11200 * 24000	* 11200 * 24000	* 9100 * 19750	7550 16250	7600 16300
3000 120			* 14100 * 30300	10800 23250	10300 22200	7200 15550	7400 11300
1500 60			15500 33350	10200 22000	10000 21500	6900 14900	7250 15600
0			15300 32800	10000 21500	9800 21050	6700 14500	7100 15350
-1500		* 9750	* 9750	15250	10000	9700	6650
-60		* 22250	* 22250	32700	21500	20900	14350
-3000		* 18300	* 18300	* 14950	10100	9800	6700
-120		* 41700	* 41700	* 32300	21750	21050	14500
-4500		* 15700	* 15700	* 11900	10350		
-180			* 25400	22350			

Illustration 81

g06475182

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
							
7500 300				* 17450	* 17450		* 6700 * 14900
6000 240				* 8150 * 17750	* 8150 * 17750	* 7650 * 14350	6100 13100
4500 180			* 11200 * 24000	* 11200 * 24000	* 9100 * 19750	8400 18100	* 8150 * 17800
3000 120			* 14100 * 30300	12150 26200	* 10450 * 22600	8050 17350	* 8750 * 19050
1500 60			* 15600 * 35000	11550 24900	* 11650 * 25150	7750 16700	8800 18950
0			* 16550 * 36450	11350 24400	12100 26050	7550 16300	8700 18700
-1500		* 9750	* 9750	* 16350	11350	12050	7500
-60		* 22250	* 22250	* 35500	24350	25900	16150
-3000		* 18300	* 18300	* 14950	11450	* 11350	7550
-120		* 41700	* 41700	* 32300	24600	* 24400	16300
-4500		* 15700	* 15700	* 11900	11750		
-180			* 25400	25250			

Illustration 82

g06475185

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

Product Information Section
330 GC

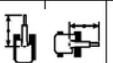
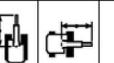
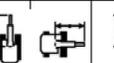
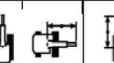
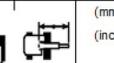
(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
							
7500 300				* 17450	17100		* 6700 * 14900
6000 240				* 8150	7900	* 7650	5550 * 6300
4500 180			* 11200	* 11200	* 9100	7600	7650 5450 * 6250
3000 120			* 14100	10850	10400	7250	7500 5300 6050
1500 60			* 15600	10300	10100	6950	7300 5150 5900
0			15400	10100	9900	6800	7200 5050 6050
-1500 -60		* 9750	* 9750	15400	10050	9800	6750 7150 5000
-3000 -120		* 18300	* 18300	* 14950	10200	9900	6800 7700 5400
-4500 -180		* 15700	* 15700	* 11900	10450		* 8650 7300 5830

Illustration 83

g06475188

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

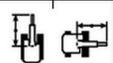
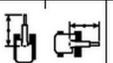
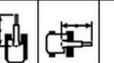
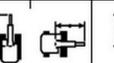
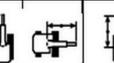
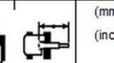
(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
							
7500 300				* 17450	* 17450		* 6700 * 14900
6000 240				* 8150	* 8150	* 7650	6150 * 6300
4500 180			* 11200	* 11200	* 9100	8500	* 8150 6100 * 6250
3000 120			* 14100	12250	* 10450	8150	* 8750 5900 * 6400
1500 60			* 15600	11700	* 11650	7850	8900 5750 * 6800
0			* 16550	11450	12250	7650	8800 5650 7350
-1500 -60		* 9750	* 9750	* 16350	11450	12150	7600 8750 5650
-3000 -120		* 18300	* 18300	* 14950	11550	* 11350	7650 * 8900 6050
-4500 -180		* 15700	* 15700	* 11900	11850		* 8650 8200 5830

Illustration 84

g06475227

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 6700 * 6700 * 14900 * 14900 6670 260
6000 240				* 17450 17400	* 8150 8000 * 7650 5650		* 6300 5400 * 13950 12050 7700 300
4500 180			* 11200 * 11200 * 9100 7750 7800 5550	* 19750 16700 16750 11950	* 14350 12100		* 6250 4700 * 13750 10450 8340 330
3000 120			* 14100 11050 * 10450 7400 7600 5400	* 22600 15950 16400 11650			6150 4400 13550 9650 8660 340
1500 60			* 15600 10500 10300 7100 7450 5250	34300 22650 22150 15300 16050 11300			6000 4250 13250 9350 8720 350
0			15750 10300 10100 6900 7350 5150	33750 22150 21700 14900 15800 11100			6150 4350 13600 9600 8510 340
-1500 -60		* 9750 * 9750	15700 10250 10000 6850 7300 5100				6700 4700 14750 10400 8020 320
-3000 -120		* 18300 * 18300 * 14950 10400 10100 6900	* 41700 * 41700 * 32300 22350 21700 14900				7850 5500 17450 12200 7180 290
-4500 -180		* 15700 * 15700 * 11900 10650	* 25400 22950				* 8650 7450 * 19000 16750 5830 230

Illustration 85

g06475228

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 6700 * 6700 * 14900 * 14900 6670 260
6000 240				* 17450 * 17450	* 8150 * 8150 * 7650 6300		* 6300 6000 * 13950 13400 7700 300
4500 180			* 11200 * 11200 * 9100 8600 * 8150 6200	* 19750 18550 * 17800 13300	* 14350 13450		* 6250 5250 * 13750 11600 8340 330
3000 120			* 14100 12450 * 10450 8250 * 8750 6050	* 30300 26900 * 22600 17850 * 19050 13000			6400 4900 14050 10750 8660 340
1500 60			* 15600 11900 * 11650 7950 9100 5850	* 35000 25600 * 25150 17150 19550 12650			6800 4750 14900 10500 8720 350
0			* 16550 11650 * 12300 7800 8950 5750	* 36450 25100 * 26650 16750 19300 12400			7500 4900 16500 10750 8510 340
-1500 -60		* 9750 * 9750	* 16350 11650 * 12250 7700 8950 5750				8150 5300 17950 11650 8020 320
-3000 -120		* 18300 * 18300 * 14950 11750 * 11350 7800	* 41700 * 41700 * 32300 25300 * 24400 16750				* 8900 6150 * 19600 13650 7180 290
-4500 -180		* 15700 * 15700 * 11900 * 11900	* 25400 * 25400				* 8650 8350 * 19000 18800 5830 230

Illustration 86

g06475229

Lift Chart Above : 330 GC Long Undercarriage, 6700 kg (14770 lb) counterweight, 6.15 m (20 ft 2 inch) reach boom, 2.65 m (8 ft 8 inch) reach stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Mass Boom with a 2.5 m (8 ft 2 inch) Mass Stick

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 7900 * 7900 5500 * 17550 * 17550 220
6000 240				* 8750 7650 * 19250 16450			* 7350 6350 6720 * 16200 14200 270
4500 180			* 11150 * 11150 * 24000 * 24000	* 9450 7450 * 20500 16050			* 7300 5300 7440 * 16050 11750 300
3000 120			* 13800 10850 * 29700 23350	10250 7150 22100 15350	7300 5150 15650 11000		6850 4800 7810 15100 10650 310
1500 60			15600 10200 33450 22000	9950 6850 21350 14700	7150 5000 15350 10750		6650 4650 7870 14650 10250 310
0 0			15250 9950 32700 21400	9700 6650 20900 14300	7050 4900 15150 10550		6900 4800 7640 15150 10550 300
-1500 -60		* 16300 * 16300 * 37150 * 37150	15200 9900 32600 21300	9650 6600 20800 14200			7650 5300 7080 16850 11700 280
-3000 -120		* 19200 * 19200 * 41500 * 41500	* 14100 10050 * 30350 21600	9800 6700			9600 6600 6110 21300 14600 240

Illustration 87

g06475231

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 600 mm (24 inch) triple grouser track shoes, and heavy lift OFF

(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300		(mm) (inch)
7500 300							* 7900 * 7900 5500 * 17550 * 17550 220
6000 240				* 8750 7750 * 19250 16600			* 7350 6400 6720 * 16200 14350 270
4500 180			* 11150 * 11150 * 24000 * 24000	* 9450 7500 * 20500 16150			* 7300 5350 7440 * 16050 11900 300
3000 120			* 13800 10950 * 29700 23550	10350 7200 22300 15500	7350 5150 15800 11100		6900 4850 7810 15250 10750 310
1500 60			15700 10300 33750 22200	10050 6900 21550 14850	7200 5050 15500 10850		6700 4700 7870 14800 10350 310
0 0			15400 10050 33000 21550	9800 6700 21100 14400	7100 4950 15300 10650		6950 4850 7640 15300 10650 300
-1500 -60		* 16300 * 16300 * 37150 * 37150	15350 10000 32900 21500	9750 6650 21000 14300			7700 5350 7080 17050 11800 280
-3000 -120		* 19200 * 19200 * 41500 * 41500	* 14100 10150 * 30350 21800	9900 6800			9650 6650 6110 21500 14750 240

Illustration 88

g06475234

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 700 mm (28 inch) triple grouser track shoes, and heavy lift OFF

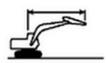
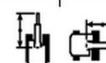
(mm) (inch)	1500 60	3000 120	4500 180	6000 240	7500 300			(mm) (inch)			
7500 300								* 7900 * 17550	* 7900 * 17550	5500 220	
6000 240				* 8750 * 19250	7850 16850			* 7350 * 16200	6550 14600	6720 270	
4500 180			* 11150 * 24000	* 11150 * 24000	* 9450 * 20500	7650 16450		* 7300 * 16050	5450 12100	7440 300	
3000 120			* 13800 * 29700	11150 24000	10550 22700	7350 15800	7500 16150	5300 11350	7050 15550	4950 10950	7810 310
1500 60			* 15950 * 34400	10500 22850	10250 22000	7050 15150	7350 15850	5150 11050	6850 15100	4800 10550	7870 310
0			15700 33700	10200 22000	10000 21550	6850 14700	7250 15650	5050 10900	7100 15600	4950 10850	7640 300
-1500		* 16300	* 16300	15650	10200	9950	6800	7900	5450	7080	
-60		* 37150	* 37150	33550	21900	21400	14600	17400	12050	280	
-3000		* 19200	* 19200	* 14100	10350	10100	6900	* 9850	6750	6110	
-120		* 41500	* 41500	* 30350	22250			* 21700	15050	240	

Illustration 89

g06475236

Lift Chart Above : 330 GC, 6700 kg (14770 lb) counterweight, 5.5 m (18 ft 2 inch) mass boom, 2.5 m (8 ft 2 inch) mass stick, 800 mm (32 inch) triple grouser track shoes, and heavy lift OFF

Identification Information

i08288047

Plate Locations and Film Locations

SMCS Code: 1000; 7000

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

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

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

Product Identification Number (PIN) and CE Plate



Illustration 90

g06184412

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

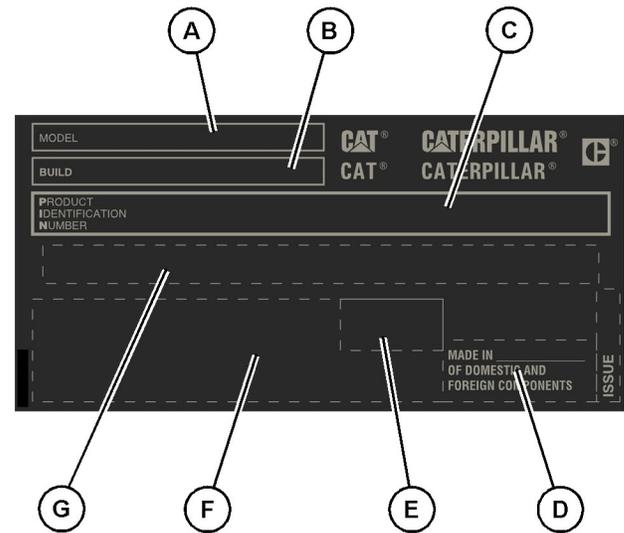


Illustration 91

g06184421

Model number (A) _____

Build (B) _____

Machine PIN (C) _____

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

Month and Year of Manufacture (If Required) (E) _____

Regional Certification Plate (If Required) (F) _____

Service Information Plate (G) _____

Local regulation may require documentation of the month and/or year of manufacture in the Operation and Maintenance Manual. Enter on line (E) above if required.

European Union

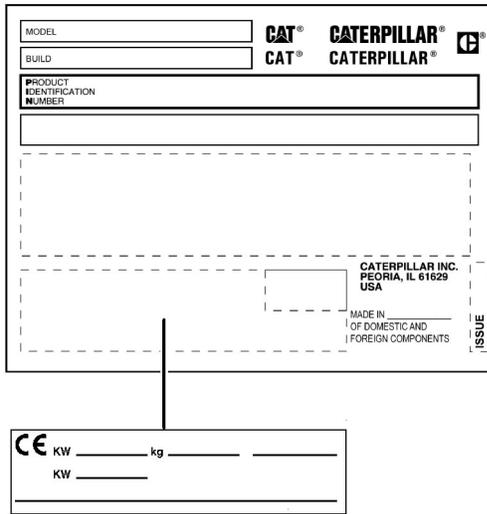


Illustration 92 g06201193

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

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

For machines compliant to 2006/42/EC, the following information is stamped onto the CE plate. For quick reference, record this information in the spaces that are provided below.

- Engine Power Primary Engine (kW) _____
- Engine Power for Additional Engine (kW) (If Equipped) _____
- Typical Machine Operating Weight for European Market (kg) _____
- Year of Construction _____
- Machine Type _____

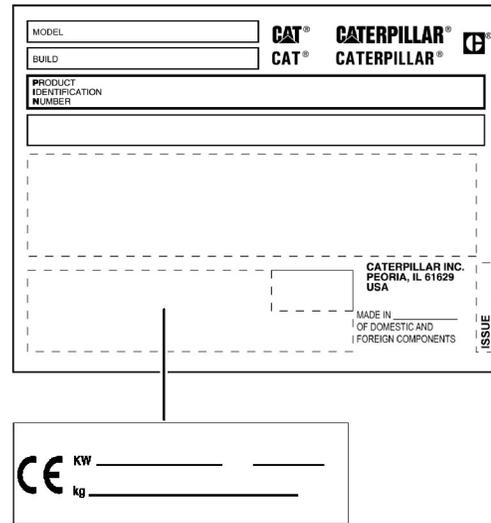


Illustration 93 g06201198

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

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

For machines compliant to 98/37/EC and 89/392/EEC, the following information is stamped onto the CE plate. For quick reference, record this information in the spaces that are provided below.

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

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

Eurasian Economic Union

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

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



Illustration 94 g06094564

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

MODEL	CAT® CATERPILLAR®
BUILD	CAT® CATERPILLAR®
PRODUCT IDENTIFICATION NUMBER	
CATERPILLAR INC. PEORIA, IL 61629 USA MADE IN _____ OF DOMESTIC AND FOREIGN COMPONENTS	
ISSUE	

ERI KW _____ kg _____
KW _____

Illustration 95 g06532250

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

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

Manufacturer Information

Manufacturer:

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

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

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

China Pin Plate

Will be located next to the pin plate or on the pin plate.

CAT® CATERPILLAR®		
卡特彼勒 徐州 有限公司 Caterpillar Xuzhou Ltd		
产品名称	履带式液压挖掘机	型号
发动机功率 (kW)		制造年份
机器识别号		
江苏省徐州市经济开发区		

Illustration 96 g03153576

Engine Serial Number

This label is located on the engine.

Engine Serial Number _____

Sound Certification Film

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

i08085827

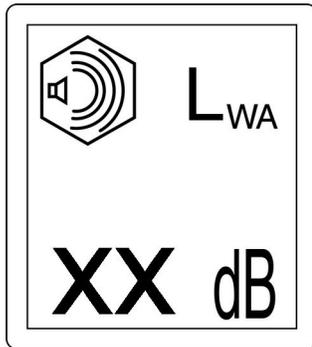


Illustration 97

g06248926

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

i05757951

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Note: This information is pertinent in Japan.



Illustration 98

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.

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Consult your Cat dealer for an Emission Control Warranty Statement.

The emission certification film is on the engine.

Declaration of Conformity

SMCS Code: 1000; 7000

Table 14

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

ORIGINAL EC or EU DECLARATION OF CONFORMITY

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

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

Standards & Regulations Manager, Caterpillar France 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:	330 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 August 2017, 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 99

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”.

i08019624

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, “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”

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.

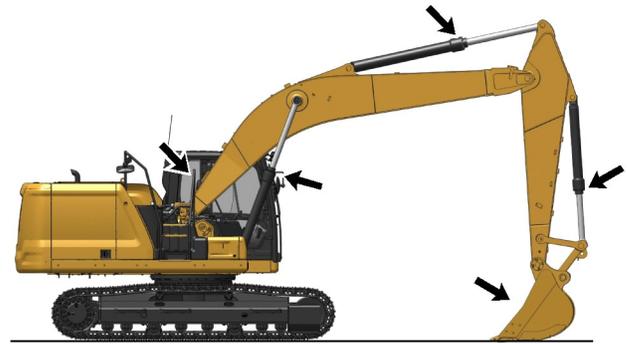


Illustration 100

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 101

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.

Inspect the swing drive for leaks.

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

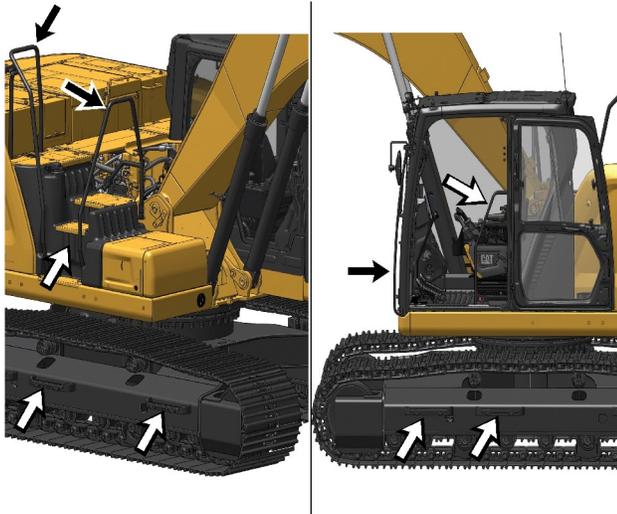


Illustration 102

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)

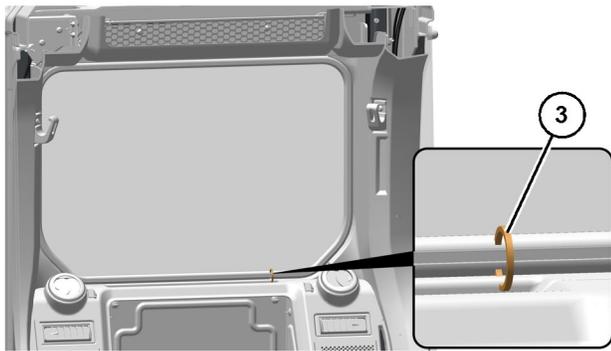


Illustration 103

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)

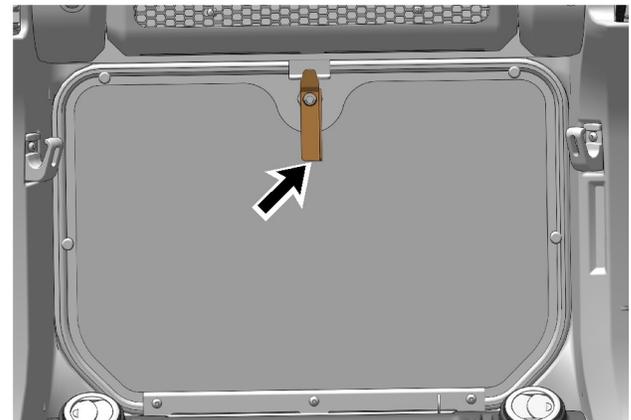


Illustration 104

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 105

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 106

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

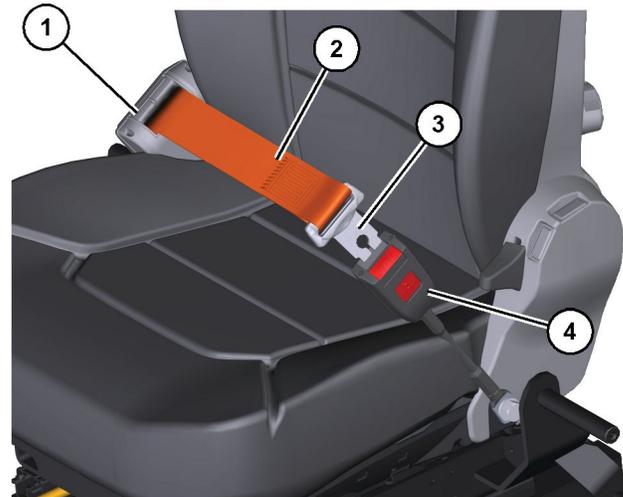


Illustration 107

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 108

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.

i07952210

Operator Controls

SMCS Code: 7300; 7301; 7451

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

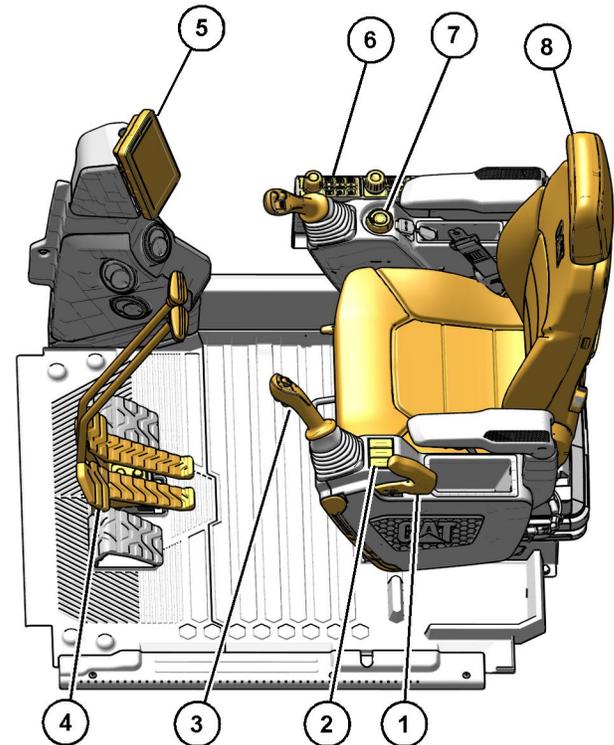


Illustration 109

g06471008

- (1) Hydraulic lockout control
- (2) Left side switch panel
- (3) Joystick controls
- (4) Travel controls
- (5) Monitor
- (6) Right side switch panel
- (7) Engine start switch
- (8) 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.

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



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



Tilt – For machines equipped with the tilt-up console, pull the lever to the rearmost position to release the console

lock and tilt the console upward for easier exit and entry.

Left Side Switch Panel (2)

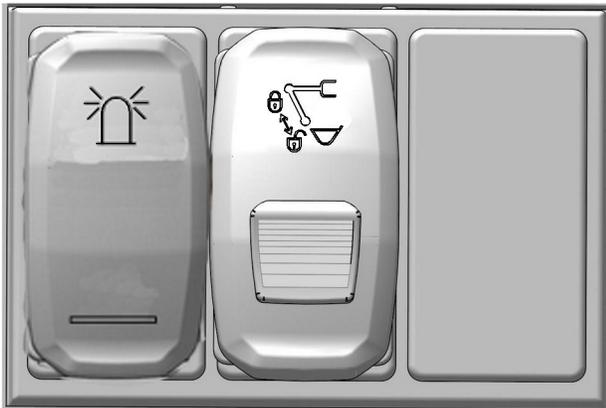


Illustration 110

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)



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, see 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 Operation and Maintenance Manual, “Joystick Controls”.

Travel Control (4)



Illustration 111

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.

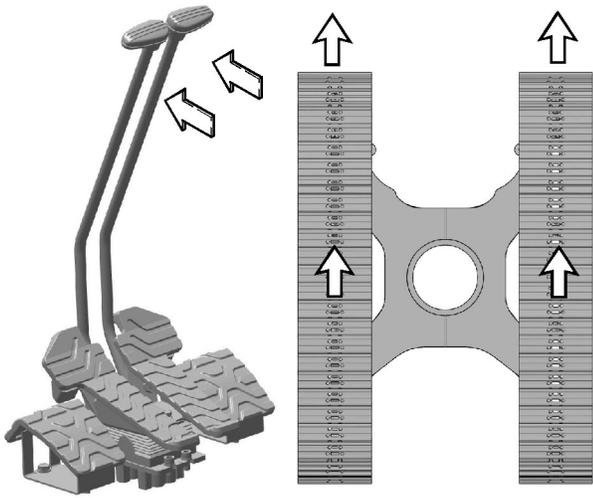


Illustration 112
FORWARD travel

g06178269

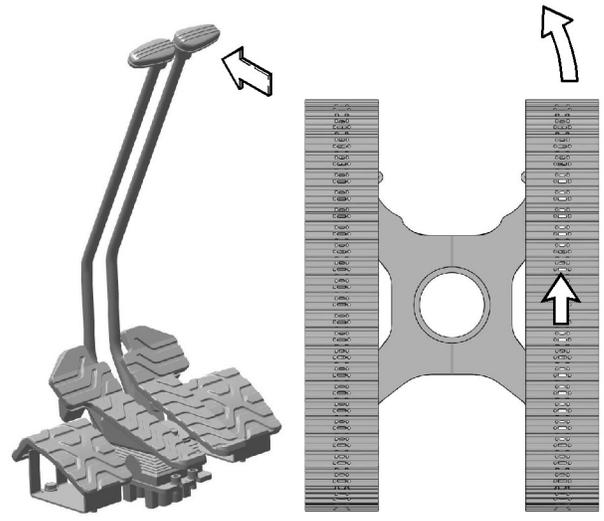


Illustration 114
Pivot left turn (FORWARD)

g06178288

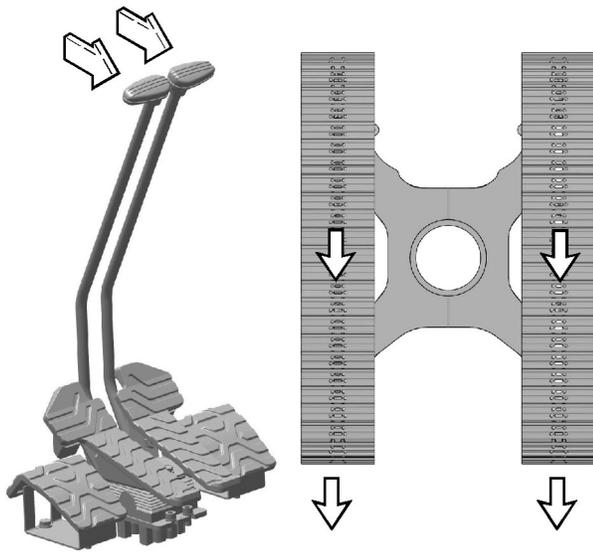


Illustration 113
REVERSE travel

g06178283

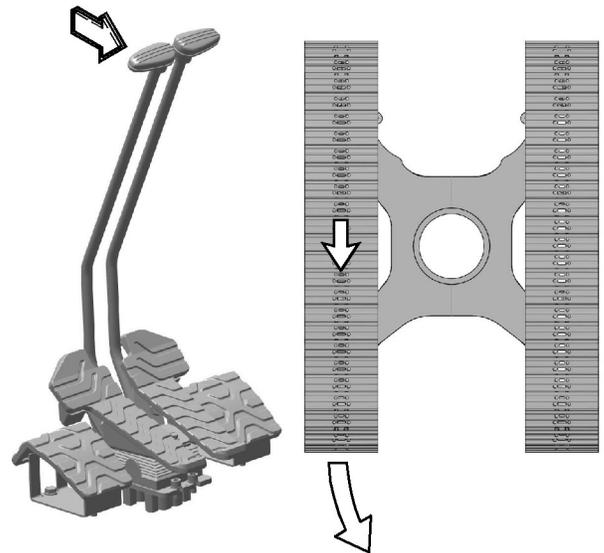


Illustration 115
Pivot Left Turn (REVERSE)

g06178294

Operation Section
Operator Controls

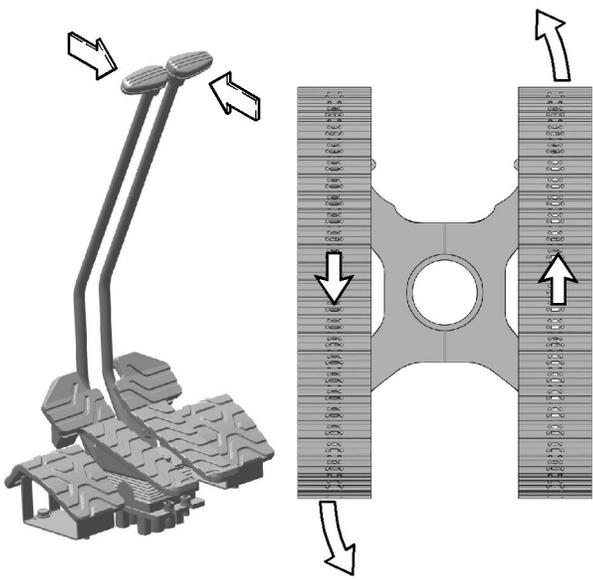


Illustration 116
Counterrotate turn (LEFT)

g06178300

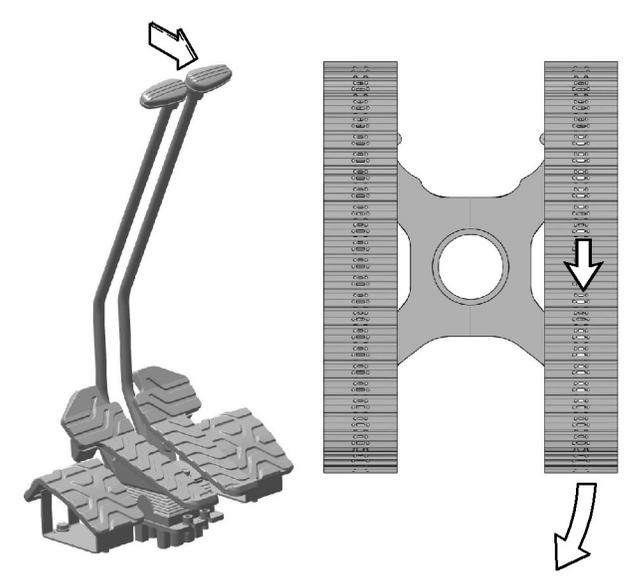


Illustration 118
Pivot right turn (REVERSE)

g06178308

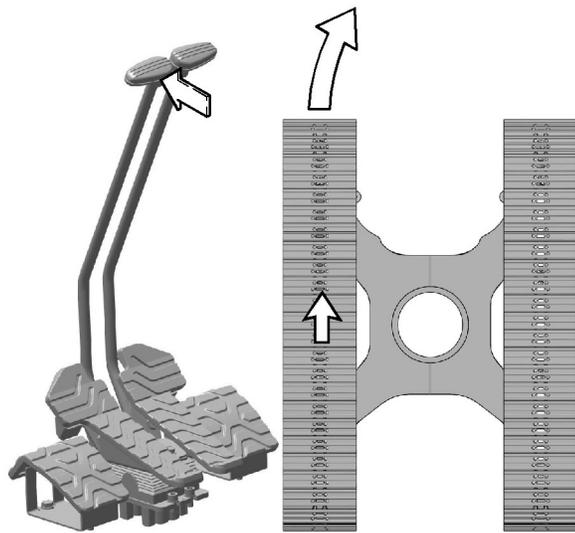


Illustration 117
Pivot right turn (FORWARD)

g06178305

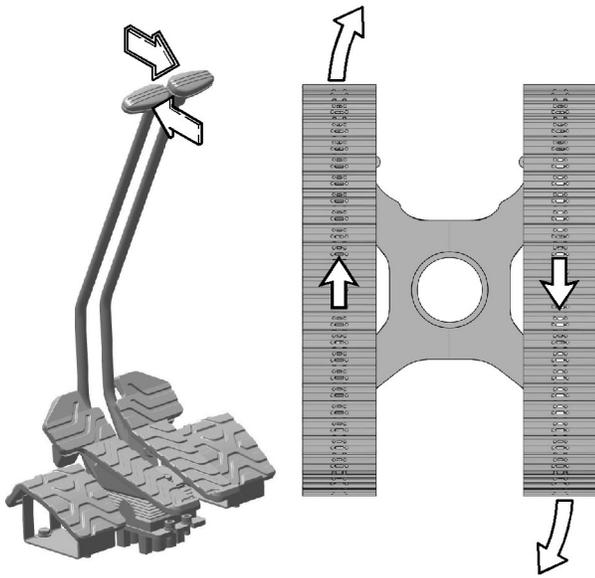


Illustration 119

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 Operation and Maintenance Manual, "Monitoring System".

Engine Start Switch (7)

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.

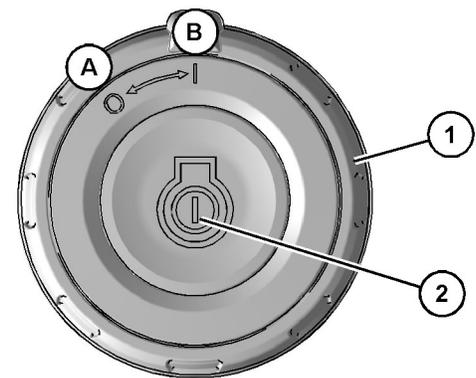


Illustration 120

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.

Engine Idle Shutdown

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

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

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

- The control levers are in neutral.
- The engine coolant temperature is greater than 70° C (158° F).
- The battery voltage is greater than 24.5V
- The engine speed is less than 2000 rpm.

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

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



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

Operator's Seat (8)

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 Operation and Maintenance Manual, "Seat".

Right Side Switch Panel (6)

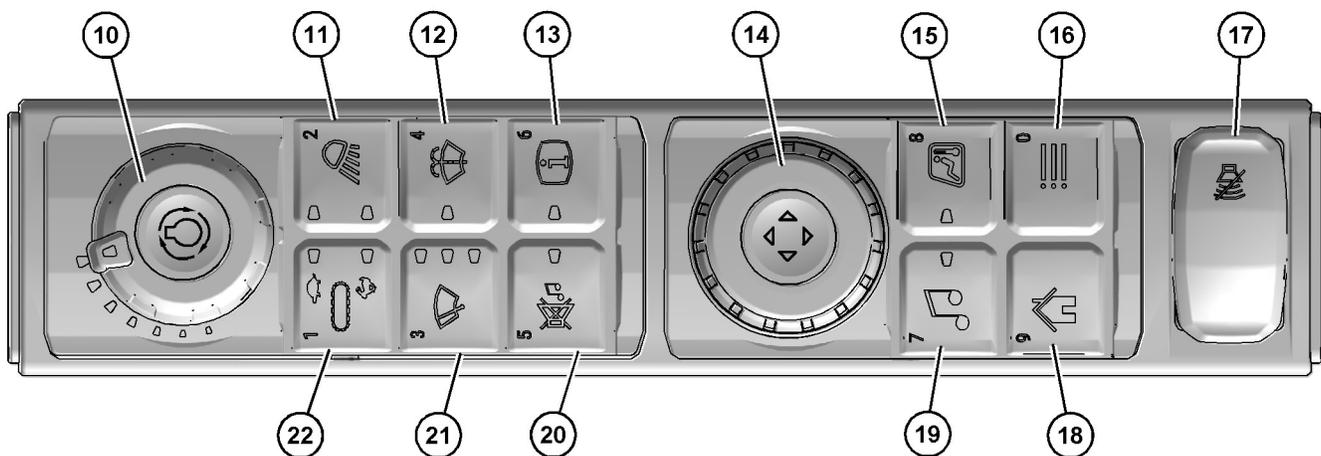


Illustration 121

g06178333

Right side switch panel

- | | | |
|--|--------------------------------------|---------------------------|
| (10) Engine speed / power mode control | (15) Heating and air conditioning | (20) Radio mute switch |
| (11) Light switch | (16) Next menu | (21) Window wiper |
| (12) Window washer | (17) Travel alarm mute (If Equipped) | (22) Travel speed control |
| (13) Operator Information | (18) Home | |
| (14) Jog dial | (19) 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 (10)

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: “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”.

Light Switch (11)

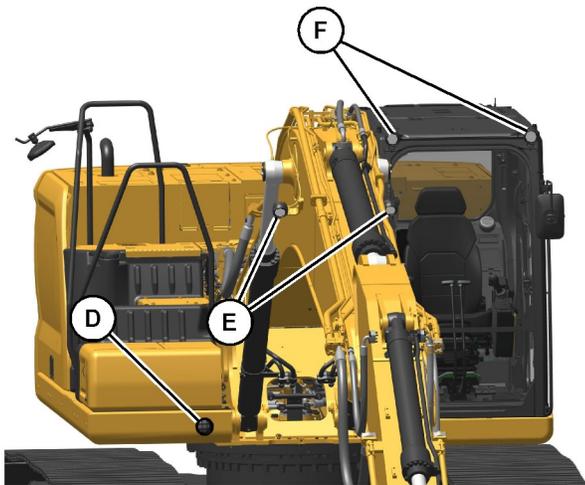


Illustration 122

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, Work Light Control for more information.

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 Monitoring System, Lighting Shutdown Timer for more information.

Window Washer (12)



Window Washer (12) – 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 (13)



Help Button (13) – Press and hold this button to view the operator information screen. The indicator light will illuminate when the button is pressed.

Jog Dial (14)

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 (15)



Air Conditioning and Heating (15) – 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 (13) 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 (16)



Next Menu (16) – 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 (17) (If Equipped)



Travel Alarm Mute Switch (17) – Press travel alarm mute switch (17) to mute the travel alarm.

Note: The travel alarm will sound when the travel levers or the travel pedals are activated.

Home (18)



Home Key (18) – Press the home key to return to the default display at any time.

Refer to Monitoring System for more information.

Radio Control (19)



Radio Control (19) – 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 (14) 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 (20)



Radio Mute (20) – Press radio mute switch (20) to mute the radio. The indicator light will illuminate when mute is activated. Press the button again to unmute the radio.

Window Wiper (21)



Window Wiper (21) – 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 (22)

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 (22) – 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 (23) (If Equipped)

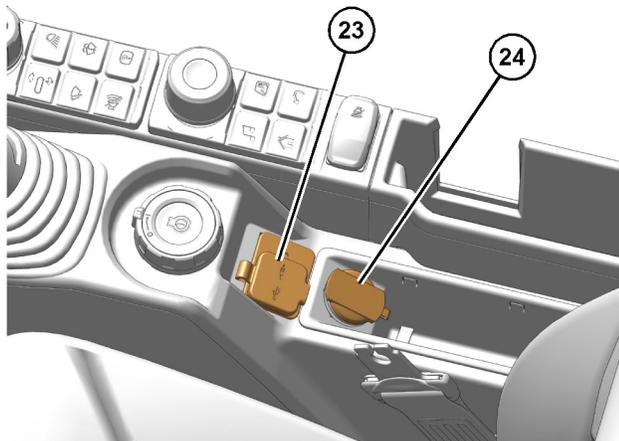


Illustration 123

g06204950

(23) USB/AUX/MIC port
(24) 12V power receptacle



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 (24) & (25)

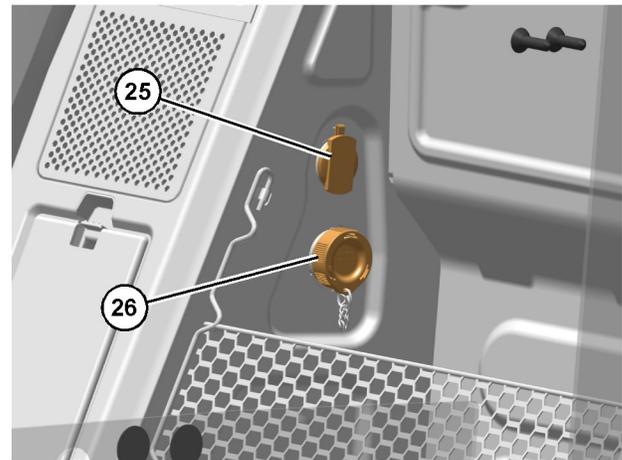


Illustration 124

g06178354

Electronic Technician service port

12V **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 (26)

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 (27)

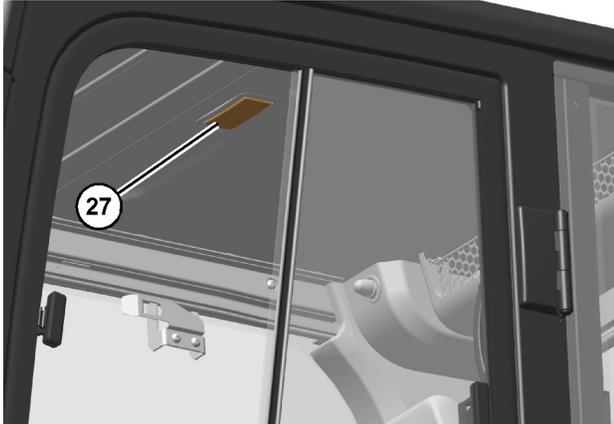


Illustration 125

g06208645

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.

i07857842

Battery Disconnect Switch

SMCS Code: 1411-B11

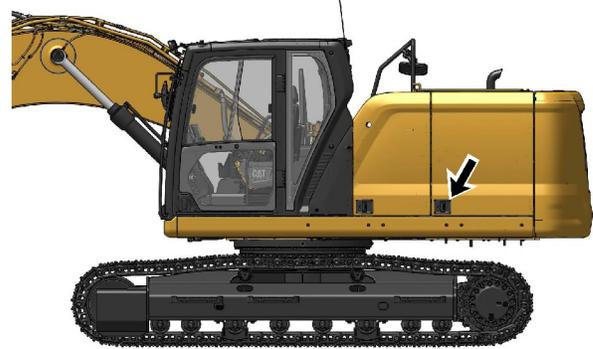


Illustration 126

g06179792

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

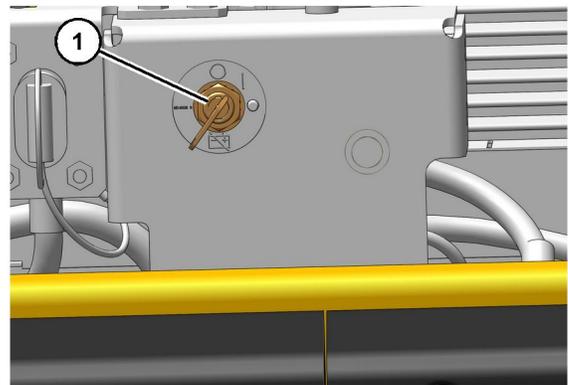


Illustration 127

g06459372

(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.

It is also good practice to use the disconnect switch after you operate the machine. This will prevent the battery from being discharged. The following problems can cause battery discharge:

- short circuits
- current draw via some components
- vandalism

i08001446

Product Link

SMCS Code: 7490; 7606

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

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

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

Data Broadcasts

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

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

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

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

Operation in a Blast Site for Product Link Radios

WARNING

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

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

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

- Operation and Maintenance Manual, SEBU8142, “Product Link - PL121, PL321, PL522, and PL523”

- Operation and Maintenance Manual, SEBU8832, “Product Link PLE702, PLE602, PLE601, PL641, PL631, PL542, PL240, PL241, PL243, PL141, PL131, PL161, PL083 and PL042 Systems”

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

- Special Instruction, REHS7339, “Installation Procedure for Product Link PLE640 Systems”
- Special Instruction, REHS8850, “Installation Procedure for the Elite Product Link PLE601, PLE641, and PLE631 Systems”
- Special Instruction, SEHS0377, “Installation Procedure for the Product Link PL131, PL141, and PL161 Systems”
- Special Instruction, REHS9111, “Installation Procedure for the Pro Product Link PL641 and PL631 Systems”
- Special Instruction, M0098124, “Installation Procedure for Pro Product Link PL243 Systems”
- Special Instruction, M0109130, “Installation Procedure for Product Link PL683 and PL783 Systems”

i07785958

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 128

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 machine 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

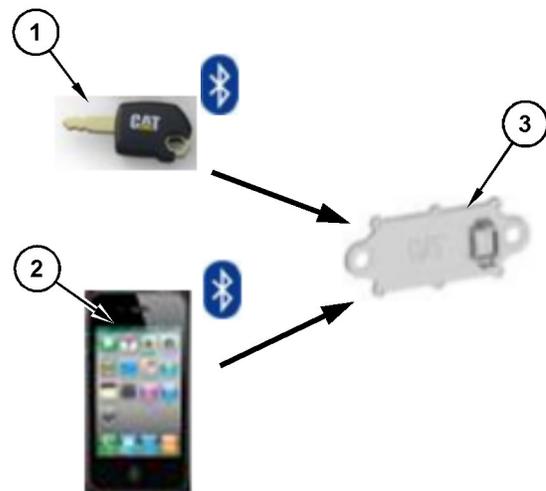


Illustration 129

g06212167

Bluetooth Connections

- (1) Cat Bluetooth key fob (CATBTFOB)
- (2) Cat App: Fleet Management mobile application
- (3) Cat Bluetooth transceiver (CATBTNT)

The 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 starting 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:

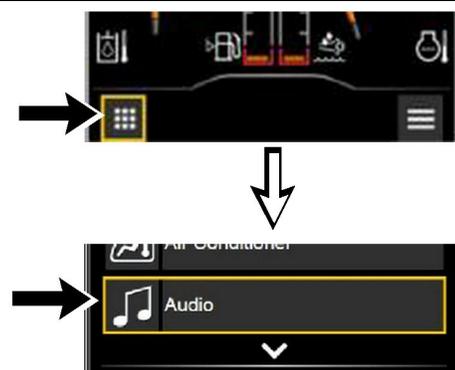


Illustration 130

g06319669

- a. From the home screen, press the navigation button in the lower left corner, then select “Audio” .

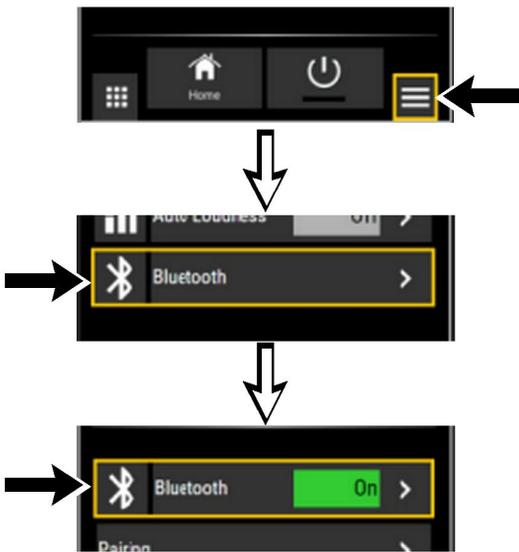


Illustration 131 g06319667

- 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:

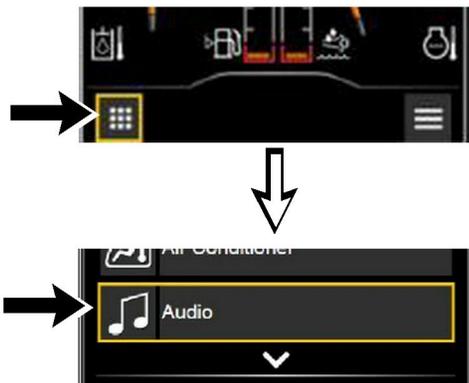


Illustration 132 g06319669

- 1. From the home screen, press the navigation button in the lower left corner, then select "Audio".

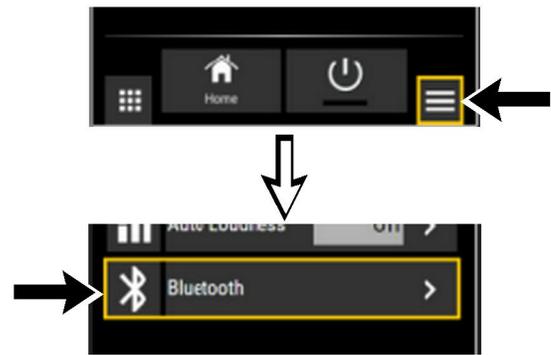


Illustration 133 g06319672

- 2. Press the radio function list menu button in the lower right corner, then select "Bluetooth".

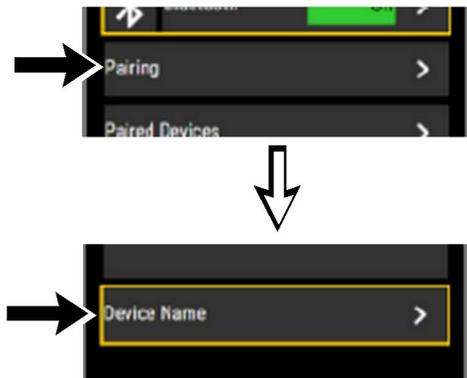


Illustration 134 g06319676

- 3. Select "Pairing", then "Device Name".

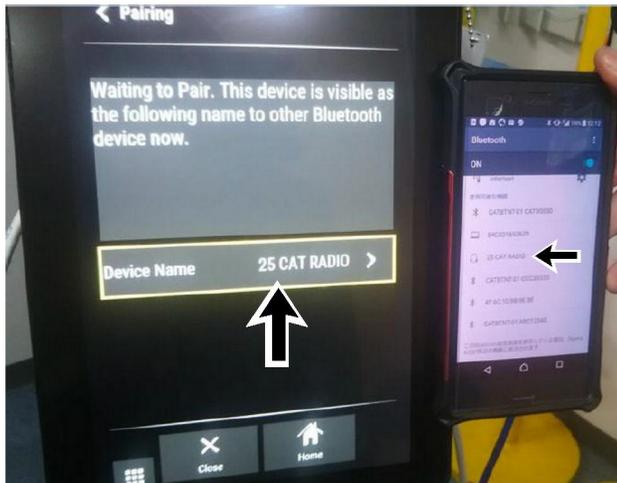


Illustration 135

g06319681

Machine name on monitoring system and operator device

- 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 (Cat 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

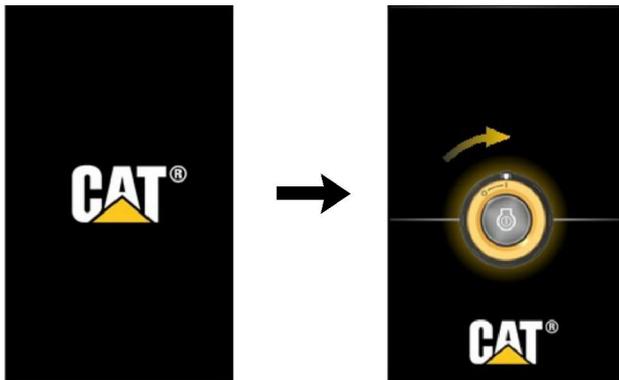


Illustration 136

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 15

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 137

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 138

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 139

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:

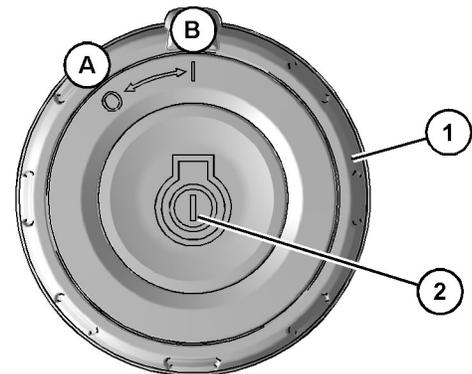


Illustration 140

g06180554

- (A) Off
(B) On
(1) Engine start switch ring
(2) Engine start button

1. Turn engine start switch (1) to the ON position (B).

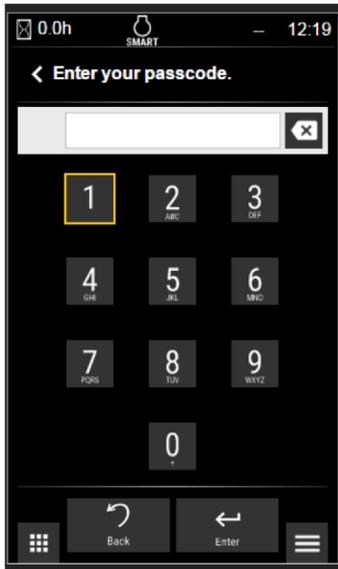


Illustration 141

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 142

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 142 .
4. Select "OK" to continue to the display homescreen.



Illustration 143

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 Operation and Maintenance Manual, Engine Starting for instructions on starting the engine.

Invalid Passcode

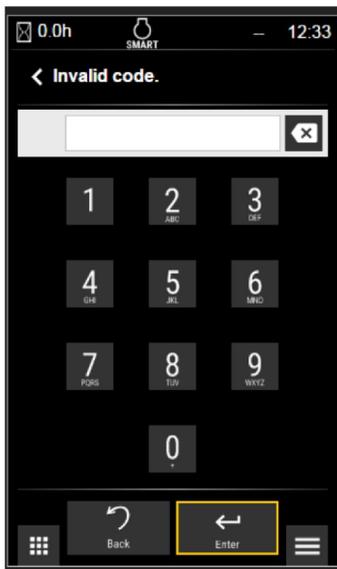


Illustration 144

g06209472

Invalid passcode screen

If a passcode is not recognized, the display will notify the user with an “Invalid code” message. Refer to Illustration 144 .

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 starting 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:

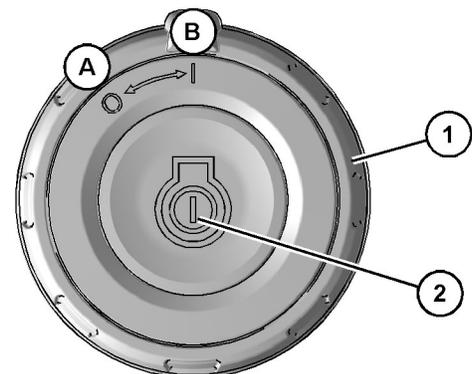


Illustration 145

g06180554

- (A) Off
- (B) On
- (1) Engine start switch ring
- (2) Engine start button

1. Turn engine start switch (1) to the ON position (B).

- 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.

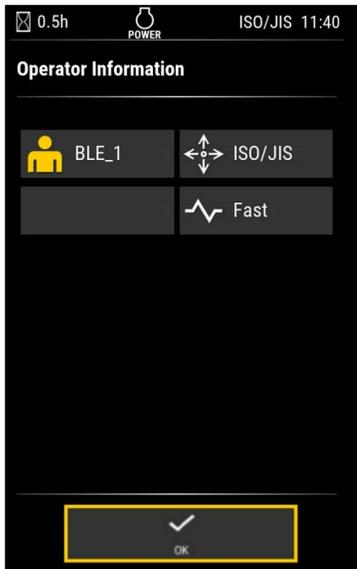


Illustration 146

g06209615

Bluetooth operator information screen

- Select the “OK” button if the proper operator has been displayed.

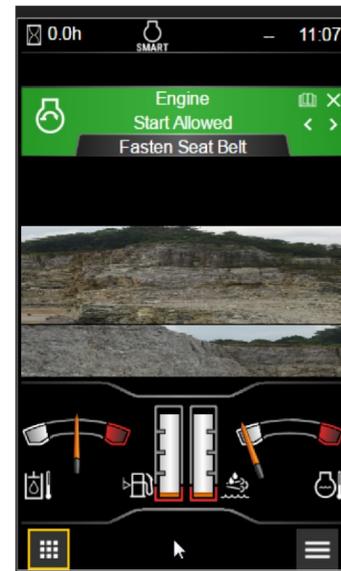


Illustration 147

g06209482

- After an operator logs in to the system successfully, an “Engine Start Allowed” message will appear across the top of the monitor. Refer to Operation and Maintenance Manual, 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 16

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 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:

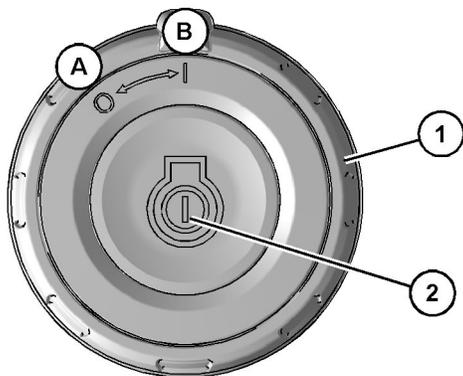


Illustration 148 g06180554

- (A) Off
- (B) On
- (1) Engine start switch ring
- (2) Engine start button

1. Turn engine start switch (1) to the ON position (B).



Illustration 149 g06400799

2. Open the Cat App: Fleet management mobile application on the mobile device.

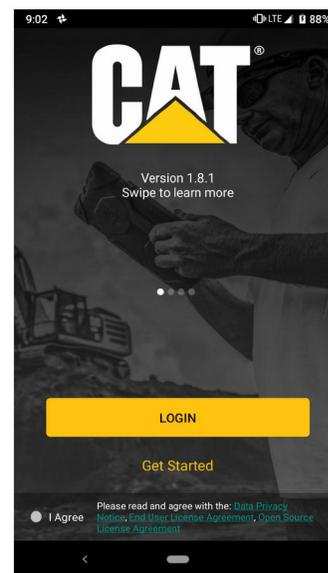


Illustration 150 g06433500

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” .

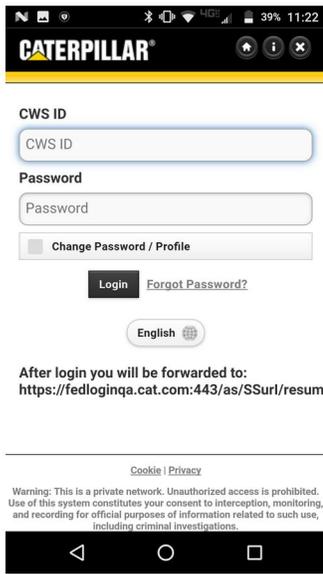


Illustration 151 g06214518
CWS login screen

5. Enter Cat eCustomer account credentials.

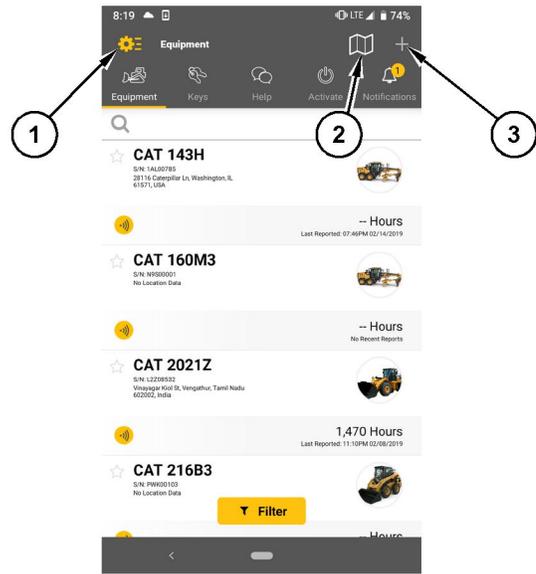


Illustration 153 g06433507

- (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.

The Menu Icon (1) includes “Preferences”, “Notifications and Alerts”, along with various documents covering the end-user license agreement, and privacy notice.

By tapping the 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).

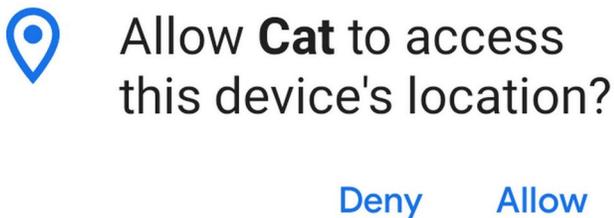


Illustration 152 g06400826

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.

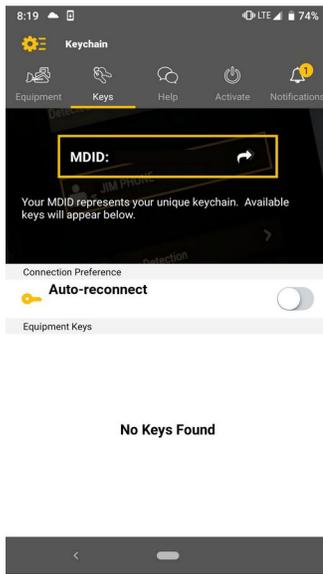


Illustration 154

g06433513

8. Go to the keys tab.

Keys are necessary to connect to vehicles. If no keys are given, the screen in Illustration 154 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.

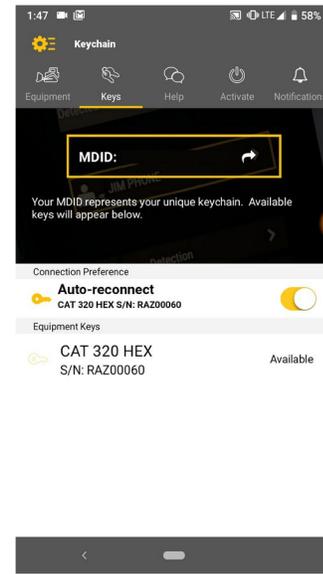


Illustration 155

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.

Operation Section Machine Security System

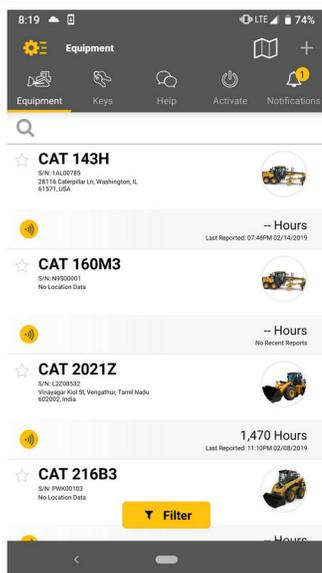


Illustration 156

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.

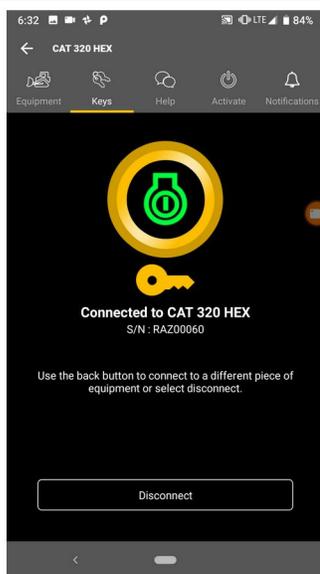


Illustration 157

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 158

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 Operation and Maintenance Manual, 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:

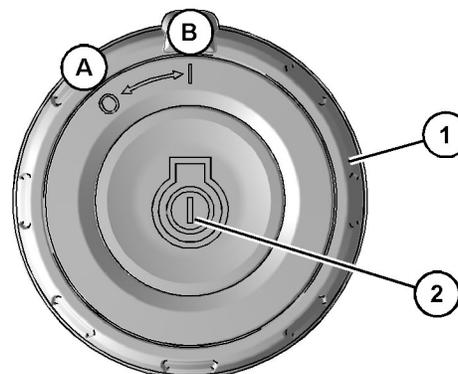


Illustration 159

g06180554

- (A) Off
- (B) On
- (1) Engine start switch ring
- (2) Engine start button

1. Turn engine start switch (1) to the ON position (B).
2. Ensure that Bluetooth detection is enabled on the in-cab display.



Illustration 160 g06400799
 Cat App: Fleet management mobile application icon

3. Open the Cat App: Fleet management mobile application on the mobile device.



Illustration 161 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” .

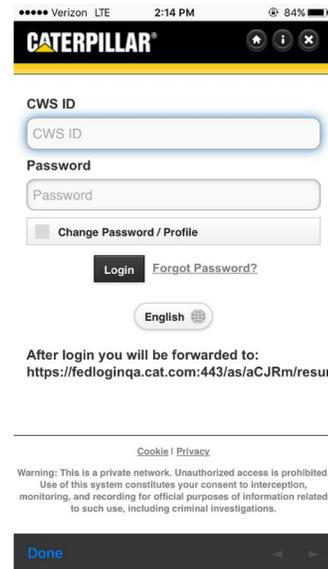


Illustration 162 g06214875

6. Enter eCustomer account credentials to log in.

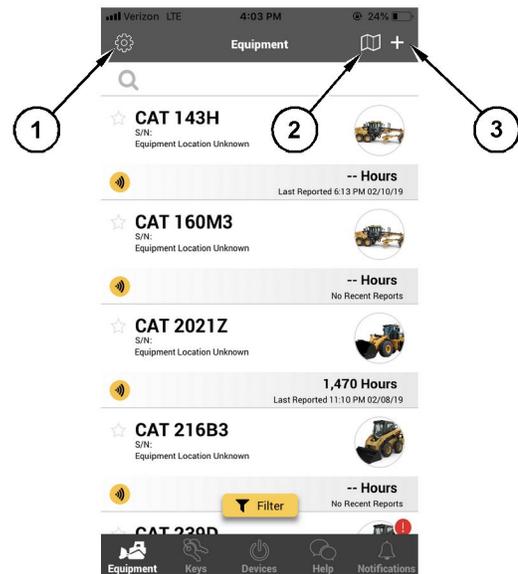


Illustration 163 g06433533

- (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.

Operation Section
Machine Security System

The Menu Icon (1) includes “Preferences”, “Notifications and Alerts”, along with various documents covering the end-user license agreement, and privacy notice.

By tapping the Map (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 the add equipment button (3).

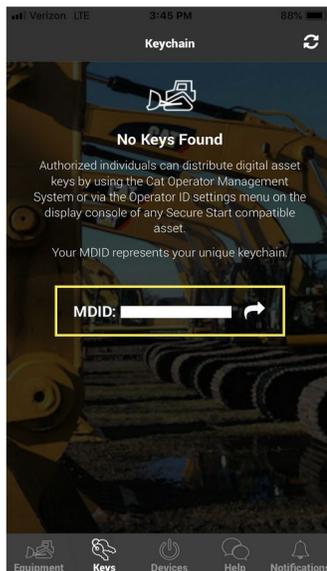


Illustration 164

g06433536

8. Access the “Keys” tab. Keys are necessary to connect to vehicles. If no keys are given, the screen in Illustration 164 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.

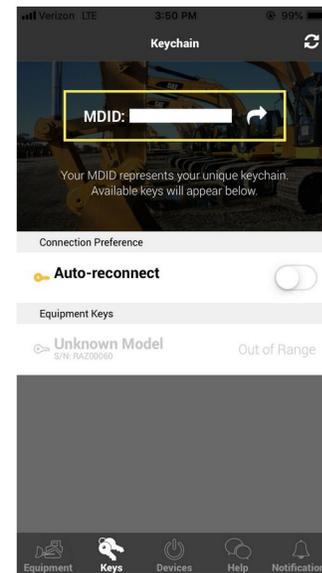


Illustration 165

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” .

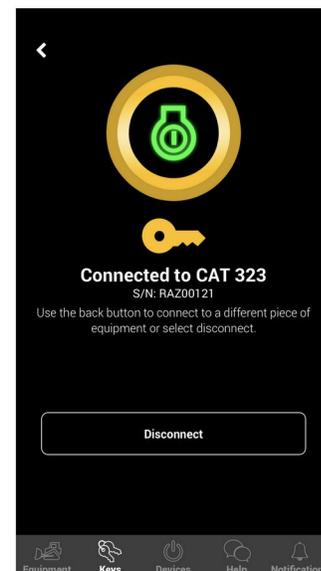


Illustration 166

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 167

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 Operation and Maintenance Manual, Engine Starting for instructions on starting the engine.

Engine Start Switch Troubleshooting

Table 17

Switch Status	Possible Cause	Resolution
Engine startswitch 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 ft) from other Bluetooth equipped machine		

(continued)

(Table 17, 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 ft) from other Bluetooth equipped machine
		Enable phone Bluetooth and connect Cat Fleet management app
		Change Bluetooth system enable status to enabled (Cat dealer)
		Contact local Cat dealer if unable to see machine Bluetooth device

i08257831

Monitoring System

SMCS Code: 7451; 7490

NOTICE

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

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

General Information

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

The monitoring system is an input and an output of the Machine Control System. The monitor has a multi-touch 8 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 168

g06469575

- (1) Action Lamps
- (2) Status Information Area
- (3) Event Indicator Area
- (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 OMM
- 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)

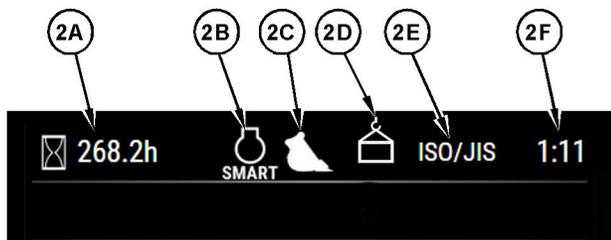


Illustration 169

g06469582

- (2A) Multi Status Information
- (2B) Seatbelt Switch Status(if equipped) / Power Mode
- (2C) Work tool
- (2D) Heavy Lift / Cat Dig Boost (if equipped)
- (2E) Lever Pattern / Fuel Level
- (2F) Clock

Multi Status Information (2A)



Service Hour Meter (2A) – Shows the total operating hours of the engine. Use the display to determine the service-hour maintenance intervals.



Soot Load (2A) – The amount of soot built up in the Diesel Particulate Filter (DPF) at the time of regeneration.



Time To Regen (2A) – Shows the estimated time left for regeneration.



Fuel Consumption Rate (2A) – Displays fuel consumption per hour. Fuel consumption can be measured in liters or gallons.



Fuel Remain Time (2A) – Shows the estimated time until fuel is empty.

Tool #1

Tool name(2A) – Shows the tool name selected.

Note: When the cursor is on this area, the information can be changed by touching the area or by rotating the jog dial.

Seatbelt Switch Status (If equipped) / Power Mode (2B)



Not Fastened (2B) – Displays when the seatbelt is not fastened.



Smart Mode (2B) – This indicator shows that the machine is set to operate in the SMART mode.



Power Mode (2B) – This indicator shows that the machine is set to operate in the Power mode.



Disabled (2B)

Work Tool (2C)

Work Tool – Displays the current work tool.



Off (inactive, Not Installed)



Other



Hammer



Grapple



Bucket

**Shear****Thumb****Magnet****Compactor****Clamshell****Rotary Cutter****Tilt Bucket****Tilt Rotor****Quick Coupler****Heavy Lift / Cat Dig Boost (If Equipped) (2D)****On (Active) (2D) – The Heavy Lift / Cat Dig Boost is in active status.****Off (inactive, Not Installed)(2D)****Lever Pattern/Fuel Level (2E)**

Lever Pattern – The lever pattern will be displayed if the hydraulic lock switch is locked. The lever patterns that can be displayed are: ISO/JIS, KOBE, MHL, SCM, and BHL.

Fuel Level – The fuel level will be displayed when the hydraulic lock switch is unlocked and the fuel gauge is not displayed in Gauge Area (5). The fuel level will indicate the amount of fuel left in the fuel tank. 100% is displayed when the fuel tank is full. The displayed fuel level will decrease by 10% as fuel is consumed. "E" in red will be displayed when the fuel tank is empty.

Note: If the hydraulic lock switch is unlocked and the fuel gauge is displayed in Gauge Area (5), then this area will be blank.

Clock (2F)

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

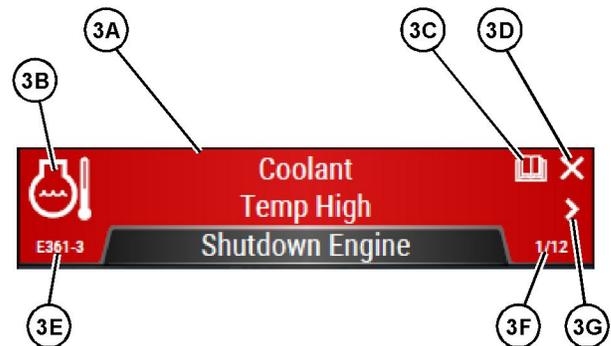
Event Indicator Area (3)

Illustration 170

g06223056

- (3A) Event Description
- (3B) Event Symbol
- (3C) e-OMM Key
- (3D) Close Key
- (3E) Event ID
- (3F) Order Number / Total Number
- (3G) Arrow Key

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

e-OMM Key (3C) – This area will indicate that the e-OMM is available for this event. If e-OMM is not available for this event, area will be blank.

Close Key (3D) – Select this key to hide the pop-up message and display the event icon list.

Event ID (3E) – The identification number for the event will be shown here.

Priority Number / Total Number (3F) – The priority number of the pop-up message is displayed next to the total number of messages. The messages are ordered from the highest to the lowest priority.

Arrow Keys (3G) – The arrow keys are shown when there is a next or previous message. Select the arrow key to display the next or previous message.

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 – 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 radio 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

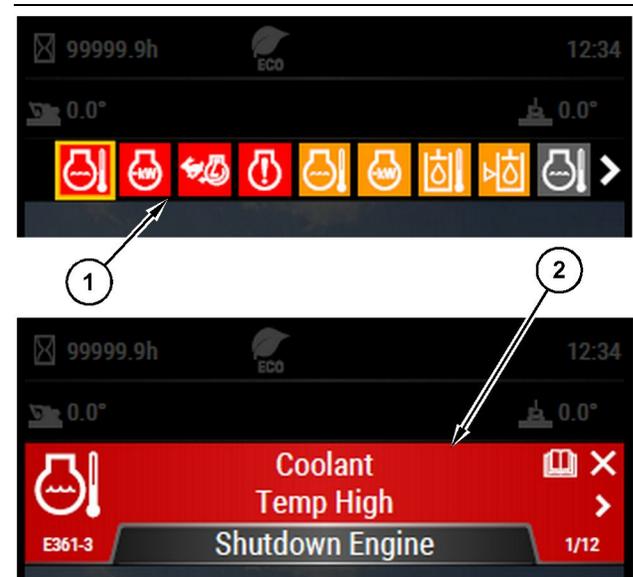


Illustration 171

g06223766

Event Indicator Area

- (1) Event Icon List
(2) Pop-up Event Message

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. Press the right or left key to view all the logged warnings. If no keys are pressed within a few seconds, the display will return to the highest warning.

Event Icon List



Illustration 172

g06223816

The Event Icon List display all active events. The list orders the higher-level warnings first, with the red furthest left, and gray furthest right. The currently selected icon will be highlighted with a yellow box surrounding the icon. Turn the jog dial left and right to change the highlighted icon and press down on the jog dial to navigate to the highlighted icon pop-up message.

Arrows will appear at either side of the icon list if there are too many icons to display on a single bar. The arrow will navigate to the next set of icons instantly rather than the next icon from the bold one. Refer to “List of Warning Messages” for more information on possible causes and responses to Machine System Event Codes.



E119-2 Fuel Level Low - Refill Fuel



E236-2 Hyd Oil Filter Plugged - Replace Filter



E237-1 Overload Warning Sensor Malfunction - Check Sensor



E237-2 Overload Warning Overload - Reduce Load



E241-2 e-fan Failure - Service Required



E363-1 Fuel Temp High



E363-2 Fuel Temp High / Power Derate



E534-2 Swing Parking Brake Malfunction - Service Required



E534-3 Hyd Lock Active - Cycle The Lock Lever



E862-2 Att Hyd Oil Filter Plugged - Replace Filter



E875-2 Battery Voltage Low - Service Required



E876-2 Battery Voltage High - Service Required



E878-2 Hyd Oil Temp High - Stop Operating



E1046-2 Tool Control Hyd Oil Temp High - Stop Operating



E1132-1 Machine Software Configuration Inconsistent - Check Software Version



E1377-1 Security System Disable/Derate Pending



E1377-2 Security System Disable/Derate Pending



E1378-2 Machine Fault - Service Required



E1379-2 Machine Fault - Service Required

**E1634–2 Refueling Pump Strainer
Plugged - Check Strainer****E1635–2 Refueling Pump Runs Dry -
Stop Refueling****E2138–1 Payload Memory Full**

List of Warning Messages

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

Table 18

Machine System Event Codes		
Event Code	Description	Possible Cause / Recommended Response
E119-2	Fuel Level Low - Refill Fuel	Possible Cause: Low fuel level in the tank, fuel line leakage, or the fuel filter is plugged. Recommended Response: Check the fuel level in the tank.
E236-2	Hyd Oil Filter Plugged - Replace Filter	Possible Cause: This event is active only when the machine is traveling and the oil temperature is greater than 50° C (122° F) for 10 seconds or more. Recommended Response: Replace the filter as soon as possible. If filter replacement is not convenient, stop machine travel until oil temperature is less than 50° C (122° F) for 180 seconds or more. If a code is present after the filter is replaced, inspect the hydraulic lines for signs of severe bending or internal collapse.
E237-1	Overload Warning Sensor Malfunction - Check Sensor	Possible Cause: The Boom Cylinder Head Pressure Sensor has experienced a failure. Recommended Response: Contact your Cat dealer for service.
E237-2	Overload Warning Overload - Reduce Load	Immediate Safe Shutdown of Machine is required Possible Cause: The machine overload pressure threshold has been exceeded. Recommended Response: Reduce the load on the machine before shutting down machine. Inspect machine stress points.
E241-2	e-fan Failure - Service Required	Possible Cause: This event is active when fan embedded control detects locked rotor, high electric current, or internal error. Recommended Response: Investigate if fan is obstructed. Test the fan with the override e-fan speed command in the monitor.
E363-1	Fuel Temp High	Possible Cause: This event is active only when the fuel temperature reaches the trip level. Recommended Response: Reduce Engine Load.
E363-2	Fuel Temp High / Power Derate	Possible Cause: This event is active only when the fuel temperature reaches the trip level. Recommended Response: Reduce Engine Load.

(continued)

Operation Section
Monitoring System

(Table 18, contd)

Machine System Event Codes		
Event Code	Description	Possible Cause / Recommended Response
E534-2	Swing Parking Brake Malfunction - Service Required	Possible Cause: Swing movement detected with no command given. Recommended Response: Contact your Cat dealer for service.
E534-3	Hyd Lock Active - Cycle The Lock Lever	Possible Cause: Swing movement detected with no command given. Recommended Response: Contact your Cat dealer for service.
E862-2	Att Hyd Oil Filter Plugged - Replace Filter	Possible Cause: Occurs when hydraulic oil temperature exceeds 50° C (122° F) for more than 5 seconds. Recommended Response: Replace filter as soon as possible. If code is present after the filter is replaced, inspect the hydraulic lines for damage.
E875-2	Battery Voltage Low - Service Required	Possible Cause: Event is active when the system voltage is less than 18 VDC for more than 60 seconds. Recommended Response: The machine returns to normal operation when the voltage exceeds 18 VDC for more than 2 seconds.
E876-2	Battery Voltage High - Service Required	Possible Cause: Event is active when the system voltage exceeds 32 VDC for more than 5 seconds. Recommended Response: The machine returns to normal operation when the voltage is less than 31.5 VDC for more than 2 seconds.
E878-2	Hyd Oil Temp High - Stop Operating	Possible Cause: The event is active when the temperature of the hydraulic oil exceeds 126° C (259° F) for more than 2 seconds. Recommended Response: Change the operation of the machine to allow the hydraulic oil to cool.
E1046-2	Tool Control Hyd Oil Temp High - Stop Operating	Possible Cause: The event is active when the temperature of the hydraulic oil exceeds 126° C (259° F) for more than 2 seconds. Recommended Response: Change the operation of the machine to allow the hydraulic oil to cool.
E1132-1	Machine Software Configuration Inconsistent - Check Software Version	Possible Cause: An attachment valve has not been configured correctly. Recommended Response: Reconfiguration of one or more of the attachment valves is required.
E1377-1	Security System Disable/Derate Pending	Possible Cause: This code is used to inform the operator that the machine is remotely disabled. Recommended Response: Contact your Cat dealer for service.
E1377-2	Security System Disable/Derate Pending	Possible Cause: This code is used to inform the operator that the machine is remotely disabled. Recommended Response: Contact your Cat dealer for service.
E1378-2	Machine Fault - Service Required	Possible Cause: Event is active when the system voltage exceeds 32 VDC for more than 5 seconds. Recommended Response: The machine returns to normal operation when the voltage is less than 31.5 VDC for more than 2 seconds.

(continued)

(Table 18, contd)

Machine System Event Codes		
Event Code	Description	Possible Cause / Recommended Response
E1379-2	Machine Fault - Service Required	Possible Cause: Event is active when the system voltage is less than 18 VDC for more than 60 seconds. Recommended Response: The machine returns to normal operation when the voltage exceeds 18 VDC for more than 2 seconds.
E1634-2	Refueling Pump Strainer Plugged - Check Strainer	Possible Cause: Debris in foot valve screen. Recommended Response: Clean or replace the foot valve screen.
E1635-2	Refueling Pump Runs Dry - Stop Refueling	Possible Cause: Kink in fuel hose or source fuel low. Recommended Response: Check source fuel and check for kink in hose.
E2138-1	Payload Memory Full	Possible Cause: When data transfer between machine ECM and network manager (product link elite) is failed. Recommended Response: Reconfigure the machine and clear the payload memory.

Logging In

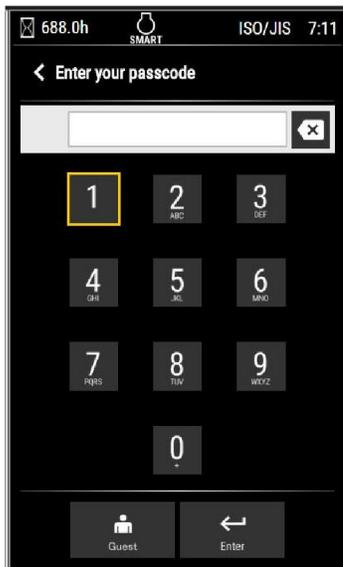


Illustration 173

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

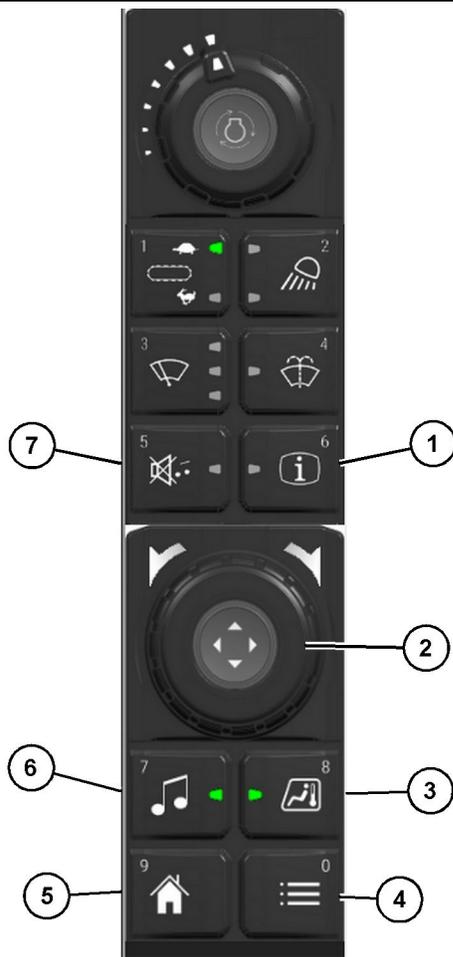


Illustration 174

g06469589

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) – Rotate the jog dial to highlight menu items in the monitor. Push the jog dial down to select the highlighted item.

Air conditioner button (3) – Press the button to access the air conditioner controls.

Next menu button (4) – 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) – Press this button to return to the main screen.

Radio button (6) – Press this button to access the radio controls.

Mute button (7) – Press this button to mute the radio. Press the button again to unmute the radio.

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.

Operator Screen



Illustration 175

g06241547

After logging in, the operator information screen will appear. The screen provides the following information for the logged in operator:

- Operator ID
- Joystick pattern
- Active tool
- Spool response speed
- Joystick button assignments

Application Menu



Illustration 176

g06469596

The operator information screen can be accessed at any time by pressing the operator information button on the right side switch panel.

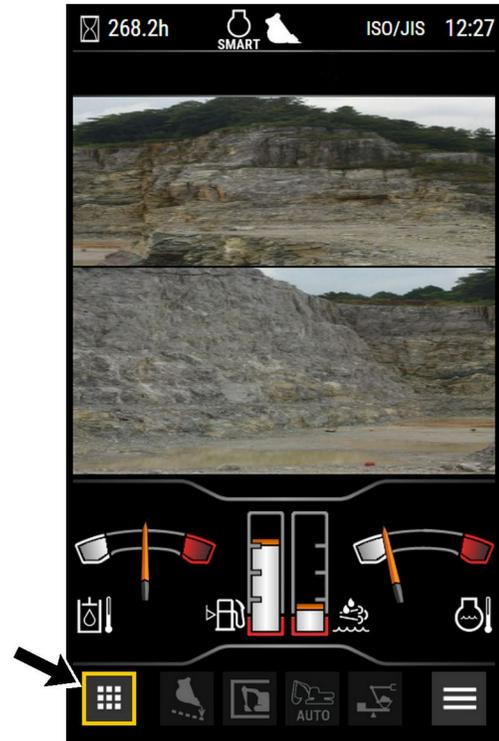


Illustration 177

g06469601

Press the application menu button to access the Application menu.

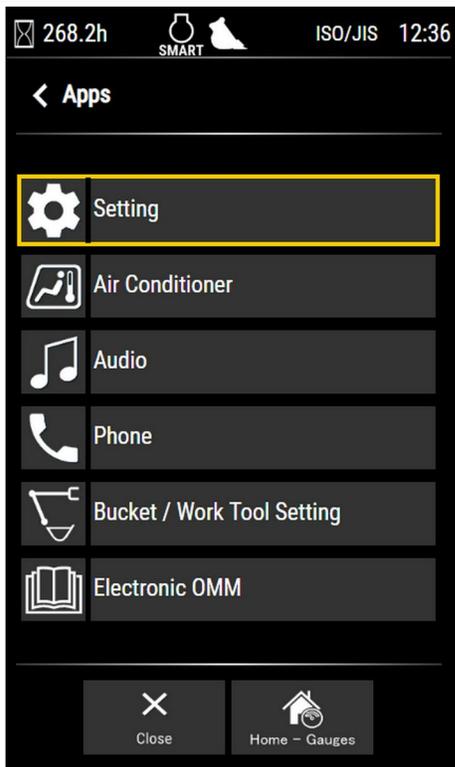


Illustration 178

g06469604

The Application menu or “Apps” menu contains the following menu items:

- Setting
- Air Conditioner
- Audio
- Phone
- Bucket/Work Tool Setting
- Electronic OMM

Setting Menu

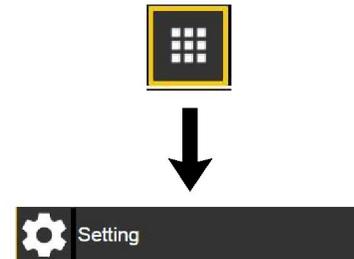


Illustration 179

g06213909

From the main screen, press the application menu button. In the Application menu, select “Setting” .

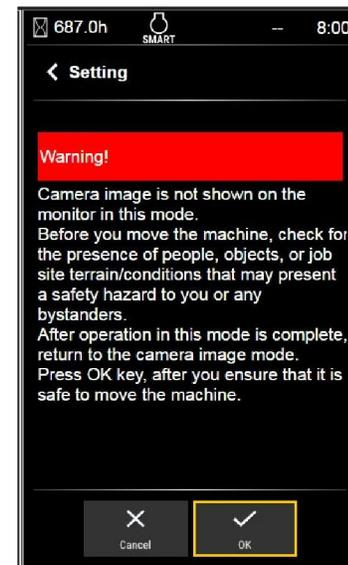


Illustration 180

g06217518

A warning will appear notifying the operator that the camera is not visible in the Setting menu. After you have read the warning and understand the content, press the “OK” button.

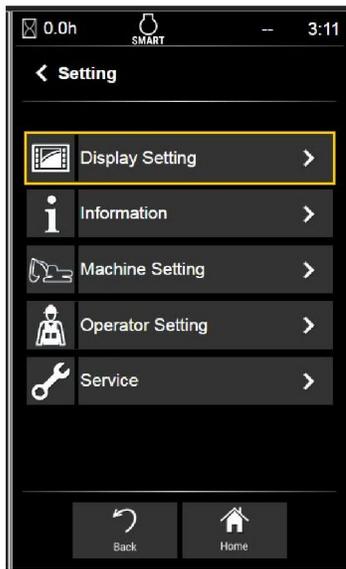


Illustration 181

g06213929

The Setting menu contains the following menu items:

- Display Setting
- Information
- Machine Setting
- Operator Setting
- Service

Note: A dealer password is necessary to access the Service menu.

Display Setting

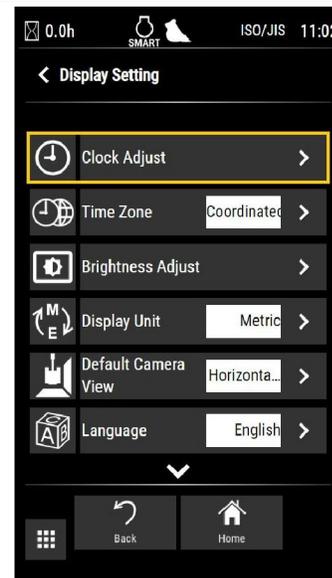


Illustration 183

g06470093

The Display Setting menu contains the following menu items:

- Clock Adjust
- Time Zone
- Brightness Adjust
- Display Unit
- Default Camera View
- Language

Clock Adjust

Note: Master level access is required to adjust clock settings.

The clock adjust feature allows the operator to set the clock and set the date.

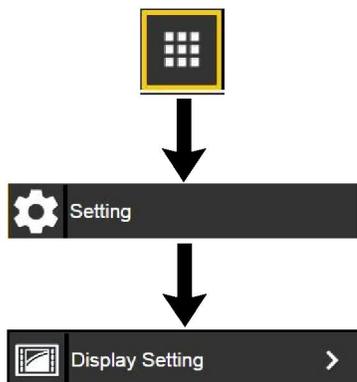


Illustration 182

g06213920

From the main screen, press the application menu button. In the Application menu, select “Setting” . Next, select “Display Setting” .

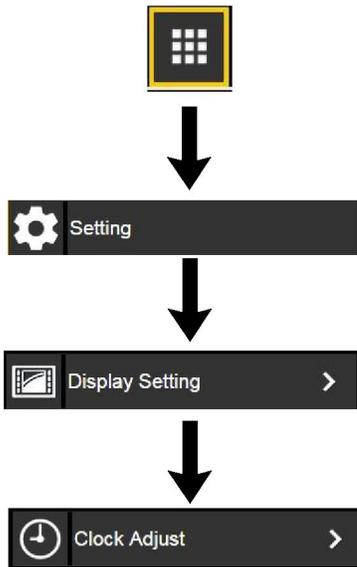


Illustration 184

g06215252

To access the Clock Adjust screen, press the application menu button. Select Setting, Display Setting, then Clock Adjust.

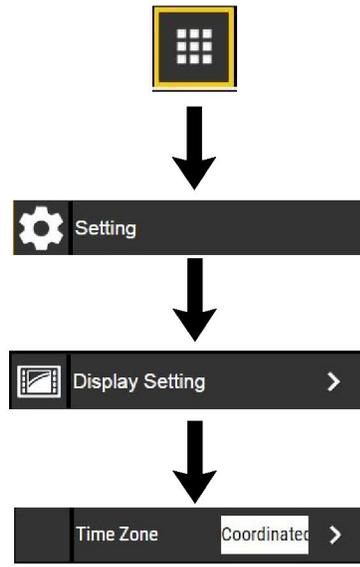


Illustration 186

g06247439

To access the Time Zone screen, press the application menu button. Select Setting, Display Setting, then Time Zone.

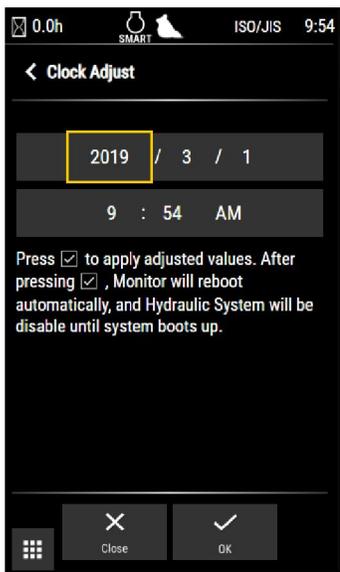


Illustration 185

g06400030

Adjust the date and time as necessary. Select the Home button to return to the main screen.

Time Zone

The time zone feature allows the operator to set the time zone for the region the machine is operating in.

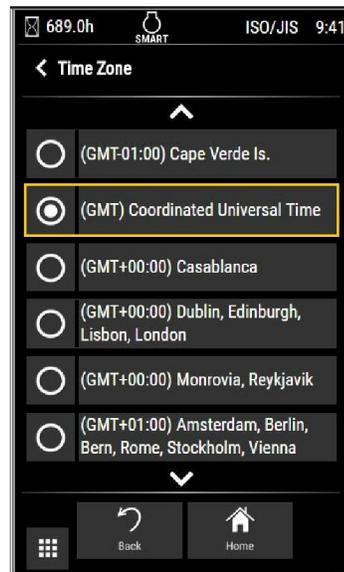


Illustration 187

g06247442

Select the correct time zone setting from the list. Select the Home button to return to the main screen.

Brightness Adjust

The brightness adjust function allows the operator to adjust the brightness of the display for day and night mode.

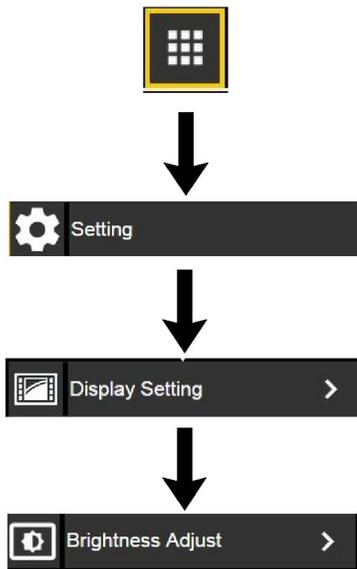


Illustration 188 g06215260

To access the Brightness Adjust screen, press the application menu button. Select Setting, Display Setting, then Brightness Adjust.

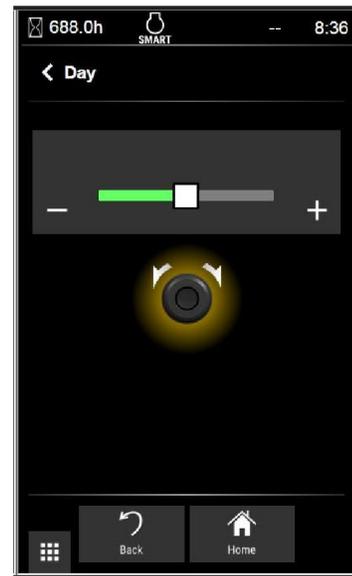


Illustration 190 g06215264

Adjust the brightness level then select "Home" to return to the main screen.

Display Unit

Display unit allows the operator to choose between Metric or English units being displayed.

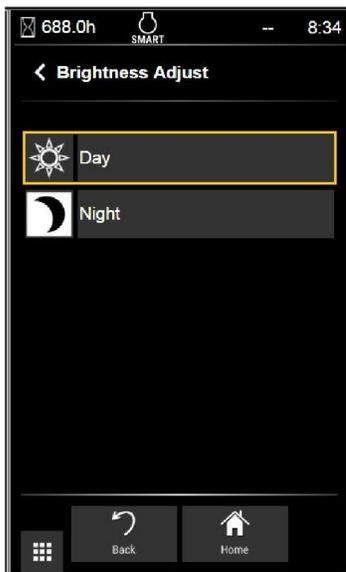


Illustration 189 g06215263

Select Day or Night to adjust the brightness level.

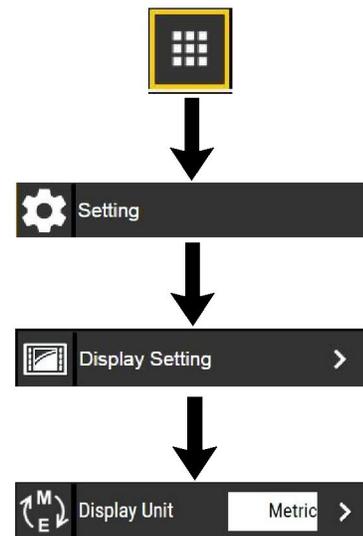


Illustration 191 g06470878

From the main screen, press the application menu button. In the Application menu, select "Setting". Next, select "Display Setting" and then "Display Unit".

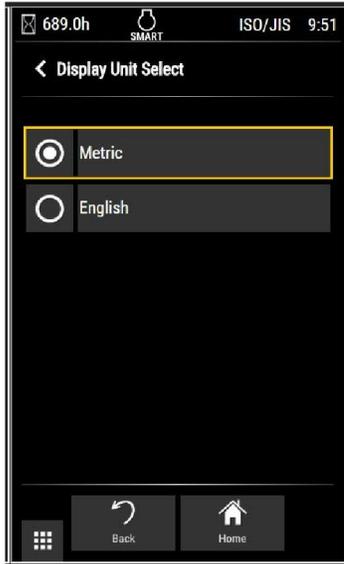


Illustration 192

g06241051

Select either Metric or English then select “Home” to return to the main screen.

Default Camera View

Default camera view allows the operator to choose the default camera view. The two choices are split screen horizontal or split screen vertical.

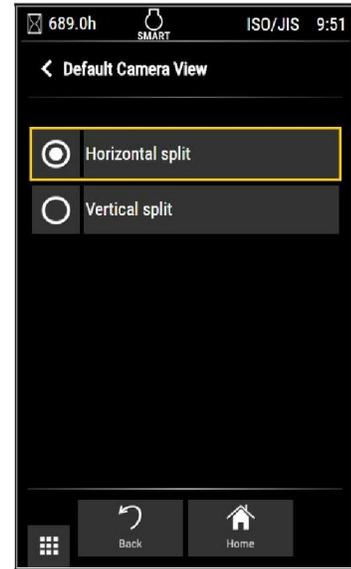


Illustration 194

g06241057

Select between “Vertical Split” or “Horizontal Split” then select “Home” to return to the main screen.

Language

Language allows the operator to choose the language for the monitor.

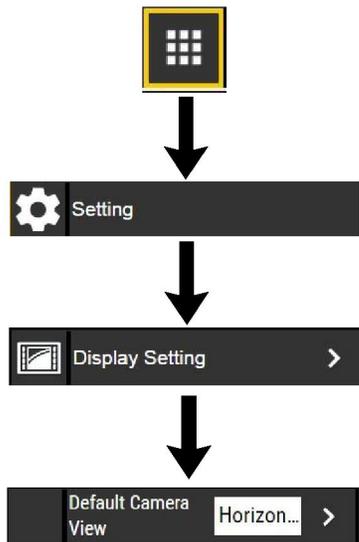


Illustration 193

g06241046

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Display Setting” and then “Default Camera View”.

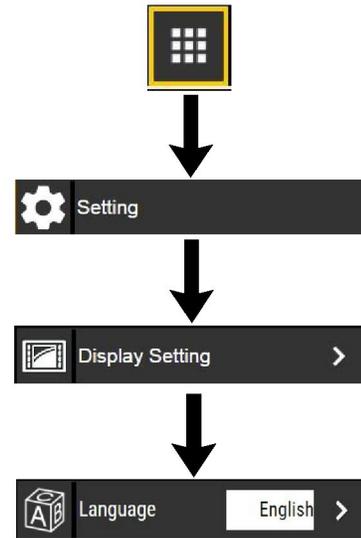


Illustration 195

g06470922

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Display Setting” and then “Language”.



Illustration 196

g06241058

Select the desired language, then select “Home” to return to the main screen.

Shortcut

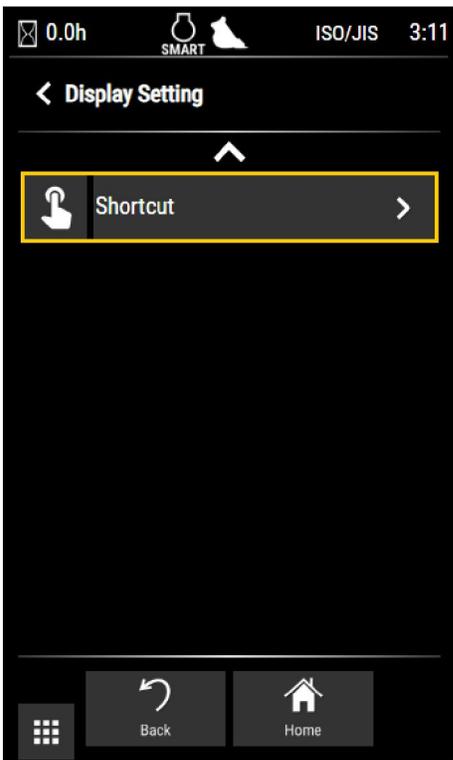


Illustration 197

g06389546

Shortcut allows the operator to choose up to 4 shortcuts to be displayed on home screen of the monitor.

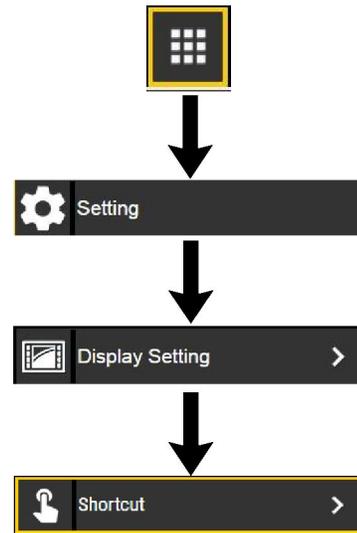


Illustration 198

g06389544

From the main screen, press the application menu button. In the Application menu, select “Setting” . Next, select “Shortcut” .

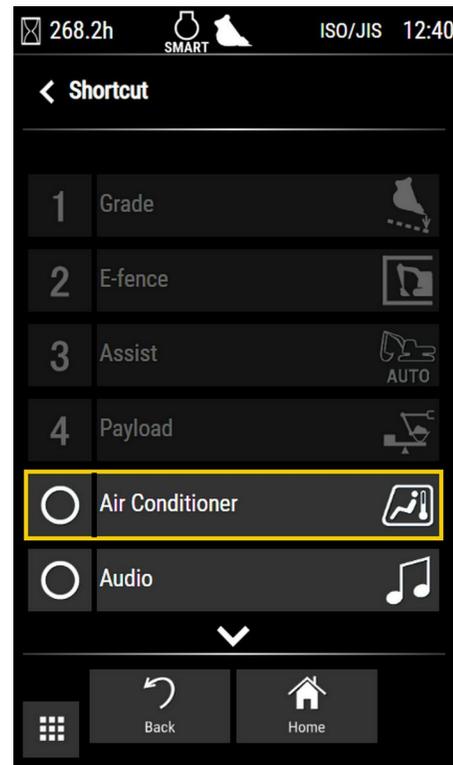


Illustration 199

g06469605

Select the desired shortcuts to be displayed on the home screen.

Information

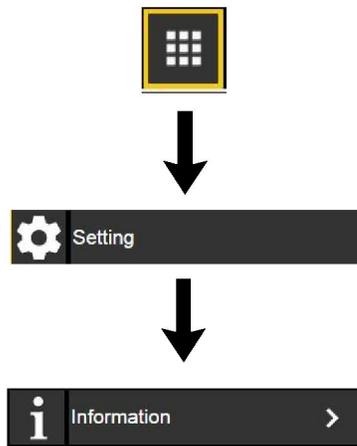


Illustration 200

g06217520

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information”.

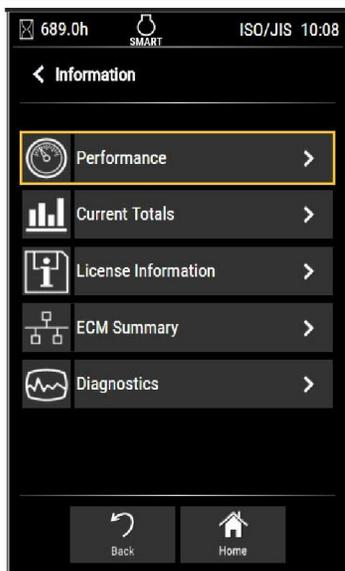


Illustration 201

g06261280

The Information menu contains the following menu items:

- Performance
- Current Totals
- License Information
- ECM Summary

- Diagnostics

Performance

The Performance screen allows the operator to view performance information such as pump outlet pressure and battery voltage.

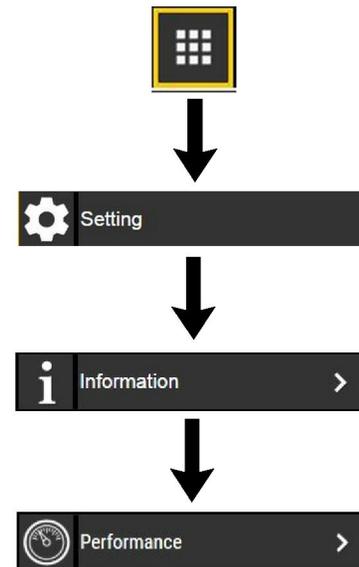


Illustration 202

g06261291

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information” and then “Performance”.

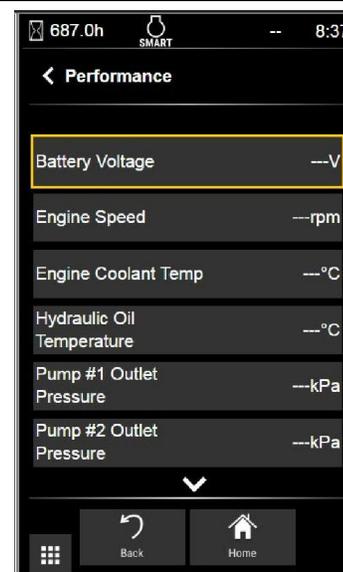


Illustration 203

g06217555

Scroll through the list of values to view machine performance. Press the “Home” button to return to the main screen.

Current Totals

The Current Totals screen allows the operator to view operating hours for machine components such as the hydraulic pump and swing motor.

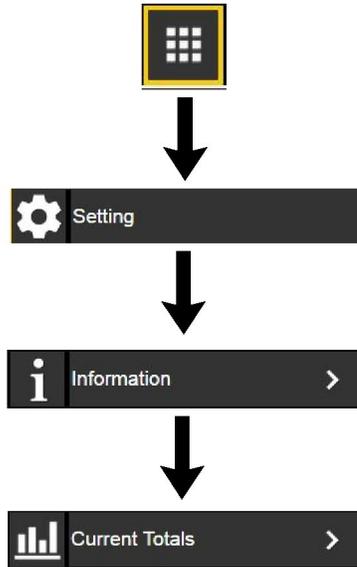


Illustration 204

g06261293

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information” and then “Current Totals”.

License Information

The License Information screen allows the operator or maintenance personnel to view the software license agreement.

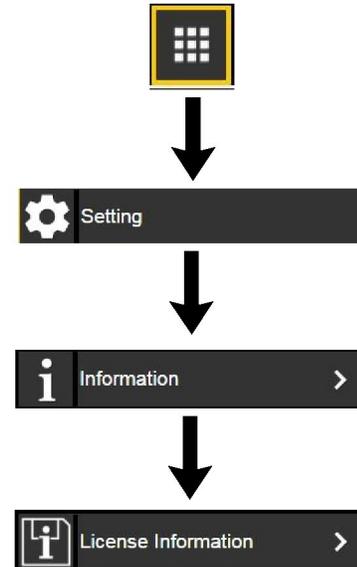


Illustration 206

g06261300

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information” and then “License Information”.

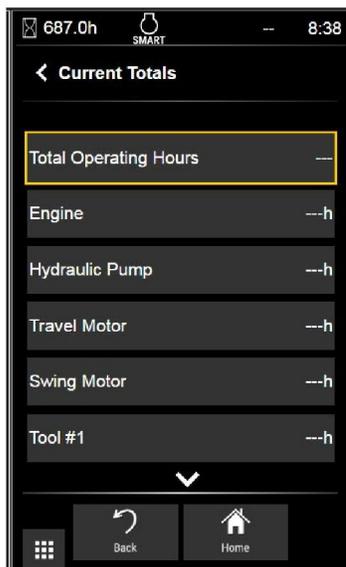


Illustration 205

g06217554

Scroll through the list of values to view component operating hours. Press the “Home” button to return to the main screen.

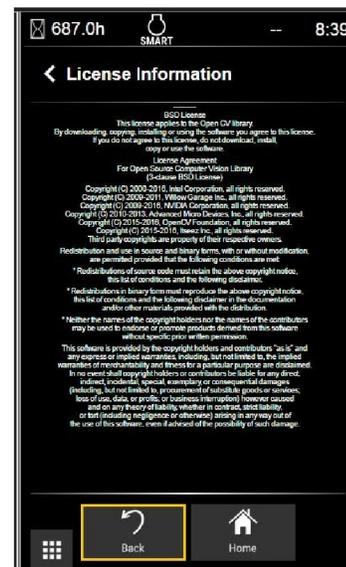


Illustration 207

g06217551

Press the “Home” button to return to the main screen.

ECM Summary

The ECM Summary screen allows the operator to choose any electronic control module (ECM) on the machine and view the following for that ECM:

- Hardware part number
- Hardware serial number
- Software description
- Software part number
- Software release date

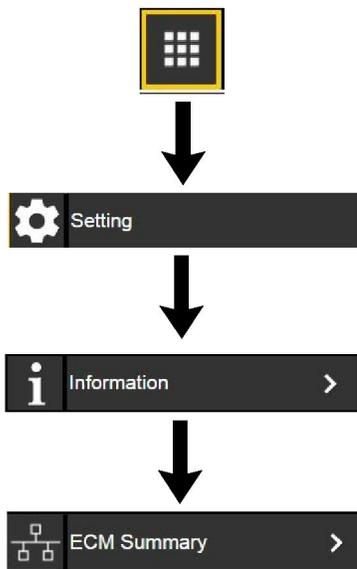


Illustration 208

g06261304

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information” and then “ECM Summary”.



Illustration 209

g06242055

Select one of the components to view hardware and software information. Press the “Home” button to return to the main screen.

Diagnostics

The Diagnosis screen allows the operator to view the following diagnostic items:

- Active diagnostic codes
- Logged diagnostic codes
- Active event codes
- Logged event codes

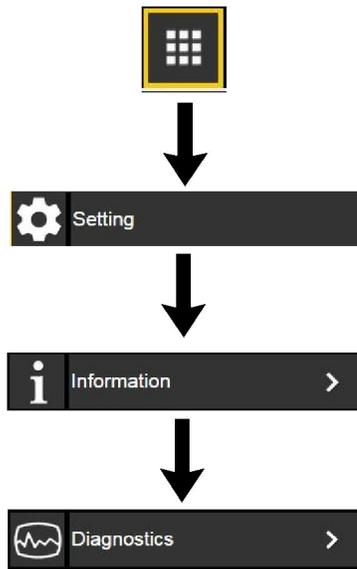


Illustration 210 g06242064

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Information” and then “Diagnostics”.

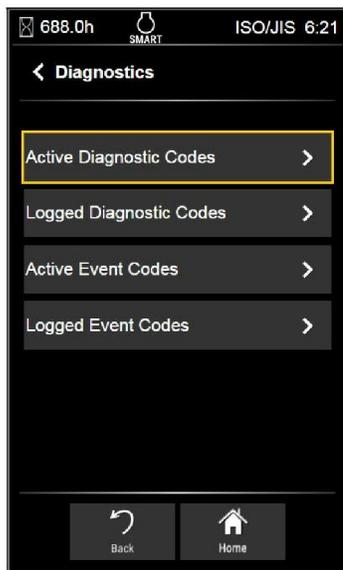


Illustration 211 g06242065

Select from the groups of diagnostic codes to view active and logged codes. Press the “Home” button to return to the main screen.

Machine Setting

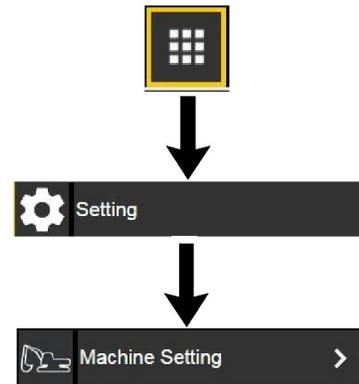


Illustration 212 g06217583

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”.

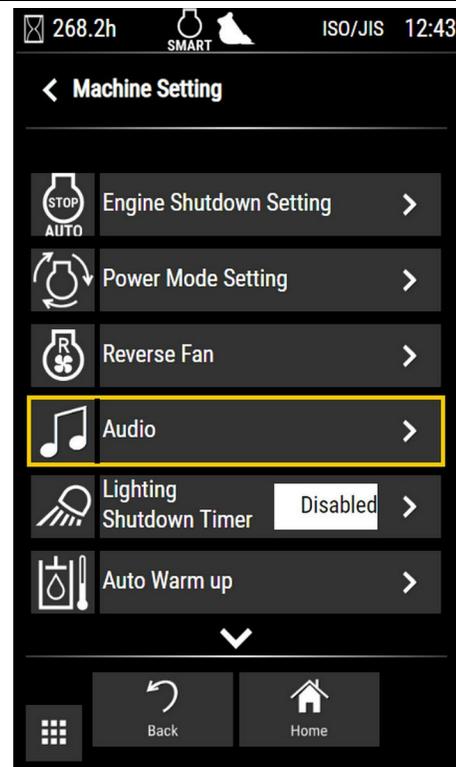


Illustration 213 g06469610

The Machine Settings menu contains the following menu items:

- Engine Shutdown Setting
- Power Mode Setting
- Reverse Fan
- Audio

- Lighting Shutdown Timer
- Auto Warm Up
- Sleep Time
- Security

Engine Shutdown Setting

Note: Master level access is required to adjust engine shutdown settings.

The Engine Shutdown Setting screen allows the operator to enable, disable, and adjust the engine shutdown timer. This feature operates the engine at idle speed for a set amount of time to cool the engine before shutting down automatically.

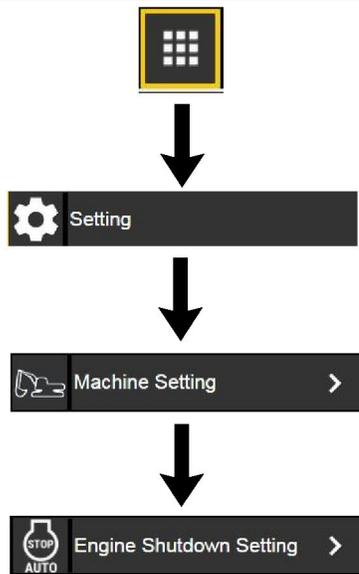


Illustration 214

g06261307

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”, and then “Engine Shutdown Setting” .

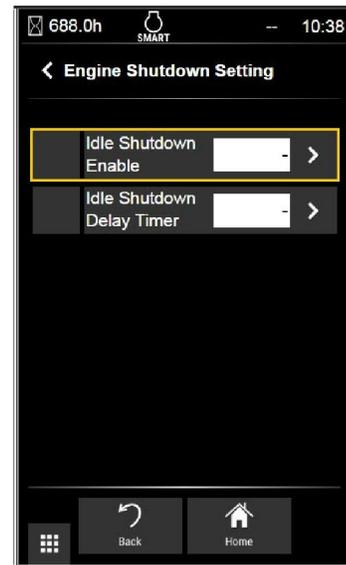


Illustration 215

g06217629

Select “Idle Shutdown Enable” to enable or disable the idle shutdown feature. If enabled, select “Idle Shutdown Delay Timer” to change the delay time.

Power Mode Setting

Note: Master level access is required to adjust power mode settings.

The Power Mode Setting screen allows the operator to choose what power mode to operate the engine.

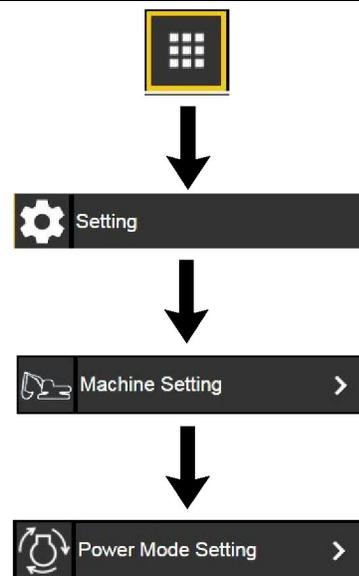


Illustration 216

g06261309

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”, and then “Power Mode Setting” .

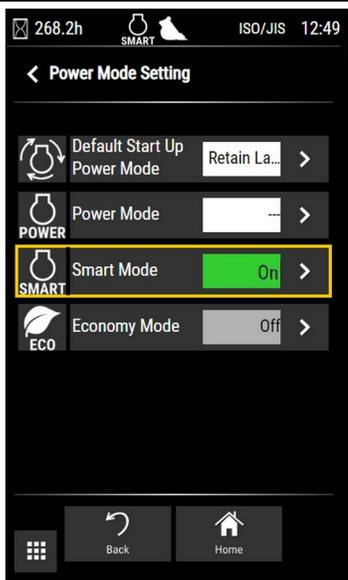


Illustration 217

g06469611

Select the desired power mode to operate in and switch to “ON” . The operator can also select the default power mode when the engine is first started. Once finished, press the “Home” button to return to the main screen.

Note: Economy Mode is not available on GC models.

Reverse Fan (If Equipped)

Note: Master level access is required to adjust reverse fan settings.

The reversing fan feature allows the operator or maintenance personnel to reverse the fan to clean debris from the cooling group. The Reverse Fan screen allows the activation of the reverse fan feature.

Note: The HVAC system in the cab will reduce air flow in the cab and disengage the compressor so it doesn't over pressurize during a reverse fan operation.

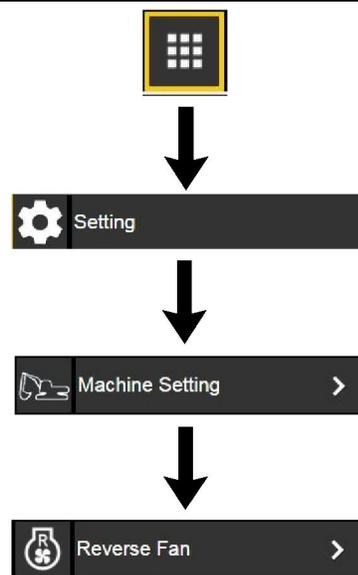


Illustration 218

g06261312

From the main screen, press the application menu button. In the Application menu, select “Setting” . Next, select “Machine Setting” , and then “Reverse Fan” .

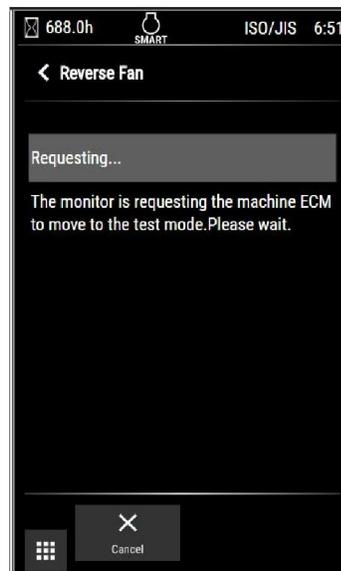


Illustration 219

g06242068

Follow the instructions and prompts on the monitor to reverse the fan.

Reverse Fan - Auto Mode

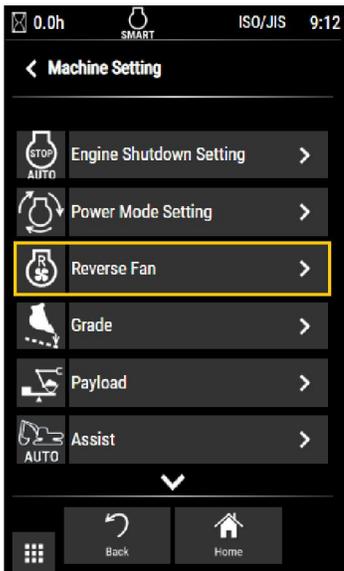


Illustration 220

g06360003

The reversing fan feature allows the operator or maintenance personnel to reverse the fan to clean debris from the cooling group. The Reverse Fan screen allows the activation of the reverse fan feature.

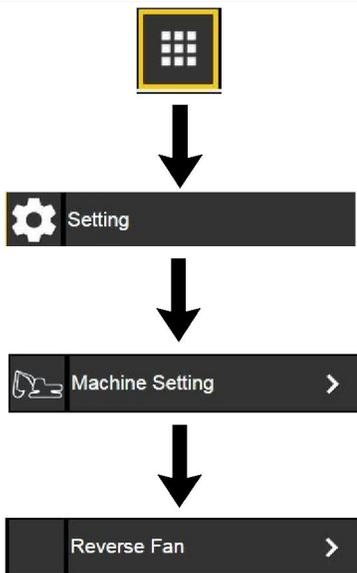


Illustration 221

g06217601

From the main screen, press the application menu button. In the Application menu, select "Setting". Next, select "Machine Setting", and then "Reverse Fan".

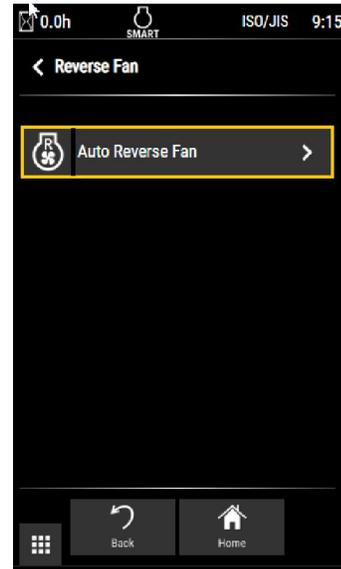


Illustration 222

g06360011

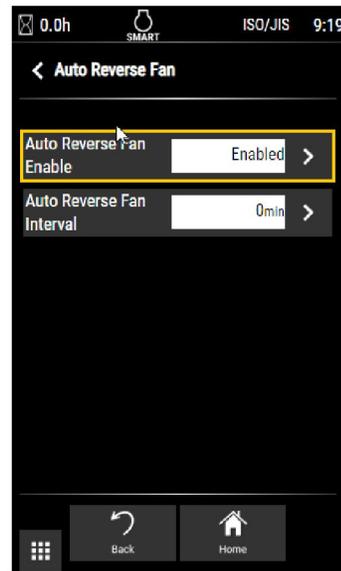


Illustration 223

g06360013

Select "Auto Reversal Fan Enable" to enable or disable the idle Auto Reverse fan feature. If enabled, select "Auto Reverse Fan Interval" to set the interval time for auto reverse fan feature. Once finished, press the "Home" button to return to the main screen.

Audio

The Audio screen allows the user to choose the radio region, enable Bluetooth, pair devices, and scan for Digital Audio Broadcast (DAB) channels.

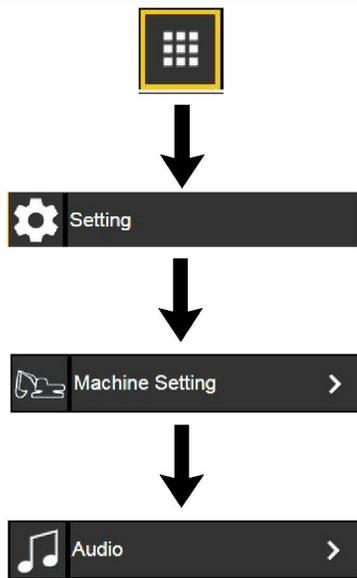


Illustration 224

g06261319

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”, and then “Audio”.

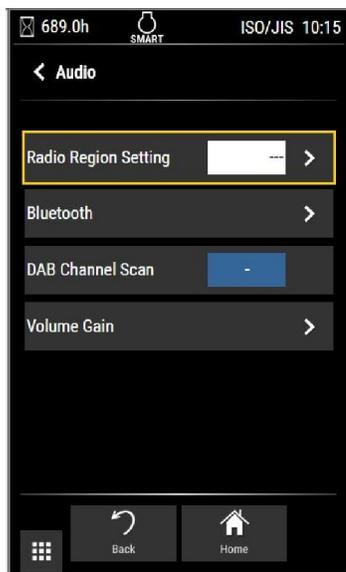


Illustration 225

g06241515

The Audio screen contains the following menu items:

- Radio Region Setting - Choose the radio region from the list of locations around the world.
- Bluetooth - Allows the operator to enable Bluetooth and pair a phone. This menu is also available through the main Audio screen. Refer to Operation and Maintenance Manual, Monitoring System - Bluetooth for information on the Bluetooth screen.

- DAB Channel Scan - Start a scan to find DAB channels in the area with good reception.
- Volume Gain - Allows the user to individually adjust the gain on various outputs such as the AM radio, FM radio, and the phone.

Lighting Shutdown Timer

Note: Master level access is required to lighting shutdown settings.

The Lighting Shutdown Timer screen allows the user to enter a delay time for the exterior lights to shut off. The Lighting Shutdown Timer provides light for a set amount of time to allow the operator to safely dismount the machine.

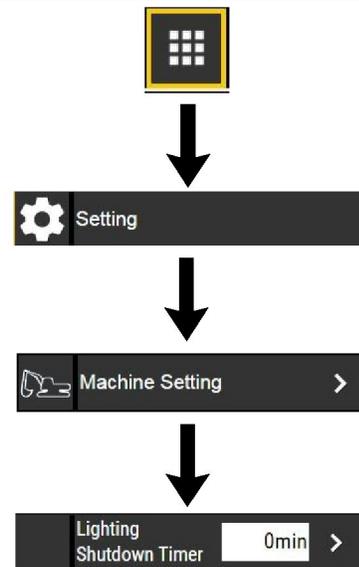


Illustration 226

g06241072

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”, and then “Lighting Shutdown Timer”.

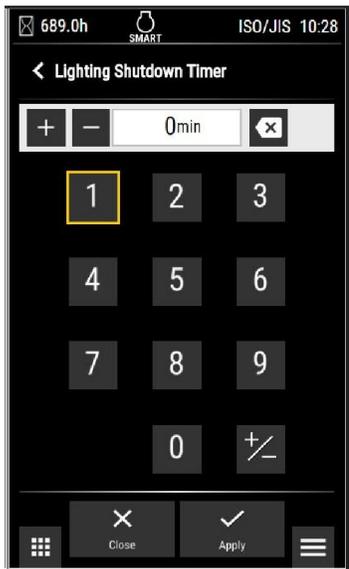


Illustration 227

g06241076

Use the keypad to enter the number of minutes for the light delay. Select “Apply” when done.

Auto Warm Up

The Auto Warm Up screen allows the user to enable and set the auto warm-up feature. This feature automatically starts a warm-up period when the engine is started and the hydraulic oil is below the set temperature.

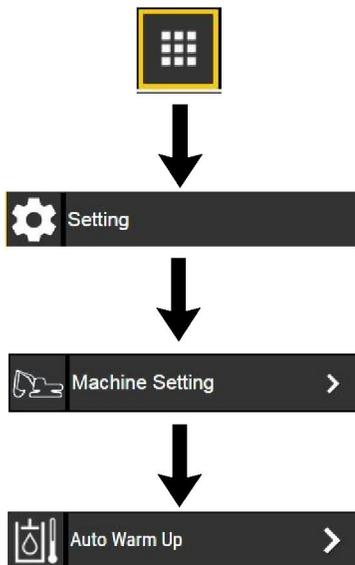


Illustration 228

g06261321

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Machine Setting”, and then “Auto Warm Up”.

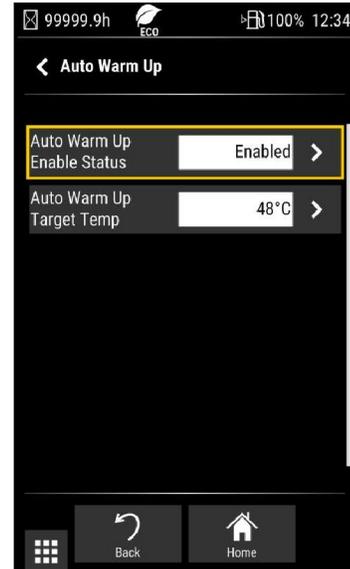


Illustration 229

g06220397

To enable or disable auto warm-up, press the “Auto Warm Up Enable Status” window, then select “Enabled” or “Disabled”.



Illustration 230

g06219830

To set the auto warm-up temperature, press the “Auto Warm Up Target Temp” window, then enter the temperature. If the hydraulic oil is below the set temperature, the auto warm-up feature will activate after the engine is started.

Sleep Time

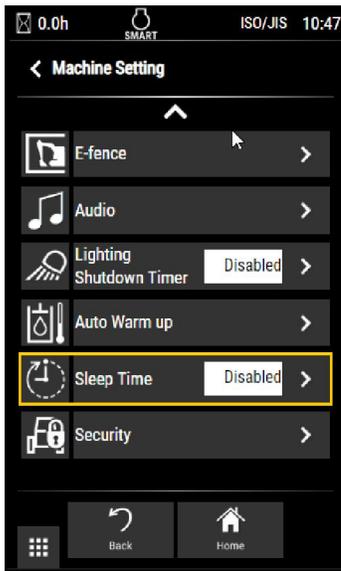


Illustration 231

g06360101

The Sleep time Setting feature allows the user to set a sleep timer for the engine start switch. If the start switch is left in the ON position, power will automatically shut off once the chosen timer interval has elapsed.

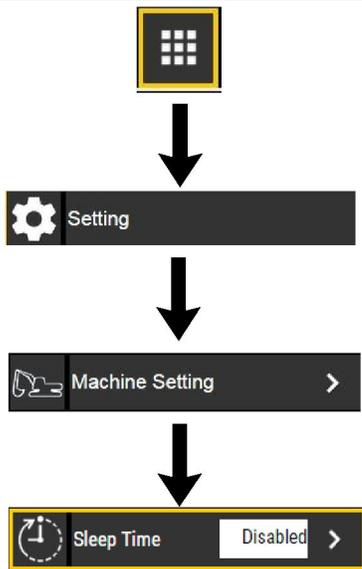


Illustration 232

g06360104

From the main screen, press the application menu button. In the Application menu, select "Setting". Next, select "Machine Setting", and then "Sleep Time".

Security

Note: Master level access is required to adjust security settings.

The Security screen allows the user to set the operator lockout time. The lockout time is the amount of time after engine shutdown that an operator can start the engine without logging back in to the monitor.

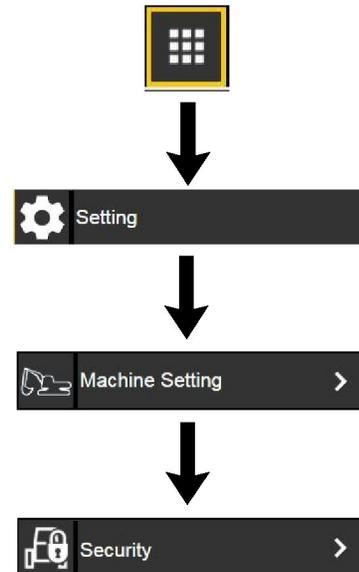


Illustration 233

g06261324

From the main screen, press the application menu button. In the Application menu, select "Setting". Next, select "Machine Setting", and then "Security".

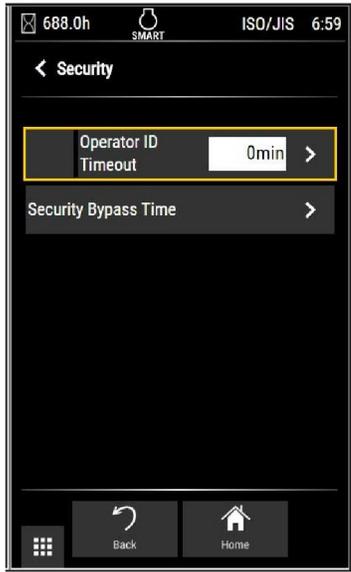


Illustration 234 g06242069

Select “Operator ID Timeout” to select the amount of time before the operators passcode times out after engine shutdown. To block out periods of time throughout the week to bypass security, select “Security Bypass Time” .

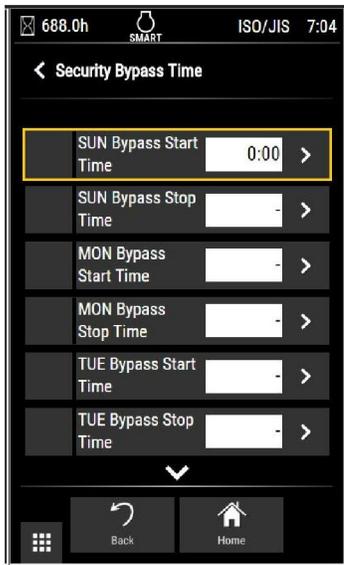


Illustration 235 g06242071

Enter the times and the days to bypass the security system.

Operator Setting

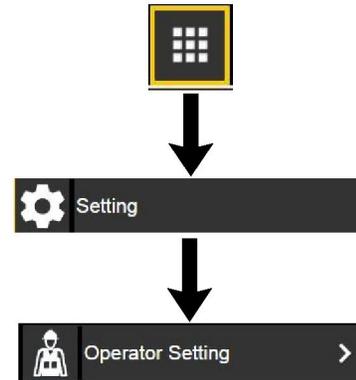


Illustration 236 g06217328

From the main screen, press the application menu button. In the Application menu, select “Setting” . Next, select “Operator Setting” .

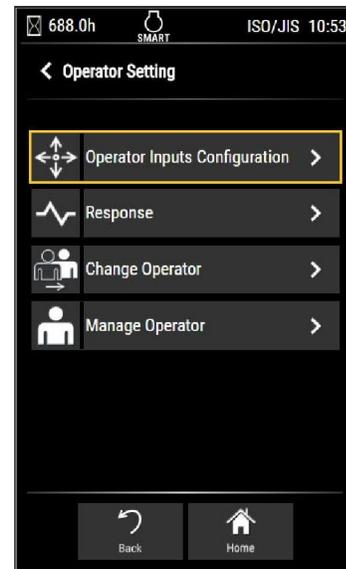


Illustration 237 g06261330

The Operator Setting menu contains the following menu items:

- Operator Inputs Configuration
- Response
- Change Operator
- Manage Operator

Operator Inputs Configuration

The operator inputs configuration screen allows the operator to configure the joystick buttons for personal preference. The settings will be stored in the preferences for that login ID.

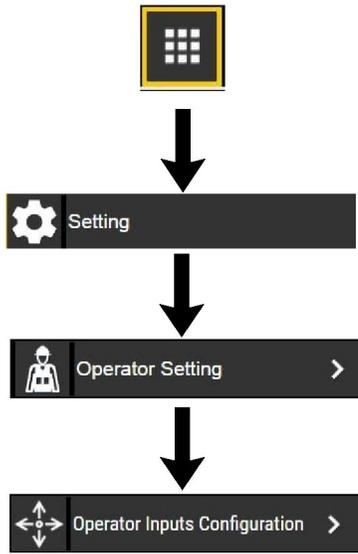


Illustration 238 g06261334

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Operator Setting”, then “Operator Inputs Configuration”.

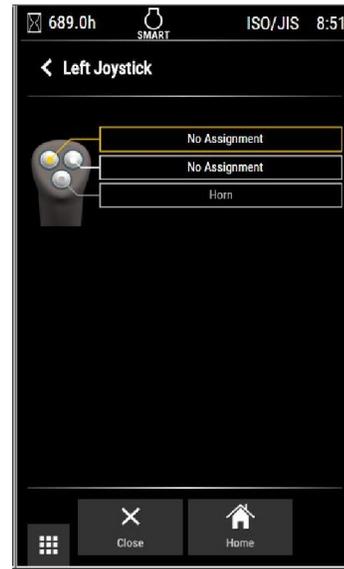


Illustration 240 g06241466

Select the button to configure.

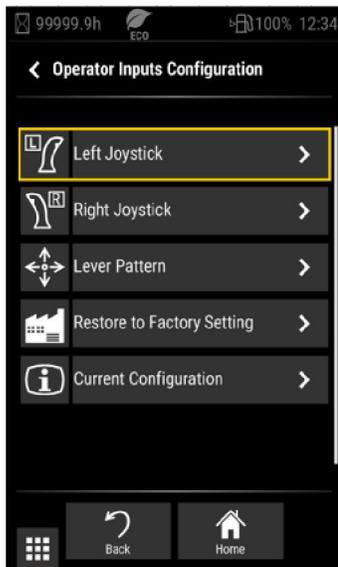


Illustration 239 g06222026

Choose the joystick to configure.

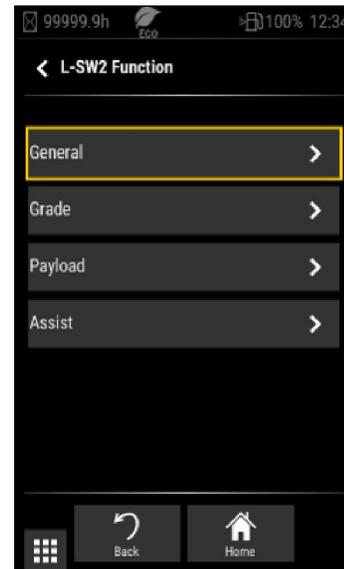


Illustration 241 g06222031

Select the category of button functions to choose from.

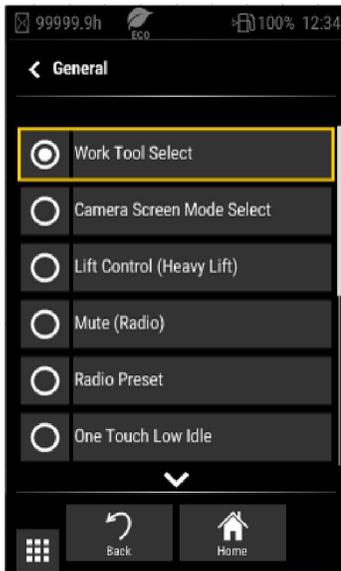


Illustration 242

g06222034

Select the desired function from the list. Repeat for the remaining buttons and press the "Home" button to return to the main screen.

Lever Pattern

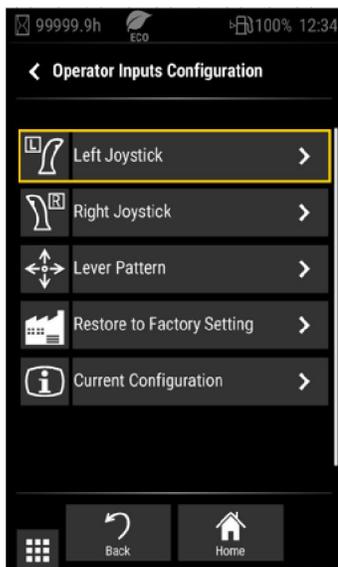


Illustration 243

g06222026

From the Operator Inputs Configuration screen, select "Lever Pattern".

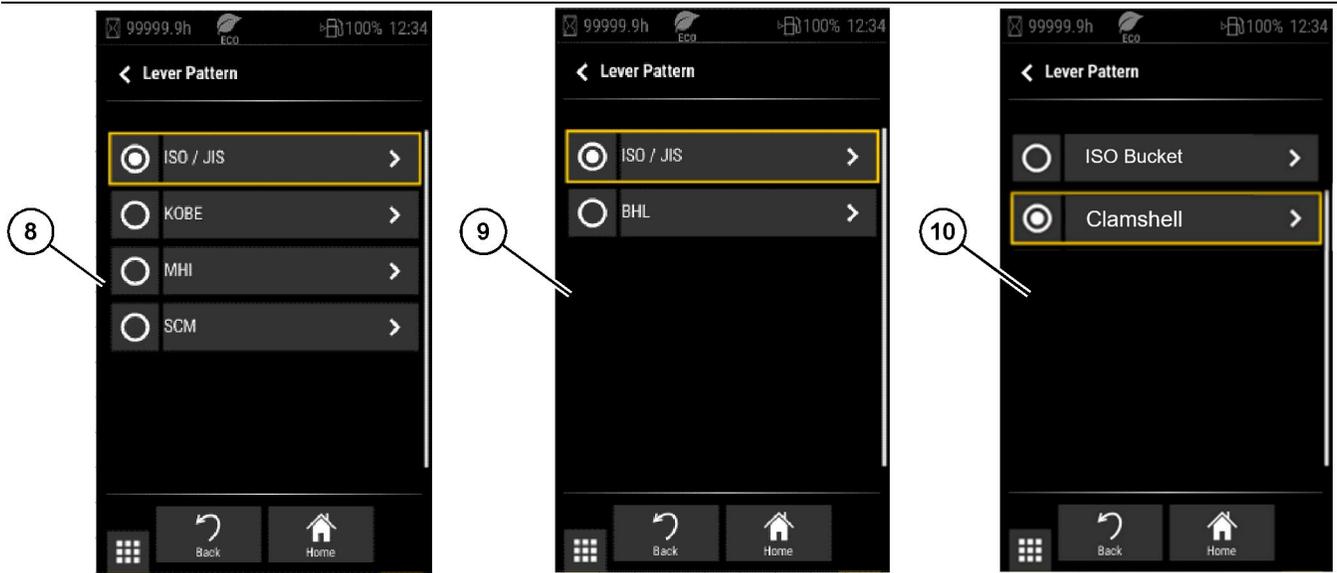


Illustration 244

g06340479

(8) 4-way menu items

(9) 2-way menu items

(10) Clamshell menu items (if equipped)

Select the desired lever pattern from the menu items.
Press the “Home” button to return to the main screen.

Restore to Factory Setting

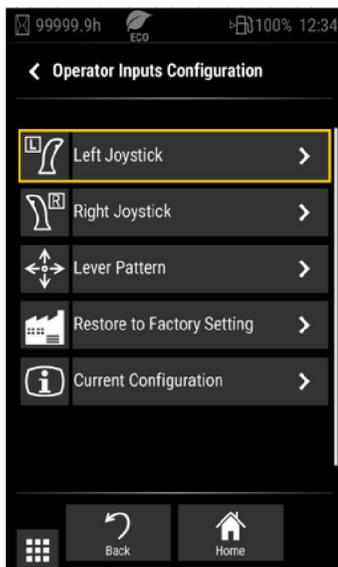


Illustration 245

g06222026

From the Operator Inputs Configuration screen,
select “Restore to Factory Setting” .

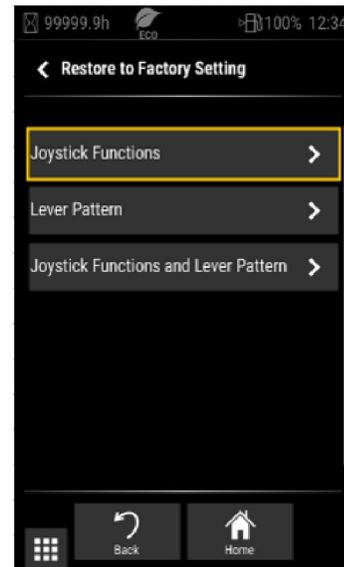


Illustration 246

g06222053

Select the item from the list to be restored.

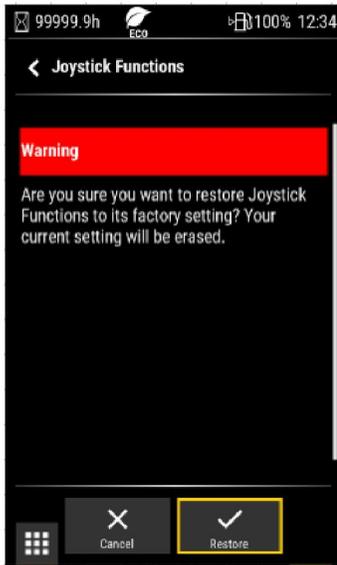


Illustration 247

g06222061

A warning will appear asking if you want to proceed. Press “Restore” to restore the settings or press “Cancel” to abort. After pressing “Restore”, the operator information screen will appear to show the new button assignments. Press the “OK” button to return to the main screen.

Response

The response screen allows the operator to adjust the spool settings which will affect how quick the machine responds when using the joysticks. The settings can be set to slow, medium, or fast.

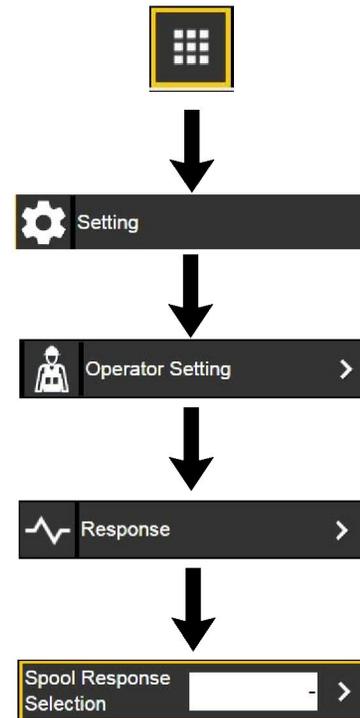


Illustration 248

g06261337

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Operator Setting”, then “Response”. Once in the Response screen, select “Spool Response Selection”.

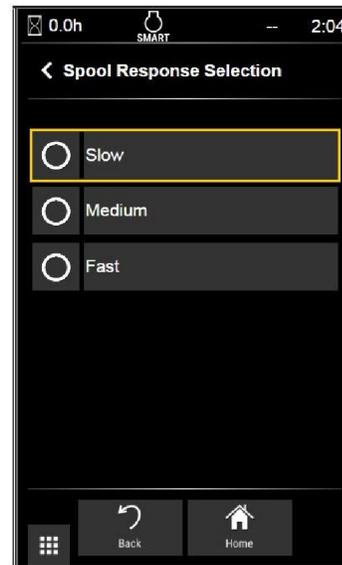


Illustration 249

g06217360

Select the desired response speed, then select the “Home” button to return to the main screen.

Change Operator

The change operator screen allows a new operator to log in. After successfully logging in, the previous operators preferences will be overridden with the new operators preferences.

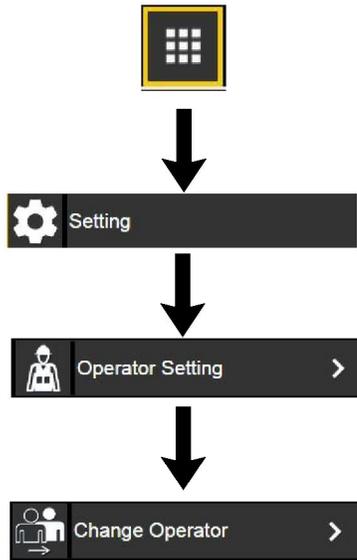


Illustration 250

g06217364

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Operator Setting”, then “Change Operator” .

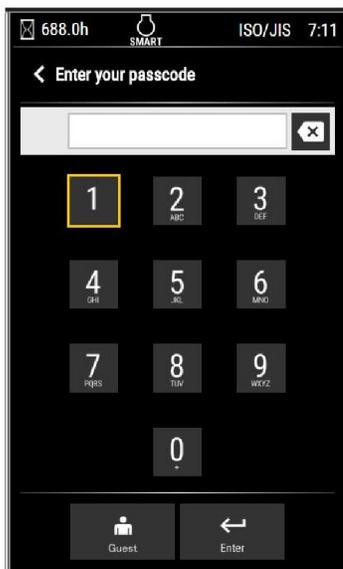


Illustration 251

g06242074

Enter the passcode or press the “Guest” button to log in as a guest.



Illustration 252

g06241547

If the login was successful, the operator screen will appear showing the preferences for the new operator. Press the “OK” button to return to the main screen.

Manage Operator

Note: Master level access is required to manage operator settings.

The Manage Operator screen allows users to add and remove operators to the machine.

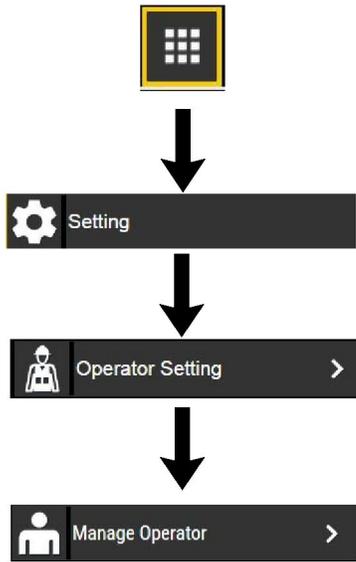


Illustration 253

g06241473

From the main screen, press the application menu button. In the Application menu, select “Setting”. Next, select “Operator Setting”, then “Manage Operator”.

Add Operator

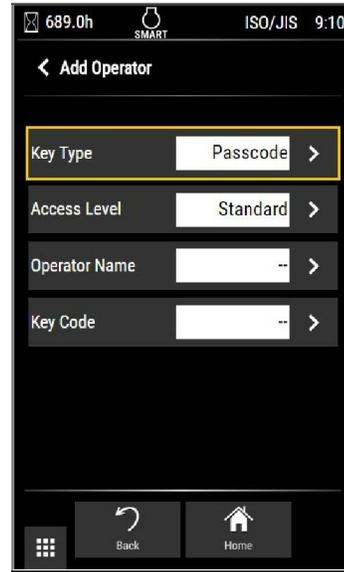


Illustration 255

g06241502

Enter the key type, access level, operator name, and the key code for the new operator. Select the “Home” button to return to the main screen.

Edit/Delete Operator

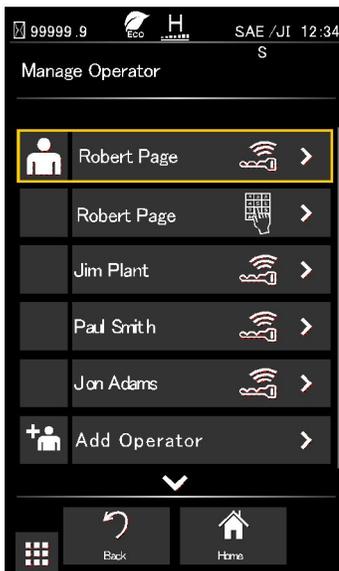


Illustration 254

g06241475

In the Manage Operator screen, select “Add Operator”.

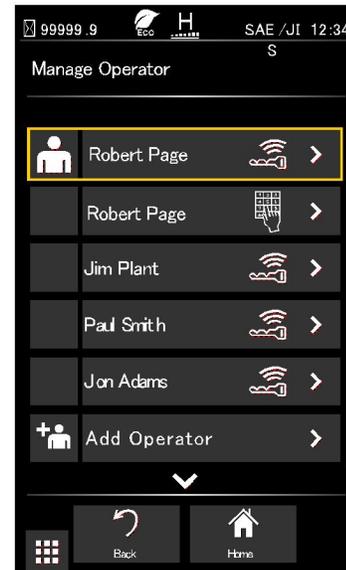


Illustration 256

g06241475

To edit or delete an operator, scroll through the operator list in the Manage Operator screen and find the operator to be changed.

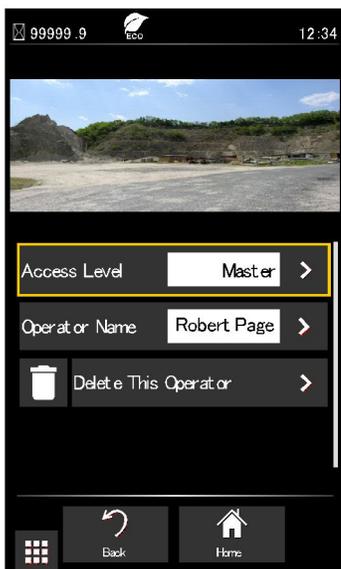


Illustration 257 g06243109

To change the access level, select the window and change to either Master or Standard.

To edit the operator name, select the window and use the keyboard to change the name.

To delete the operator, select "Delete The Operator".

Air Conditioner

Refer to Operation and Maintenance Manual, Air Conditioning and Heating Control for coverage of the air conditioner screen in the monitor.

Audio

Refer to Operation and Maintenance Manual, Radio for coverage of the audio screen in the monitor.

Phone

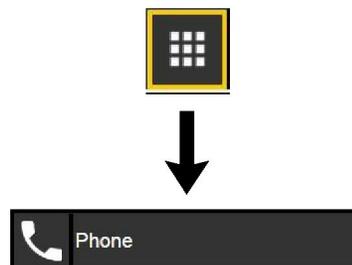


Illustration 258 g06213901

From the main screen, press the application menu button. In the Application menu, select "Phone".

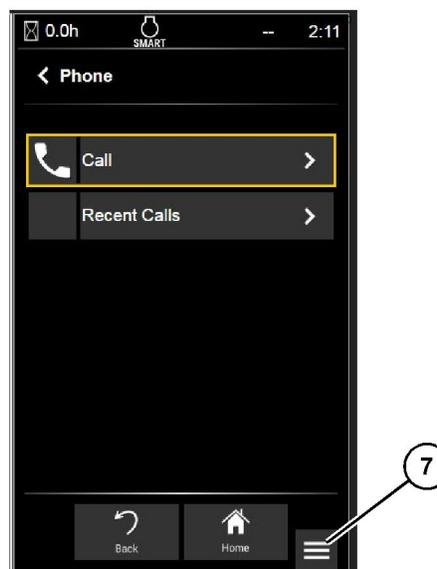


Illustration 259 g06340470

To make a call, select "Call", then use the keypad to dial the number.

Note: There must be a paired phone in the cab and Bluetooth enabled to make a call.

To check for recent calls, select "Recent Calls" from the menu. The Recent Calls screen will appear listing the most recent calls.

To access the Audio menu, press button (7).

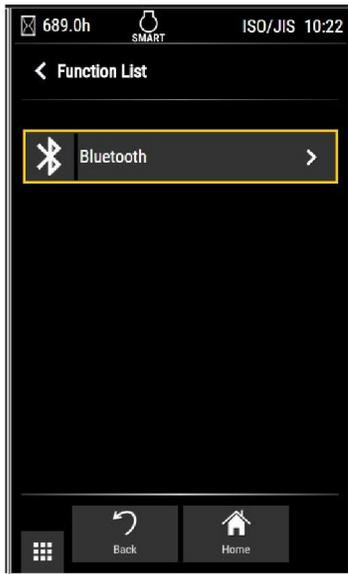


Illustration 260

g06241520

The Audio menu contains the following:

- Bluetooth - Allows the operator to enable Bluetooth and pair a phone. This menu is also available through the main Audio screen. Refer to Operation and Maintenance Manual, Monitoring System - Bluetooth for information on the Bluetooth screen.

Bluetooth

Pairing A Phone

1. While in the phone application, select “Bluetooth Setting” from the Function List menu.

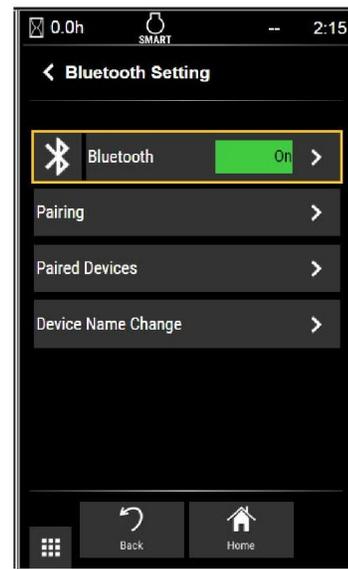


Illustration 261

g06261348

2. Ensure that the Bluetooth power is on in the monitor. If not, select “Power” and switch to On.
3. Ensure that the Bluetooth setting on the phone is on, then select “Pairing” from the monitor menu.

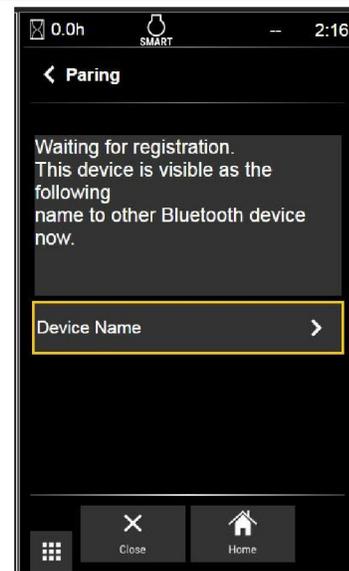


Illustration 262

g06217712

4. If the phone does not automatically search for devices, activate the search feature on the phone and follow any phone prompts.

Once paired, the phone will be added to the “Paired Devices” screen. On the screen the connected phone will have a Bluetooth symbol next to the listing. To change the name assigned to the phone, go to “Device Name Change” screen and edit the name.

Bucket/Work Tool Setting

The Bucket/Work Tool Setting screen allows the operator to choose the tool being used for work.

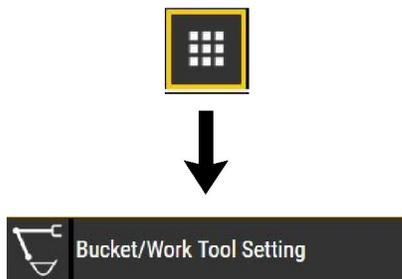


Illustration 263 g06220041

From the main screen, press the application menu button. In the Application menu, select “Bucket/Work Tool Setting” .

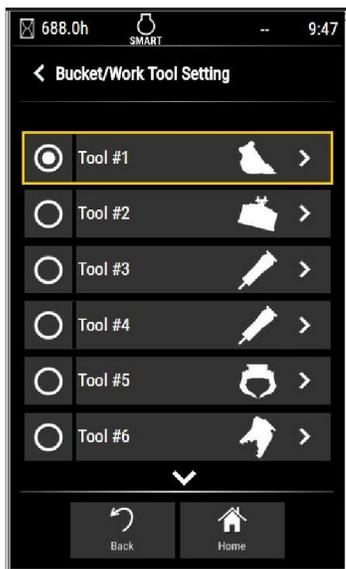


Illustration 264 g06220034

Select the desired tool.

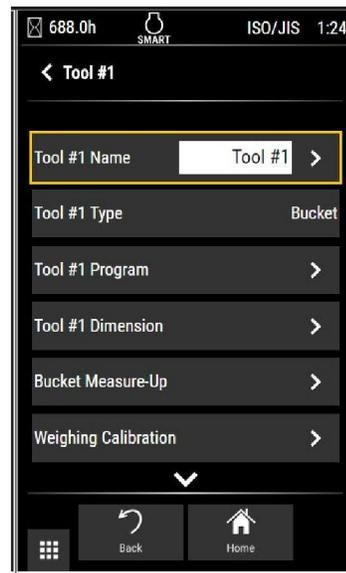


Illustration 265 g06241581

The Tool screen contains the following:

- Tool Name - Enter this screen to edit the name of the tool.
- Tool Type
- Tool Program - This screen requires a dealer password and is used to set parameters for the tool.

Electronic OMM

The Electronic OMM screen allows the operator to view the Operation and Maintenance Manual (OMM) for the machine.

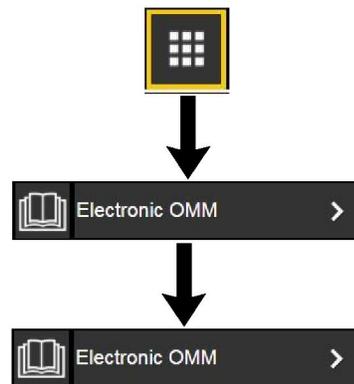


Illustration 266 g06261340

From the main screen, press the application menu button. In the Application menu, select “Setting” . Next, select “Information” and then “Electronic OMM” .

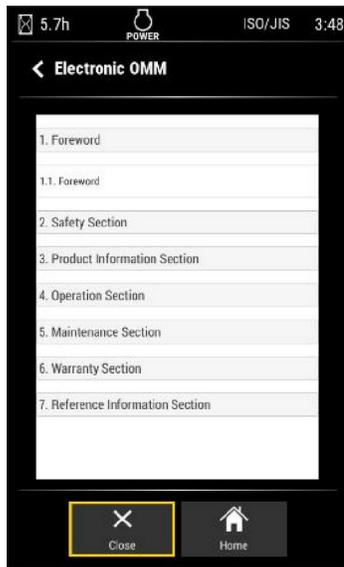


Illustration 267

g06342831

Navigate through the OMM to find the topic of choice. Press the “Home” button to return to the main screen.

Note: Contact your Cat Dealer for information to update the electronic OMM.

Function List Screen

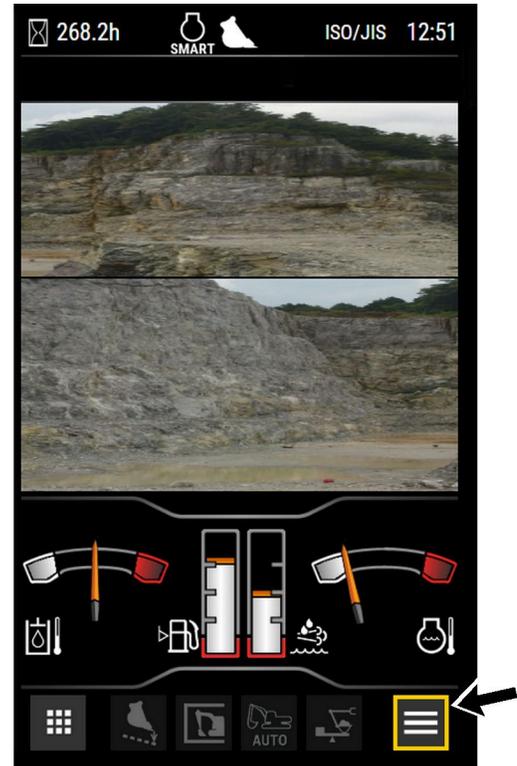


Illustration 268

g06469616

Press the Function List icon to access the Function List screen.

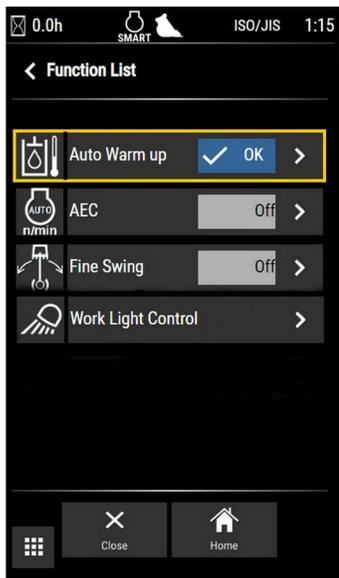


Illustration 269

g06493173

The Function List screen allows the user to turn on or off the available functions on the machine. Tap or select with the jog dial the item to turn on or off.

Auto Warm Up

The auto warm-up feature is a convenient way to make sure that the machine component temperatures are optimum for machine operation. More settings are located in Settings, Machine Settings, Auto Warm Up screen.

AEC

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

The engine rpm will recover automatically to the setting of the engine speed dial when any hydraulic function is activated.

Table 19

AEC State	Position of Manual Low Idle Switch	Description of Mode
Enabled	OFF	The electronic controller will automatically reduce the engine rpm after there has been no hydraulic demand for a set amount of time. The default time setting is 5 seconds. Approximate engine rpm: 320 GC - 950 rpm, All models except 320 GC - 1000 rpm.
Enabled or Disabled	ON	The engine speed is reduced. Approximate engine rpm: 320 GC - 950 rpm, All models except 320 GC - 1000 rpm..

Note: The position of the engine speed dial has no relevance on the actions described in Table 19 .

Fine Swing

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

Operate the machine with the fine swing control disabled when the machine is on a slope. Operate the machine with the fine swing control disabled when great swing forces are required. For example, digging on a sidewall requires great swing force. Operate the machine with the fine swing control disabled to control the motion with the swing brake.

Work Light Control

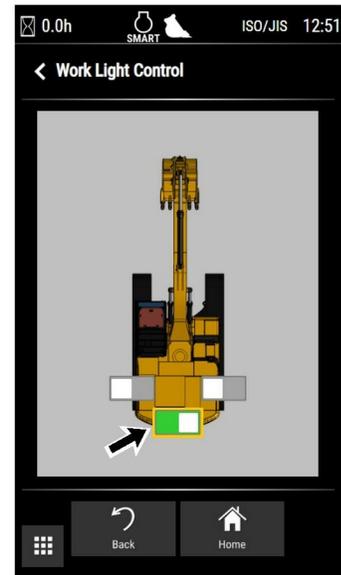


Illustration 270

g06493153

If equipped with premium surrounding lighting package, the lights are selected by this menu. The operator can activate or deactivate the lights and the lights can be selected based upon operator preference.

i06951931

Fuel Transfer Pump (Refueling) (If Equipped)

SMCS Code: 1256

Use the following procedure to pump fuel and store the hose.

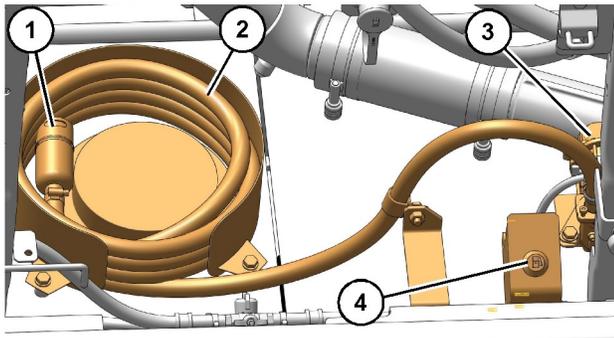


Illustration 271

g06180565

- (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.

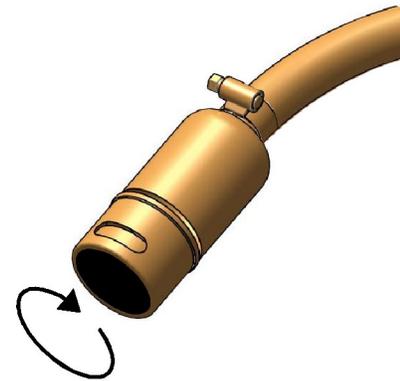


Illustration 272

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.

i07092848

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.

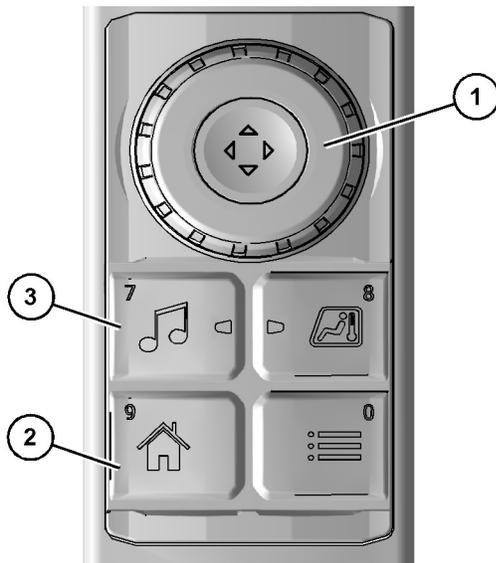


Illustration 273

g06213193

- (1) Jog dial
- (2) Home button
- (3) Radio button

The audio menu can be directly accessed by pressing radio button (3) on the right side switch panel. Input selections can be made using jog dial (1) or using the monitor touch screen. Home button (2) can be used to return to the main screen.

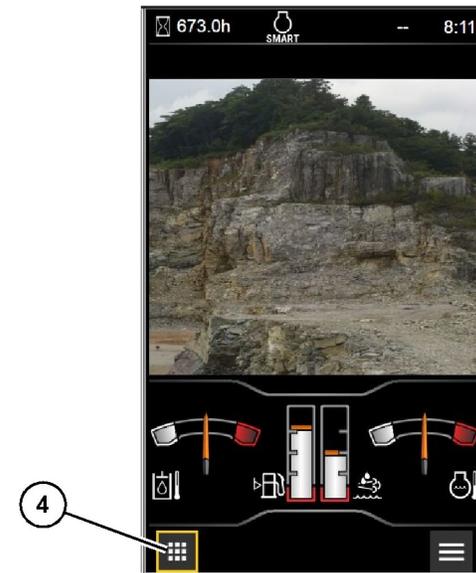


Illustration 274

g06213076

Press radio button (3) to go directly to the radio screen. To navigate to the radio screen from the main screen, press application menu button (4).

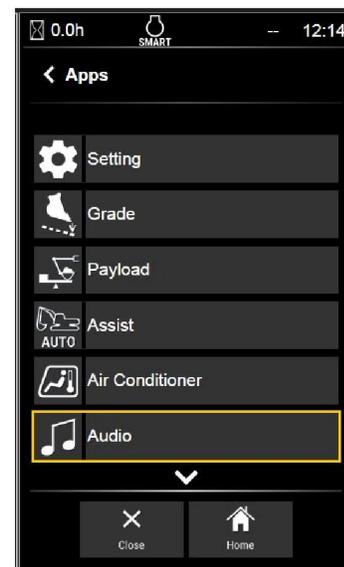


Illustration 275

g06213198

Use jog dial (1) to highlight "Audio" and then press the jog dial downward to select the entry. You may also access the screen by simply touching the "Audio" box on the touch screen.

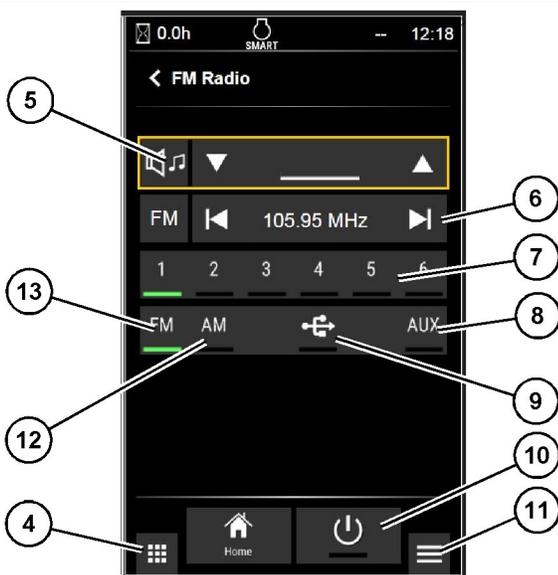


Illustration 276

g06213200

Radio screen

- (4) Application menu button
- (5) Volume control
- (6) Tuner
- (7) Preset stations
- (8) Auxiliary button
- (9) USB button
- (10) Power button
- (11) Radio Function List menu
- (12) AM button
- (13) FM button

Application menu button (4) – Use this button to return to the application menu.

Volume control (5) – The volume control is used to raise or lower the audio volume.

Tuner (6) – The tuner is used to tune the radio to the desired station.

Preset stations (7) – The preset stations 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.

Auxiliary button (8) – When a device is plugged into the auxiliary port, press the auxiliary button 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 the USB button to connect the device to the radio. The indicator light will illuminate when this mode is active.

Power button (10) – Pressing this button turns the radio on and off. The indicator light on the monitor and on button (3) will illuminate when the power is on.

Radio function list menu button (11) – Pressing this button leads to the radio function list menu.

AM button (12) – Press this button to access AM radio. The indicator light will illuminate when this mode is active.

FM button (13) – Press this button to access FM radio. The indicator light will illuminate when this mode is active.

Radio Function List

To access the radio function list, press the function list button (11) in the lower right corner of the radio screen.

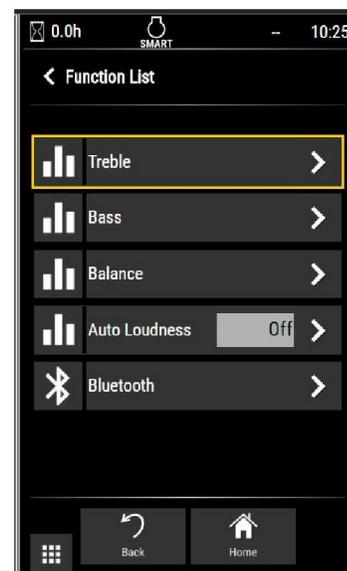


Illustration 277

g06223378

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 adjust 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 - Bluetooth for information on the Bluetooth screen.

Selection Method

All settings can be made using the touch screen or by using the jog dial. The method depends on the preference of the operator. When using the touch screen, simply touch the icon you want to select. When using the jog dial, rotate the dial to switch to different selections within the screen. Press the jog dial downward to choose a selection.

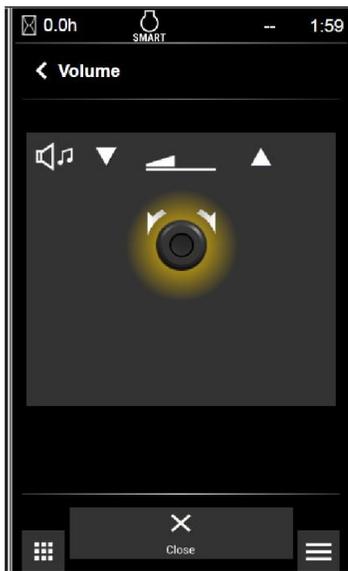


Illustration 278

g06213233

When using the jog dial to set the volume or tuner, rotate the dial clockwise to increase and counter-clockwise to decrease. Press downward on the dial to enter the desired setting.

Radio Operation

1. To operate the system, press power button (10).
2. Select between the AM button for AM stations or select the FM button 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.

USB/AUX Operation



Illustration 279

g06213245

1. To play music from a device such as an MP3 player or a phone, connect the device using an auxiliary cable or a USB cable. Depending on the cable being used, plug the cable into the appropriate port 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 as necessary.

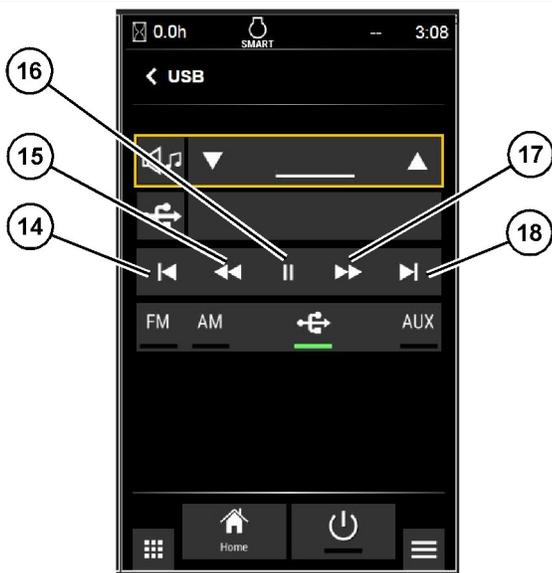


Illustration 280

g06213254

Note: If USB is selected, extra controls appear on the screen for playing music. They include the following:

- 14 – Skip to the beginning of the track
- 15 – Rewind the track
- 16 – Pause/Play the track
- 17 – Fast forward the track
- 18 – Skip to the end of the track

i08031142

Air Conditioning and Heating Control

SMCS Code: 7304; 7320; 7337

Consult with your Cat dealer for periodic maintenance of the heating and air conditioning system.

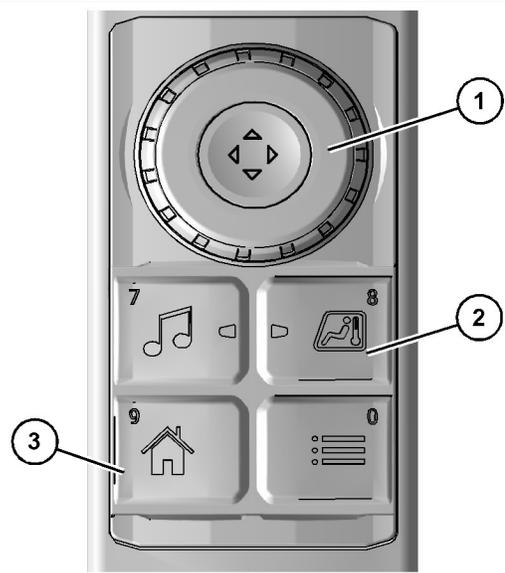


Illustration 281

g06178710

- (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 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.

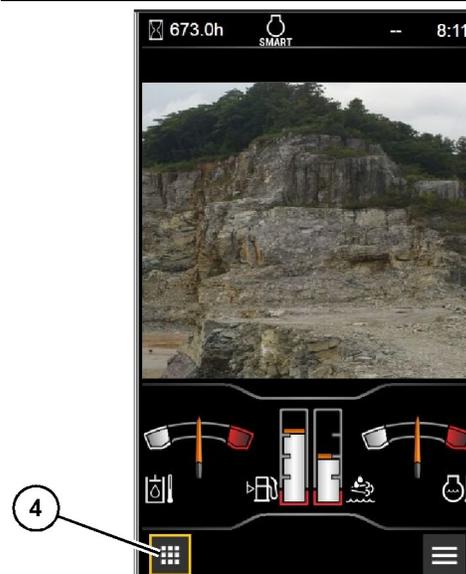


Illustration 282

g06213076

Press the Air Conditioning and Heating button (2) to go directly to the air conditioner screen. To navigate to the air conditioner screen from the main screen, press application menu button (4).

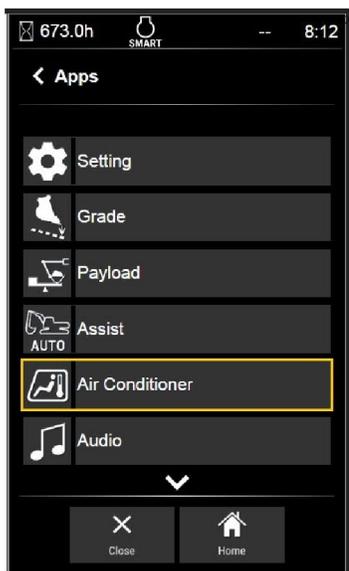


Illustration 283 g06213088

Use jog dial (1) to highlight “Air Conditioner” and then press the jog dial downward to select the entry. You may also access the screen by simply touching the “Air Conditioner” box on the touch screen.

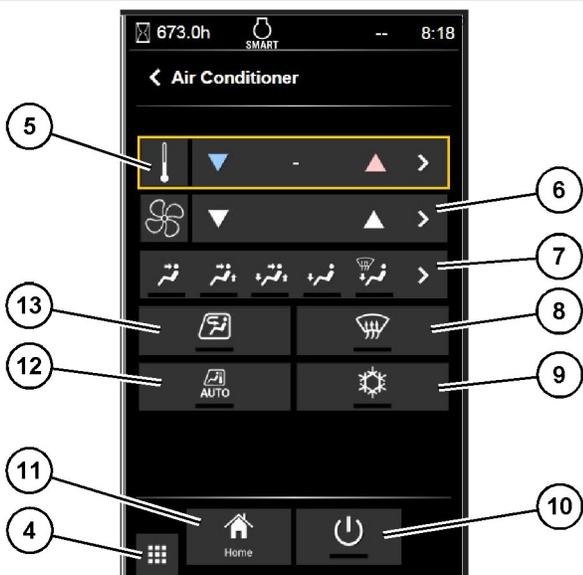


Illustration 284 g06213092

Air conditioner screen

- (4) Application menu button
- (5) Temperature control
- (6) Fan blower speed control
- (7) Air outlet settings
- (8) Defroster
- (9) Compressor ON/OFF
- (10) Power
- (11) Home button
- (12) Auto
- (13) Recirculation

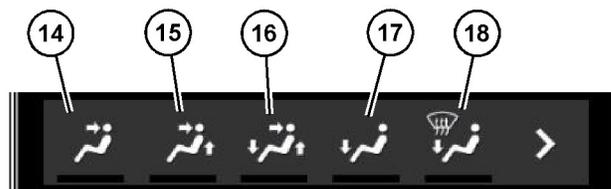


Illustration 285 g06213104

- (14) Front vents
- (15) Front and rear vents
- (16) Front, foot, and rear vents
- (17) Foot vents
- (18) Defrost and foot mode

Application menu button (4) – Use this button to return to the application menu.

Temperature control (5) – The temperature control is used to raise or lower the desired temperature.

Fan blower speed control (6) – The blower control is used to increase or decrease the desired blower speed.

Air outlet settings (7) – The desired air outlet setting can be chosen from this panel. The indicator light will illuminate to show the active setting.

Defroster (8) – Pressing this button activates and deactivates the defroster. Use the defroster to remove steam and frost from the windows. The indicator light will illuminate when this mode is active.

Compressor ON/OFF (9) – Pressing this button activates and deactivates the air conditioner. The indicator light will illuminate when this mode is active.

Power (10) – Pressing this button turns the heating and cooling system on and off. Push and hold the power button for 3 seconds to turn OFF the HVAC system. The indicator light on the monitor and on button (2) will turn green when power is on.

Home button (11) – Use this button to return to the main screen.

Auto (12) – Select this option to hold the system at the desired temperature. The system will modulate to keep the cab at the temperature that the system is set to. The indicator light will illuminate when this mode is active.

Recirculation (13) – This option recirculates air from the cab instead of pulling air from the outside. This mode is more efficient because the system is recycling conditioned air from the cab. However, no fresh air is coming into the cab when in this mode. The indicator light will illuminate when this mode is active.

Front vents (14) – In this mode, air will only circulate from the front vents.

Front and rear vents (15) – In this mode, air will circulate from the front vents and rear vents.

Front, foot, and rear vents (16) – In this mode, air will circulate from the front vents, rear vents, and foot vents.

Foot vents (17) – In this mode, air will only circulate from the foot vents.

Defrost and foot mode (18) – In defrost mode, air will circulate from the defrost vents and foot vents.

Selection Method

All settings can be made using the touch screen or by using the jog dial. The method depends on the preference of the operator. When using the touch screen, simply touch the icon you want to select. When using the jog dial, rotate the dial to switch to different selections within the screen. Press the jog dial downward to choose a selection.



Illustration 286

g06213141

When using the jog dial to set the temperature or blower speed, rotate the dial clockwise to increase and counter-clockwise to decrease. Press downward on the dial to enter the desired setting.

Operation

1. To operate the system, press power button (10).
2. Use temperature control (5) to adjust to the desired temperature.
3. Select the desired mode and outlet vents.
4. Use fan blower speed control (6) to adjust the blower. If the system is in "Auto" mode, the blower fan speed and air outlet setting will automatically be adjusted. But recirculation air intake is not changed automatically.

Note: In cold ambient temperature condition, fan speed is stopped or restricted depend on coolant temperature.

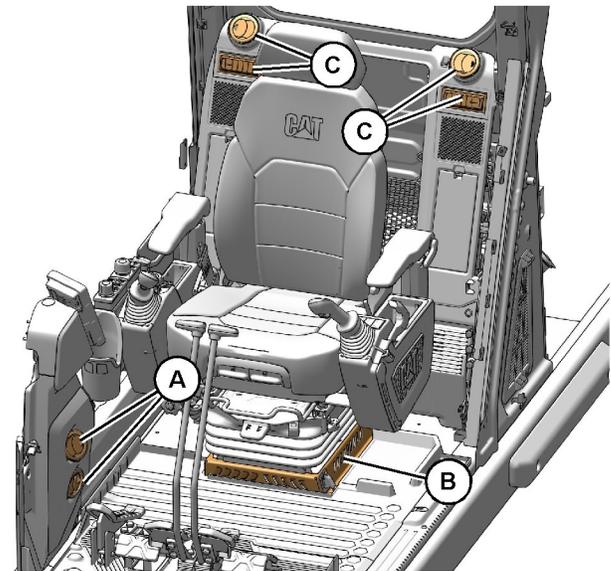


Illustration 287

g06178705

- (A) Defrost vent (front window)
- (B) Foot air vents
- (C) Rear air vents

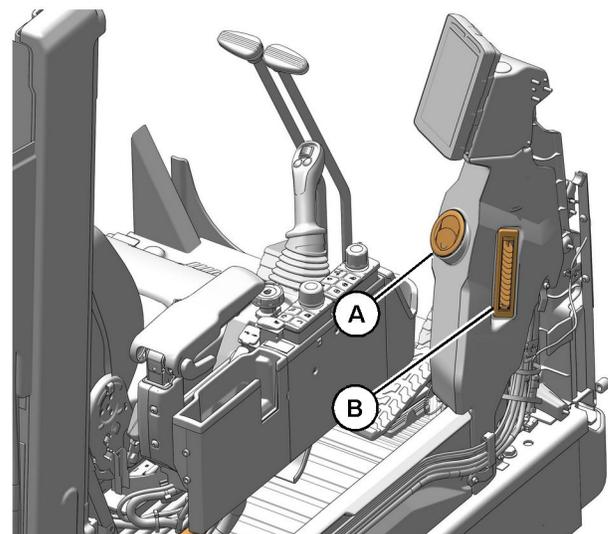


Illustration 288

g06287632

- (A) Front vent
- (B) Defrost vent (RH window)

5. Redirect the louvers for air outlets (A) and (C) by hand to the desired direction. The louvers for air outlet (B) cannot be redirected.

i07088628

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.

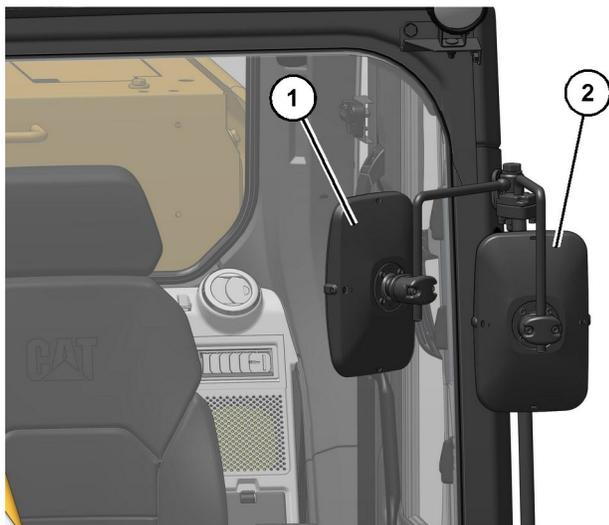


Illustration 289

g06220616

- (1) Right Side View Mirror on the Cab
(2) Left Side View Mirror on the Cab

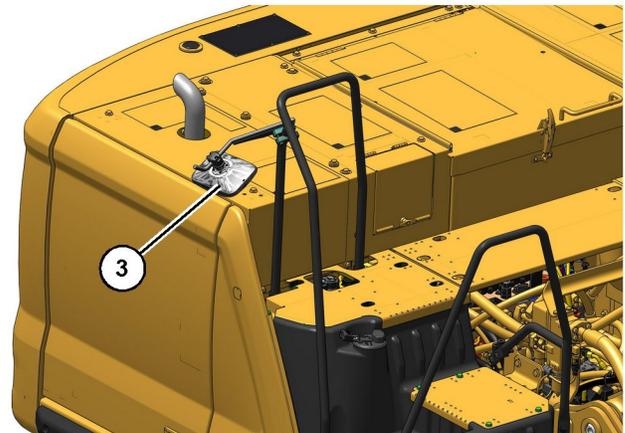


Illustration 290

g06220627

- (3) 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 Operation and Maintenance Manual, "Operator Controls".
- Stop the engine.
- Adjust rear view mirrors to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.

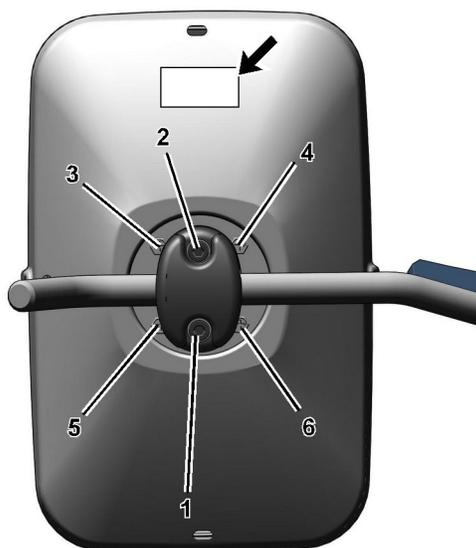


Illustration 291

g06220634

Tightening sequence

After adjustment of the mirror angle, make sure that the CAT logo is at the top.

It may be necessary to periodically tighten the mirror mounting bolts. If the bolts are loose, tighten the bolts in the sequence shown in Illustration 291. Tighten bolts (1) and (2) to $11 \pm 2 \text{ N}\cdot\text{m}$ ($8.1 \pm 1.5 \text{ lb ft}$).

Tighten the bolts (3) through (6) to $2 \pm 0.4 \text{ N}\cdot\text{m}$ ($1.5 \pm 0.3 \text{ lb ft}$).

Right Side View Mirror on the Cab (3)

Illustration 292

g06223277

If equipped, adjust the right side view mirror on the cab (1) so the front of the right track can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the right front of the machine should be seen from the operator seat.

Left Side View Mirror on the Cab (4)



Illustration 293

g06223279

If equipped, 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 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 (3)



Illustration 294

g06223284

If equipped, adjust the tank mirror so the fuel tank and the hydraulic tank can be seen from the operator seat. A view of at least 1 m (3.3 ft) from the side of the machine should be seen from the operator seat.

i07854649

Camera

SMCS Code: 7347; 7348

Rear View Camera



Illustration 295

g06184579

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.

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

Side View Camera (If Equipped)



Illustration 296

g06214504

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".

i07427990

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:

Operation Section
Window (Front)

- Park the machine on a level surface.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position.
- Stop the engine.

Perform Step 1 through Step 3 to open the upper window.

Note: If equipped, the Cat Grade Control monitor may interfere with the window when opening. Ensure that the monitor is adjusted out of the way before opening the window.

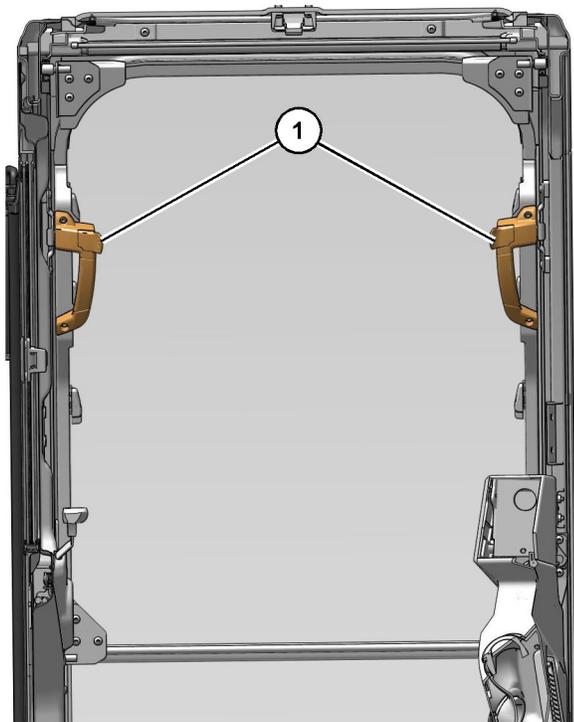


Illustration 297

g06185052

(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.

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.

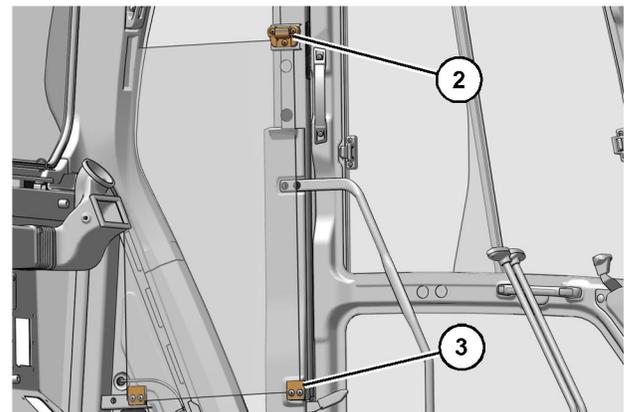


Illustration 298

g06185076

(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.

i07538754

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).

NOTICE

Do not change the position of the sun screen 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.

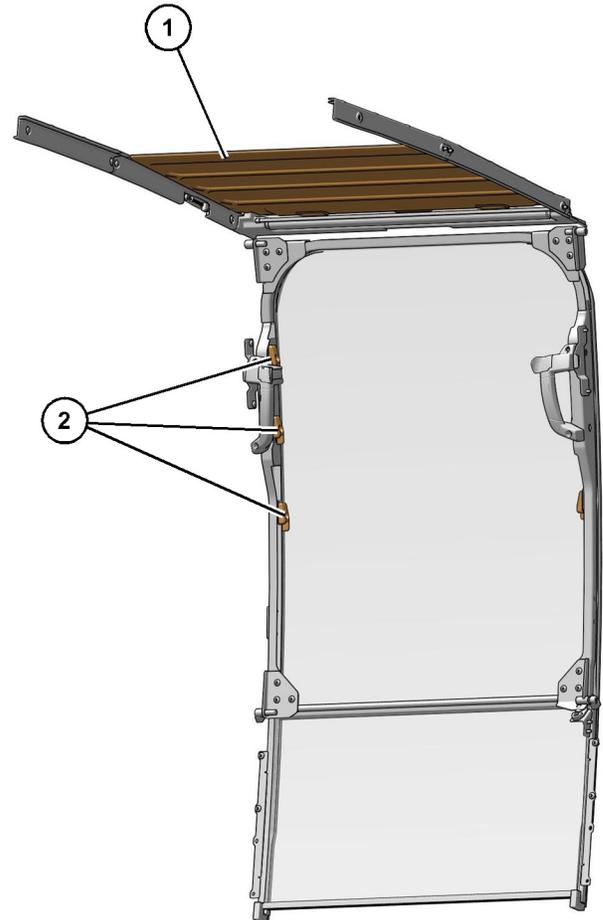


Illustration 299

g06179846

Pull sun screen (1) down from the ceiling. Hook the sun screen to the brackets (2) at both sides of the front window. The sun screen 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.

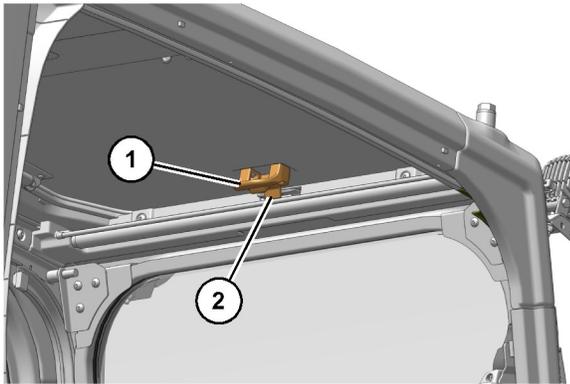


Illustration 300

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 301

g06180275

To open the cab door from the outside of the cab, pull outward on the door handle.

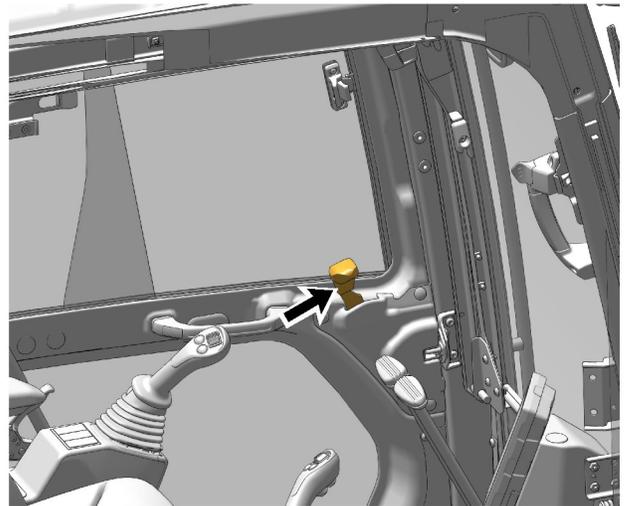


Illustration 302

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.

i06946782

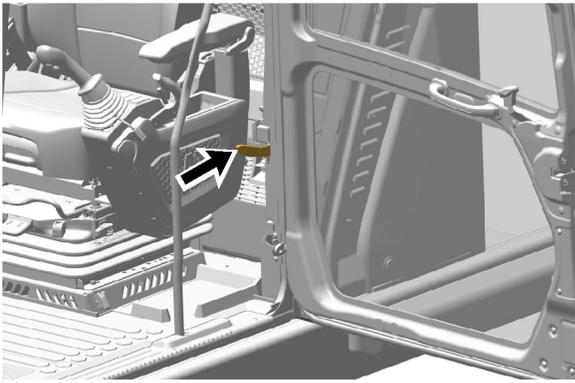


Illustration 303

g06180267

To release the cab door from the catch, pull downward on the cab door release lever.

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.

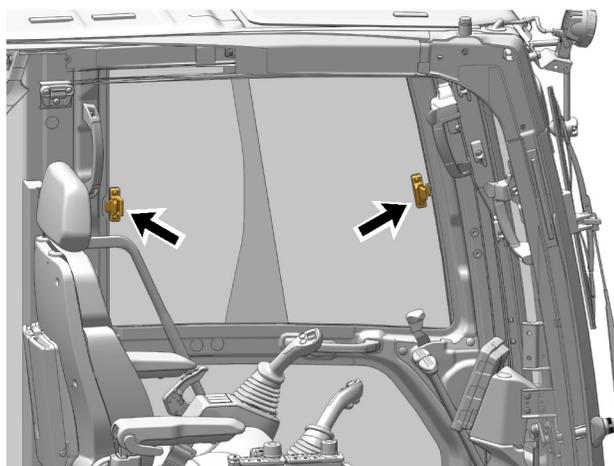


Illustration 304

g06179957

To open a window, release the window latch, and then slide the window to the desired position.



Illustration 305

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.

Operation Section
Straight Travel Pedal (If Equipped)

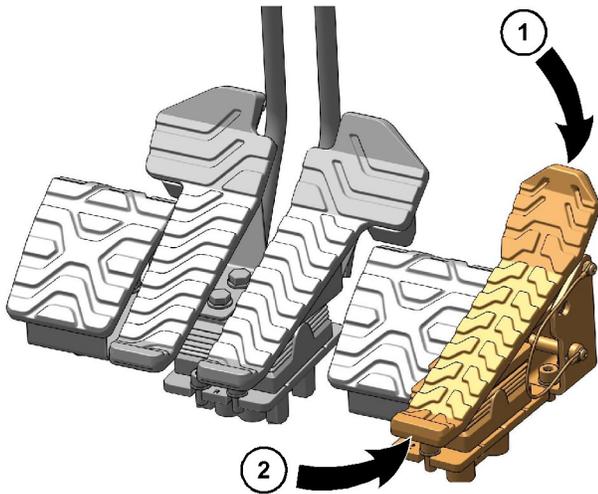


Illustration 306

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.

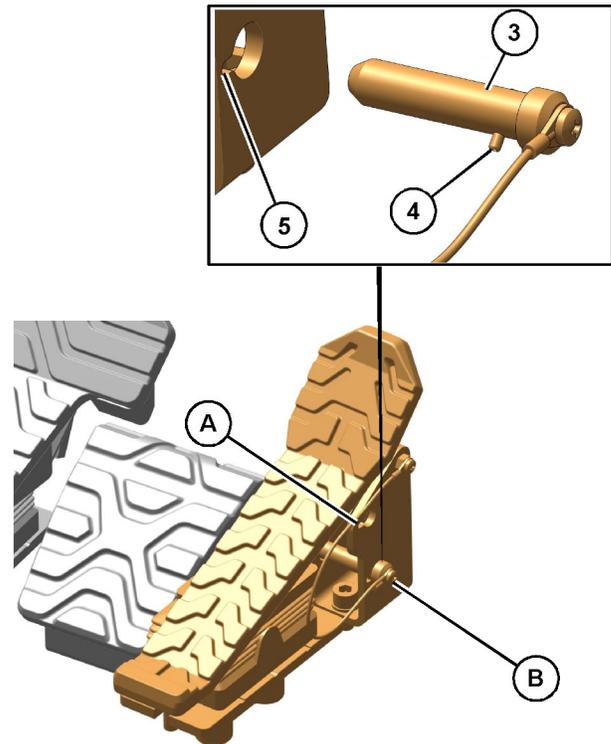


Illustration 307

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.

i08015281

Joystick Controls

SMCS Code: 5705

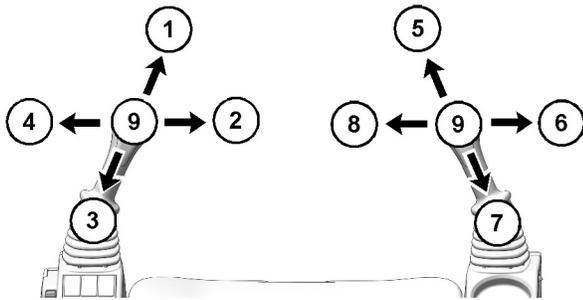


Illustration 308

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

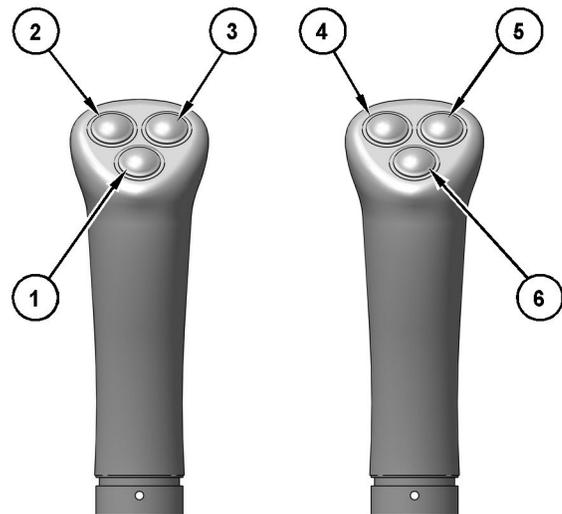


Illustration 309

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 20

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 310

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 21

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

⁽¹⁾ Button is configurable on machines without tool control.

Medium Pressure (If Equipped)

Rotating Tool Control

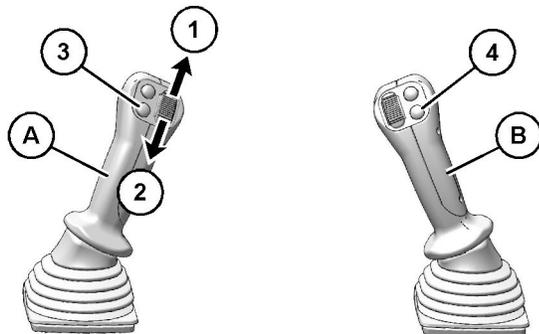


Illustration 311

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.

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

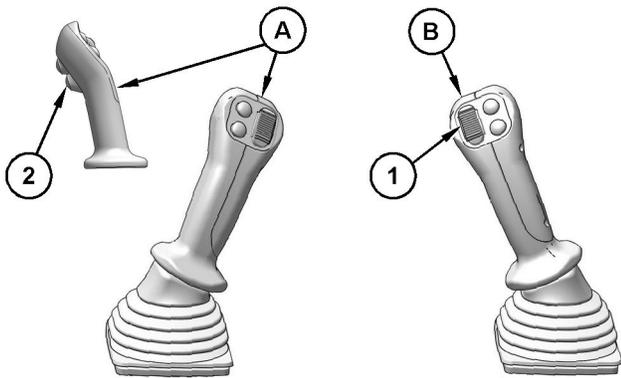


Illustration 312

g06588792

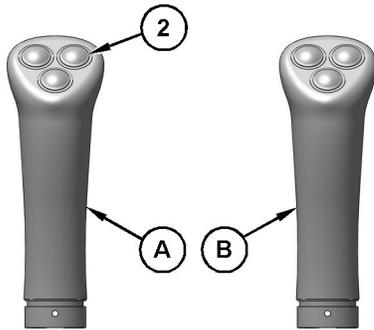


Illustration 313

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

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 modulate the speed of the work tool.

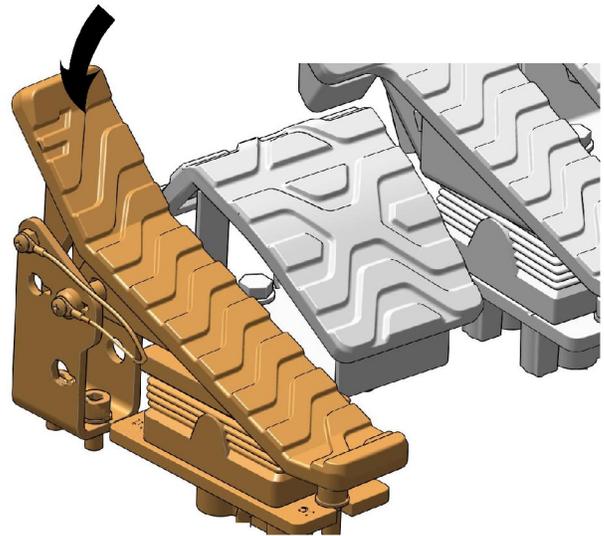


Illustration 314

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.

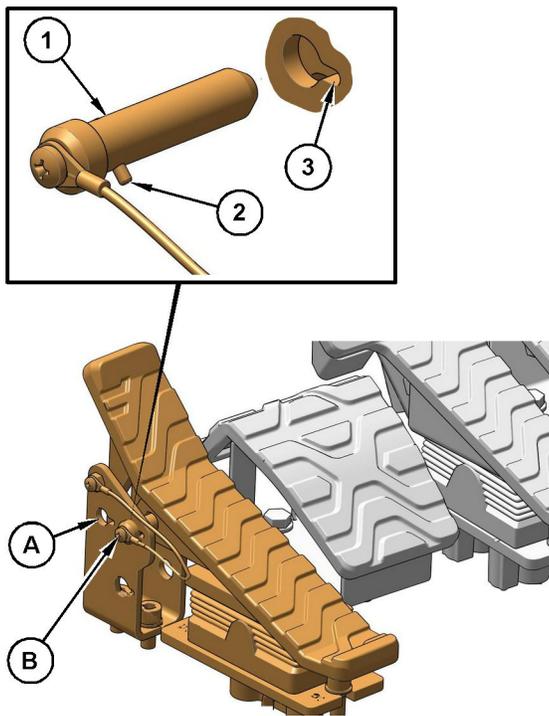


Illustration 315

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

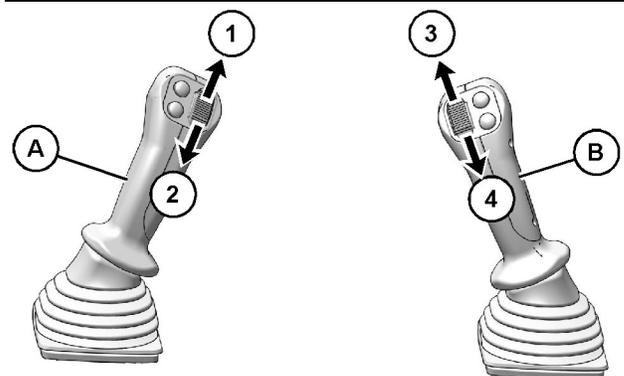


Illustration 316

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.

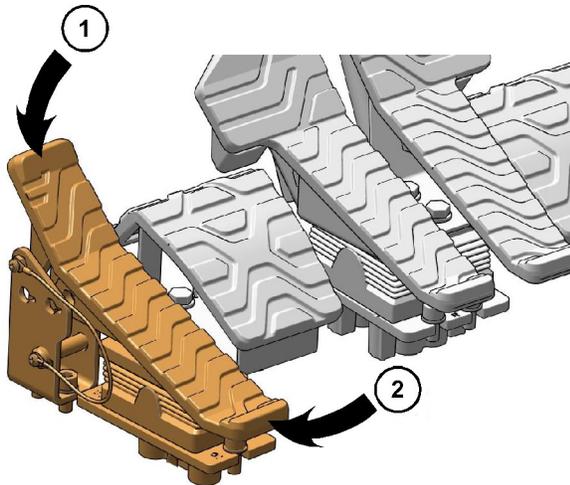


Illustration 317

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.

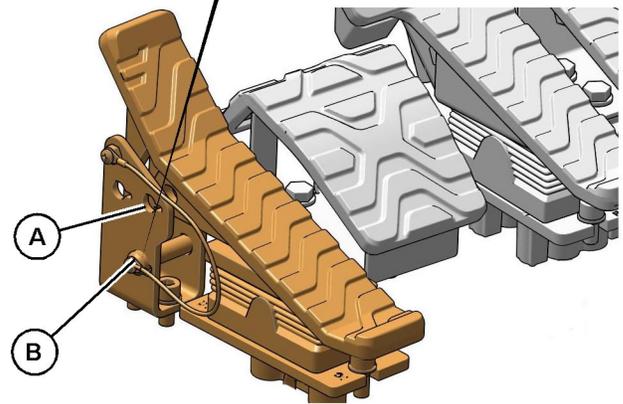
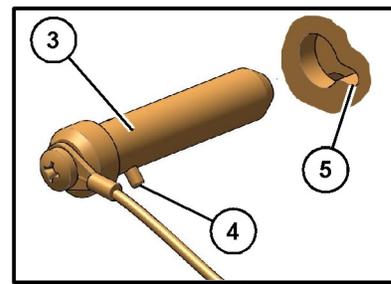


Illustration 318

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.

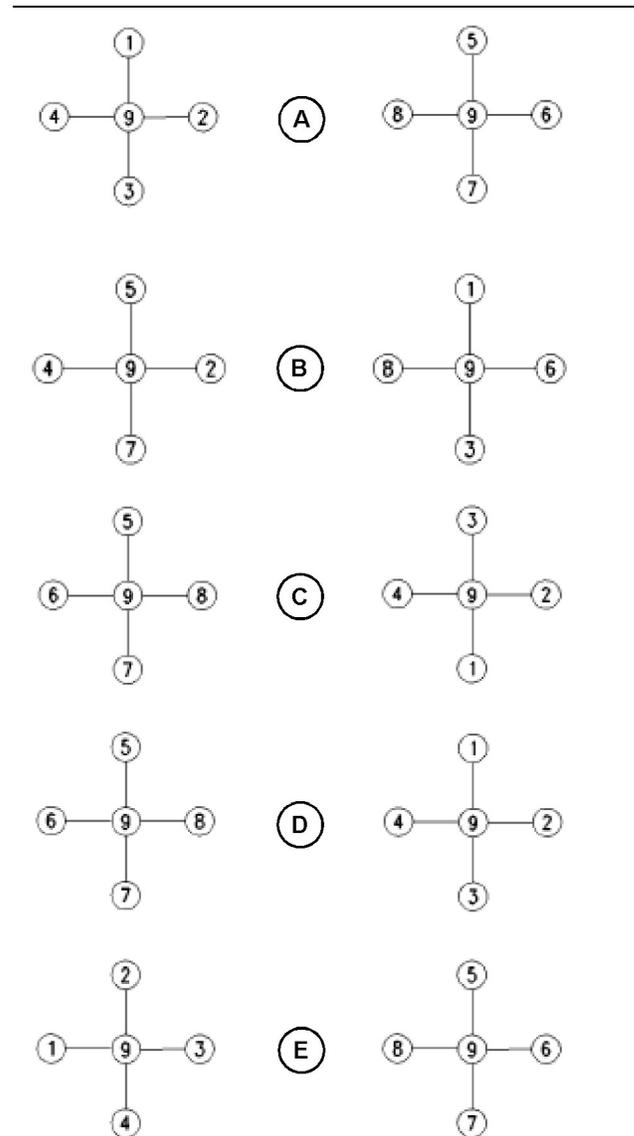


Illustration 319

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.

i07362012

Work Tool Flow Control

SMCS Code: 7007-WTL

Many hydraulic attachment circuits are adaptable on this machine. Various types of work tools can be installed. Select a suitable arrangement of the hydraulic circuit in order to provide the requirements for flow and the requirements for action for the work tool that is used.

One-way flow is available for work tools such as hydraulic hammers.

Two-way flow is available for work tools such as hydraulic shears.

A manually controlled ball valve is provided in the return line.

Before attachment hydraulic circuits are serviced, place the machine in the servicing position. Stop the engine.

Place the ball valve in the correct position. To determine the correct position, refer to the requirements for the work tool on Illustrations 320 , 321 , and 322 .

Use the manual lever to turn the ball valve. Make sure that you fully turn the ball valve until the ball valve stops.

Never use the manual lever as a step when the manual lever is attached to the ball valve. Remove the manual lever from the valve after the valve is adjusted.

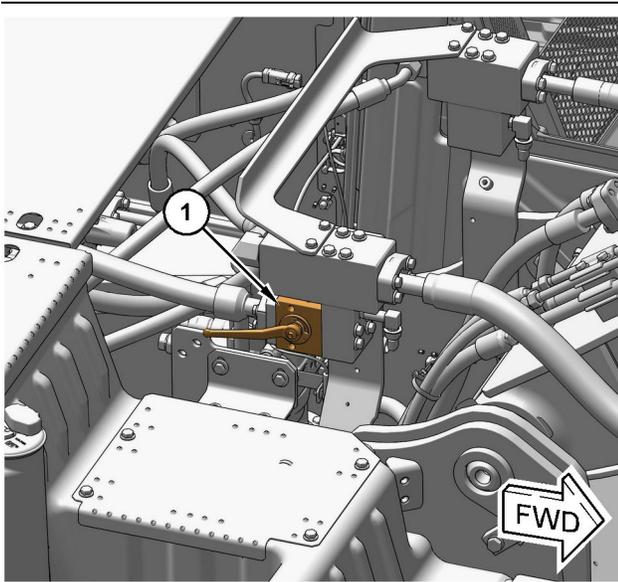


Illustration 320 g06295566
Ball valve location
 (1) Ball valve

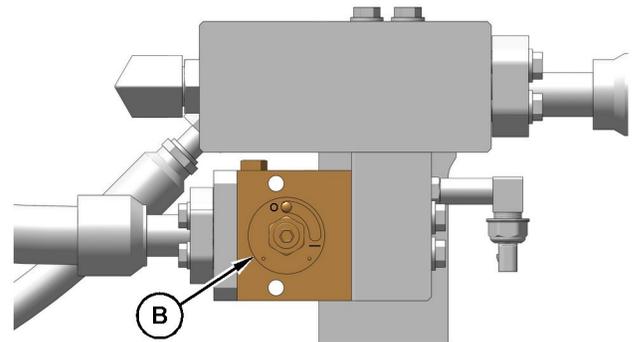


Illustration 322 g06295576
Ball valve (two-way flow position)
 (B) Ball valve closed

i06951805

Fuel Tank Shutoff and Drain Control

SMCS Code: 1273

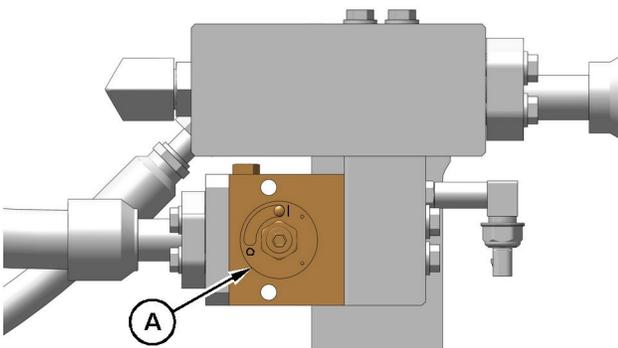


Illustration 321 g06295579
Ball valve (one-way flow position)
 (A) Ball valve open

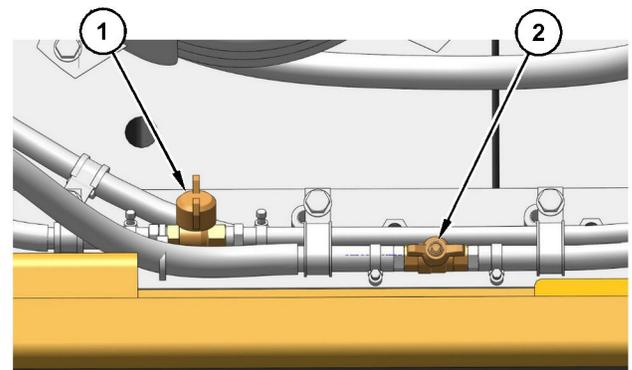


Illustration 323 g06214473
Fuel tank drain valve and shutoff

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, turn the fuel shutoff valve clockwise. To turn on the fuel supply, turn the fuel shutoff valve counterclockwise.

Operation Section
Fuel Tank Shutoff and Drain Control

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".

Engine Starting

i08185791

Engine Starting

SMCS Code: 1000; 1090; 1456; 7000

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.

1. Move the hydraulic lockout control to the LOCKED position.

This machine is equipped with an engine neutral start system. The system only allows the engine to start when the lever for the hydraulic lockout control is in the LOCKED position.

2. Ensure that the joysticks and travel controls are in the HOLD position.

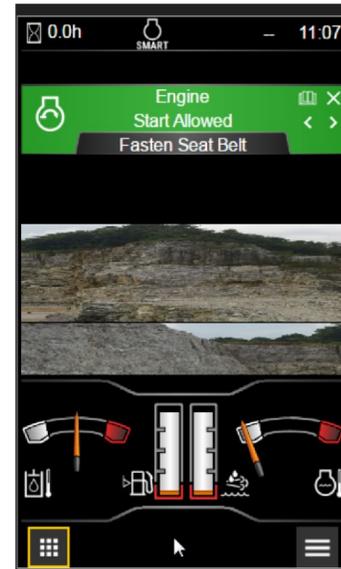


Illustration 324

g06209482

3. The operator passcode, Bluetooth key or Cat App: Fleet management app must be authenticated before starting the engine. Once authenticated, an "Engine Start Allowed" message will appear across the top of the monitor and the start switch LED will turn green.

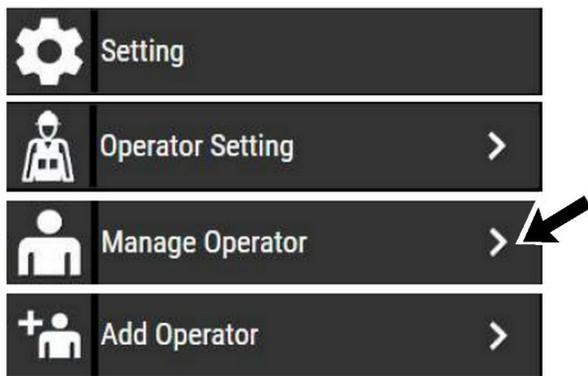


Illustration 325

g06579150

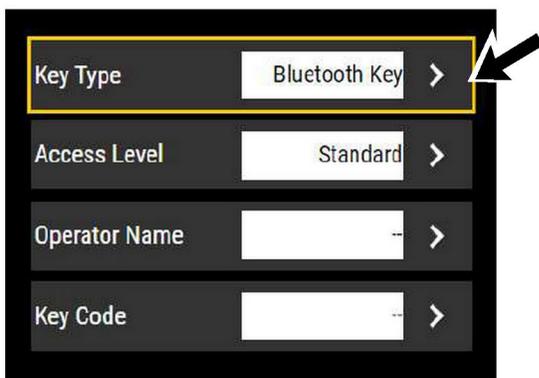


Illustration 326

g06579155

- 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, Operator Login for instructions.

- Before you start the engine, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the horn before you start the engine.

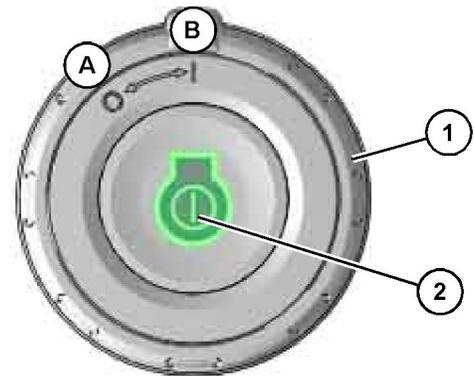


Illustration 327

g06226447

- (A) Off
(B) On
(1) Engine start ring
(2) Engine start button

- Turn the engine start ring(1) to the ON position, then press and hold start button (2) to start the engine. Release the button 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.

i07552385

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 328

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.



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.

Recommendation for Crankcase Breather Protection (Machines with C4.4 and C7.1)

Crankcase ventilation gases contain a large quantity of water vapor. This water vapor can freeze in cold ambient conditions and can plug or damage the crankcase ventilation system. If the engine is operated in temperatures below -25°C (-13°F), measures must be taken to prevent freezing and plugging of the breather system. Insulated hoses and a heated canister assembly should be installed.

Consult with your Cat dealer for the recommended breather components for operation from -25° to -40°C (-13° to -40°F).

Installation



Illustration 329

g06181368

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 329 . The covers should fully cover the door vents.

Operation

i07348768

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°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.

Make sure that no personnel are on the machine or near the machine to prevent any personal injury. Keep the machine under control at all times to prevent injury.

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

Reduce the engine speed when you maneuver the machine in tight quarters and when you drive over an incline.

Select the necessary travel speed range before you drive downgrade. Do not change the travel speed range while you drive downhill.

Use the same travel speed on a downgrade and on an upgrade.

When you travel for any distance, keep the stick inward and carry the boom in a low position.

When you drive up a steep grade, keep the boom as close to the ground as possible.

When you travel uphill or you travel downhill, keep the boom on the uphill side of the machine.

1. Adjust the operator seat.
2. Fasten the seat belt.



Illustration 330

g06181515

3. Turn the engine speed dial to the desired operating range.
4. Move the hydraulic lockout control to the UNLOCKED position.

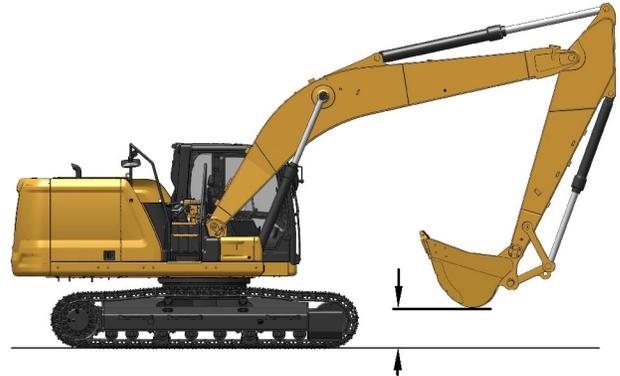


Illustration 331

g06181525

5. Raise the boom enough to provide sufficient ground clearance.

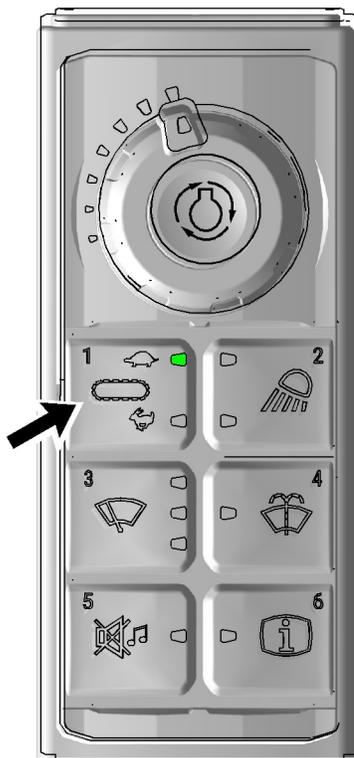


Illustration 332

g06181517

6. Select the desired travel speed by operating the travel speed control switch. The indicator will light to display the active mode.
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. See Operation and Maintenance Manual, "Operator Controls" for information about spot turning and about pivot turns.

11. When you make turns in soft material, travel in a forward direction occasionally 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.

Lifting Objects

If the machine is equipped with the CE plate per requirements for the European Union, used to lift objects, then the machine must be equipped with a boom lowering control valve, a stick lowering control valve, and an overload warning device.

A fit for purpose test was completed to confirm that a properly equipped machine meets the requirements of the European Union Machinery Directive "2006/42/EC" for lifting objects.

The overload warning device (if equipped) must be adjusted for the bucket linkage and bucket size that is installed on the machine. Adjust the overload warning device for proper operation.

The setting for the overload warning device (if equipped) should be checked by an authorized dealer.

i06981624

Frozen Ground Conditions

SMCS Code: 7000



Illustration 333

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.

i07474576

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.

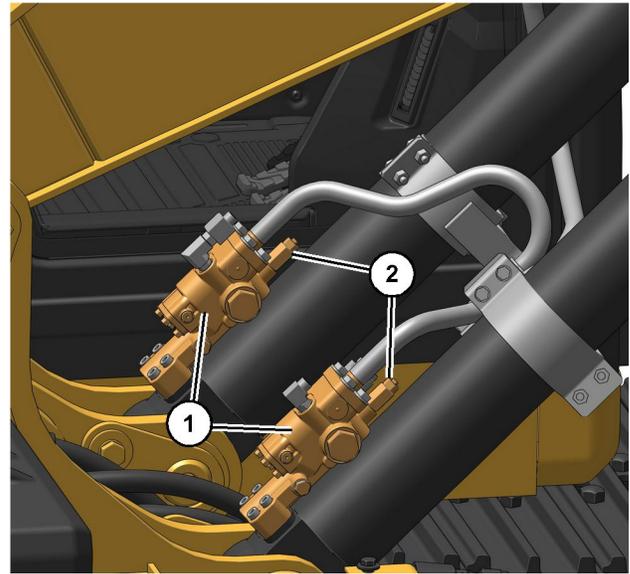


Illustration 334

g06263683

- (1) Boom lowering control valve
- (2) Line relief

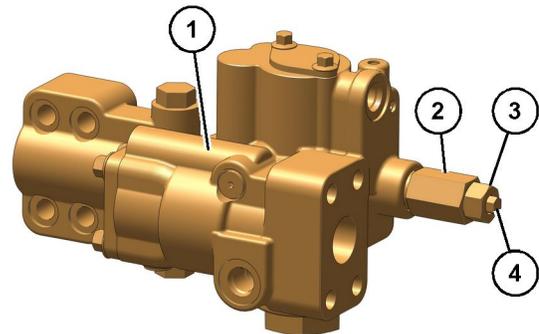


Illustration 335

g06263723

- (1) Boom lowering control valve
- (2) Line relief
- (3) Locknut
- (4) Set screw

1. Loosen the locknut (3) at each of the boom lowering control valves.

2. Slowly, turn set screw (4) counterclockwise until the boom begins to lower onto the ground.

Note: Once the boom begins to lower, stop turning set screw (4).

3. After the boom has lowered completely onto the ground, turn set screw (4) back to the original position.
4. Tighten locknut (3) to 40 ± 4 N·m (29.5 ± 3 b ft).
5. Before operating the machine, make any necessary repairs.

For additional information, consult your Cat dealer.

Machines without a Boom Lowering Control Valve

WARNING

Be sure no one is under or near the work tools before manually lowering the boom. Keep all personnel away from the boom drop area when lowering the boom with the engine stopped in order to avoid possible personal injury.

Use the following procedure to manually lower the boom due to an engine malfunction.

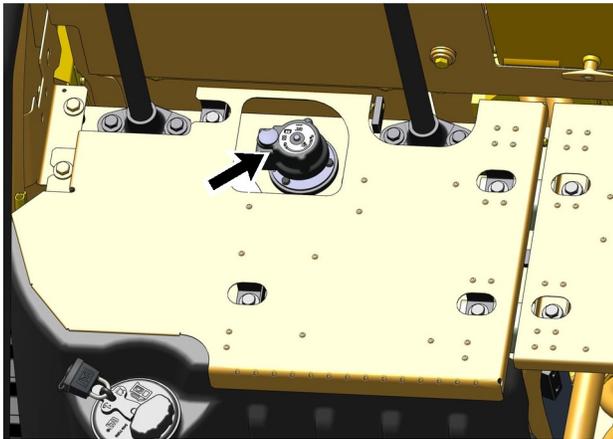


Illustration 336

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.

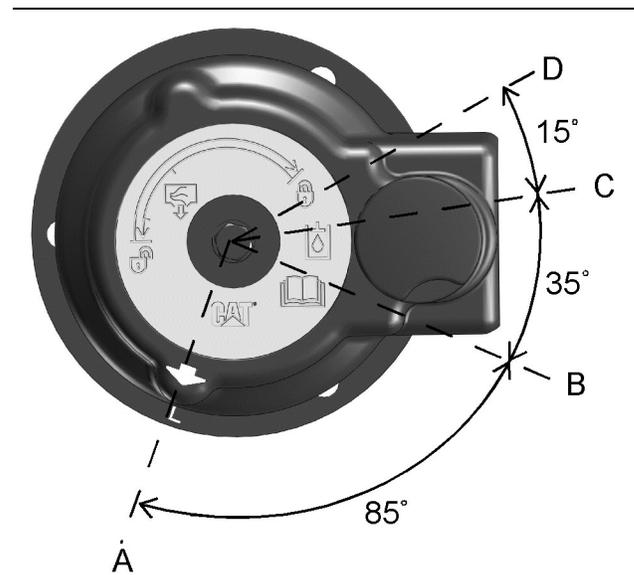


Illustration 337

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 337 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.

Operation Section
Equipment Lowering with Engine Stopped

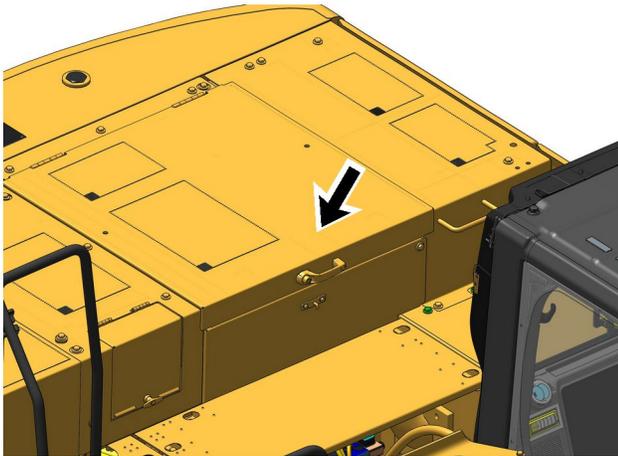


Illustration 338

g06225770

2. Open the engine hood.

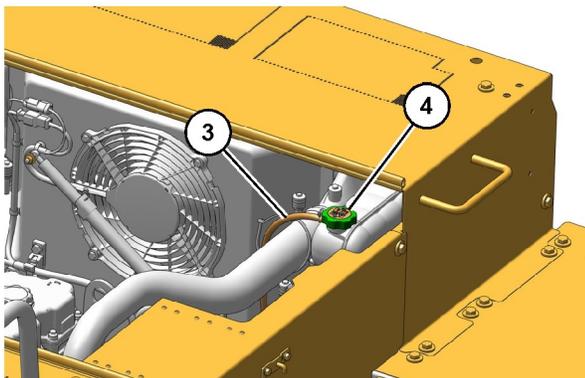


Illustration 339

g06184089

(3) Hose
(4) Clamp

3. Loosen clamp (4) and disconnect hose (3) from the reservoir. Remove the clamps and the cable straps that secure the hose to the machine.

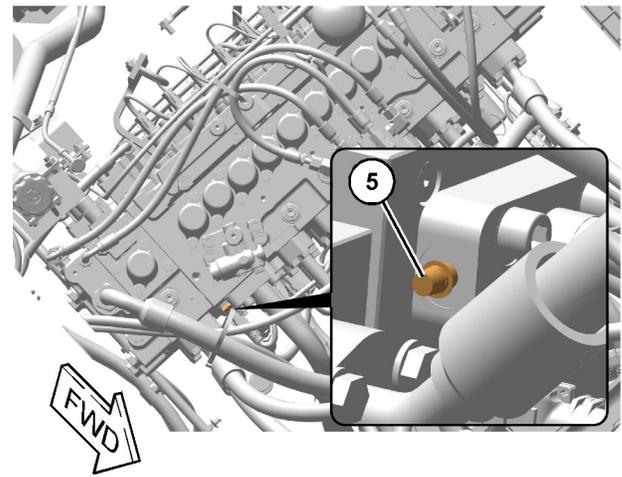


Illustration 340

g06205184

Main control valve

(5) Screw

- 4. Connect one end of the radiator hose to screw (5). 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 (5) 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 (5) to 13 ± 2 N·m (9 ± 1 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. Close the engine hood.**

After completion of the manual boom lowering, make necessary repairs before you operate the machine again.

Pressure Release of Auxiliary Lines

WARNING

Personal injury can result from hot oil spray and raised work tools.

Make sure all the work tools have been lowered, the oil is cool and the pressure has been released from the hydraulic system before removing any components or lines.

Do not allow hot oil or components to contact skin.

Note: Refer to Operation and Maintenance, “General Hazard Information” for information on containing fluid spillage.

Refer to the procedure below before any of the following conditions.

- The work tool is changed.
 - The position of the ball valve is changed.
1. Turn the engine start switch to the OFF position.
 2. Place the hydraulic lockout lever in the UNLOCKED position.
 3. Release the pressure in the auxiliary lines by pressing the auxiliary control buttons or the auxiliary control pedal three times.
 4. Place the hydraulic lockout lever in the 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

i07887891

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 341

g06223763

Digging with a stable machine increases productivity. Create a stable work platform.

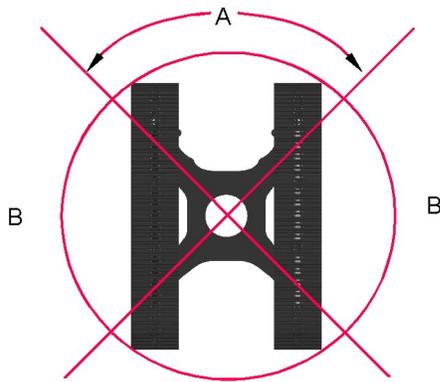


Illustration 342 g06210141

- (A) Most stable dig
- (B) Dump

For improved stability: Do not dig over the drives or perpendicular to the tracks.

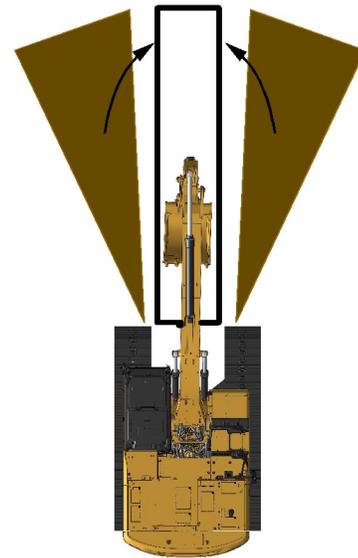


Illustration 344 g06210334

Minimize unneeded movement. During backfilling, start with the material closest to the trench.

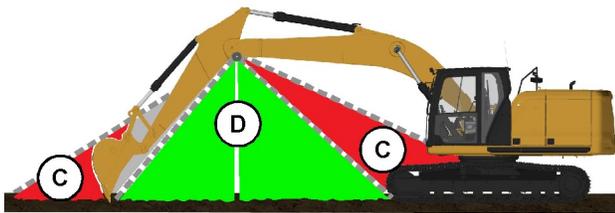


Illustration 343 g06212328

- (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.

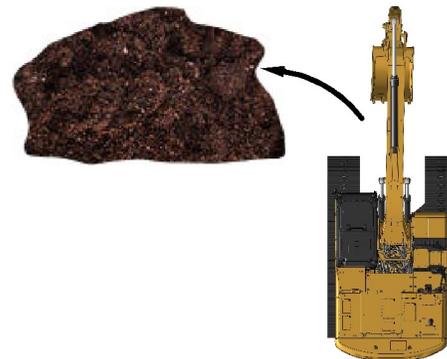


Illustration 345 g06210343

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.

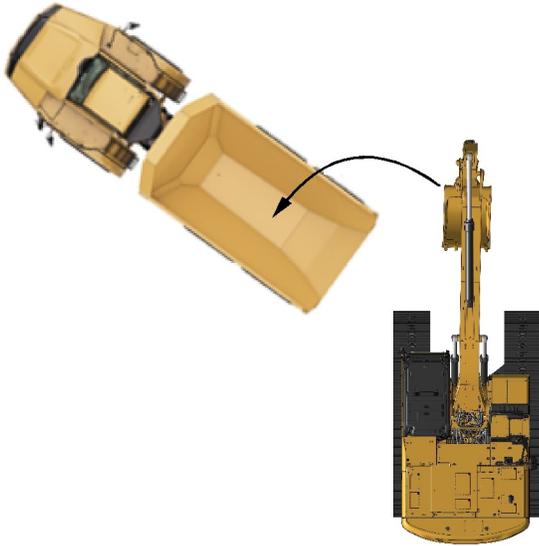


Illustration 346

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 347

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 348

g06212594

Do not use the dropping force of the bucket or work tool as a hammer. Using the bucket or work tool as a hammer will bring excessive force on the rear of the machine. Possible damage to the machine could result.



Illustration 349

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.

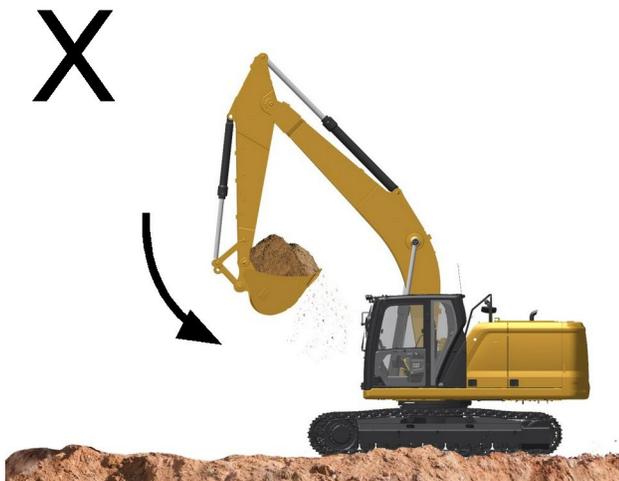


Illustration 350

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 352

g06222505

Do not use the dropping force of the rear of the machine for excavation. This operation will damage the machine.

Operating Precaution



Illustration 351

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 353

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 354

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.

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 355

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 356

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 357

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 358

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.

i07107419

Boom, Stick and Bucket Operation

SMCS Code: 7000

Digging



Illustration 359

g06212506

1. Position the stick at a 70 degree angle to the ground.

Operation Section
Boom, Stick and Bucket Operation



Illustration 360

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 361

g06222533

3. Move the stick toward the cab and keep the bucket parallel to the ground.



Illustration 362

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 363

g06222538

8. Close the bucket and raise the boom when the pass has been completed.



Illustration 364

g06223077

9. Engage the swing control when the bucket is clear of the excavation.



Illustration 365

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.

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

Japan regulations require a shovel crane configuration to lift certain objects.

Contact your Cat dealer for additional information.

Short slings will prevent excessive load swing.

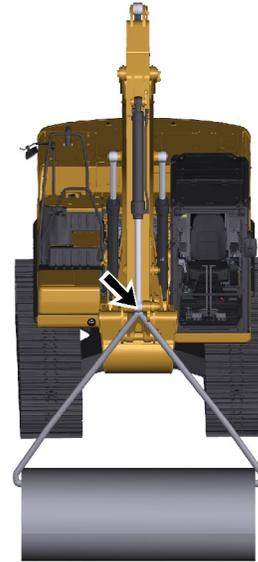


Illustration 366

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 367

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 368

g06212530

The most stable lifting position is over a corner of the machine.

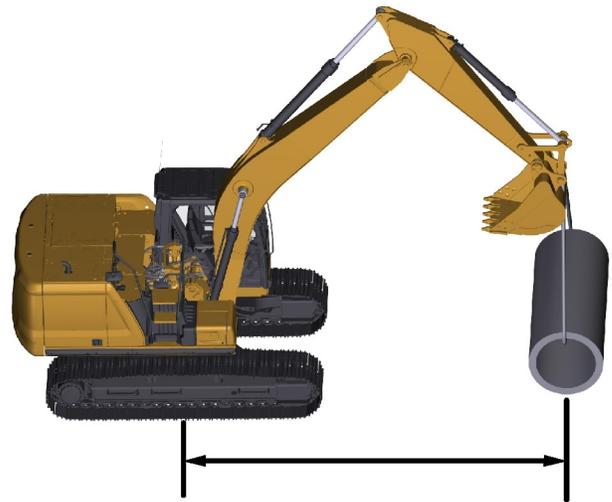


Illustration 370

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. Taking this into account, adjustments are made in timing for applying the swing brakes and speed of swinging.



Illustration 369

g06212535

For the best stability, carry a load close to the machine and to the ground.

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.

i06978374

Bucket - Remove and Install

SMCS Code: 6001; 6001-012; 6001-011; 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 371

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.

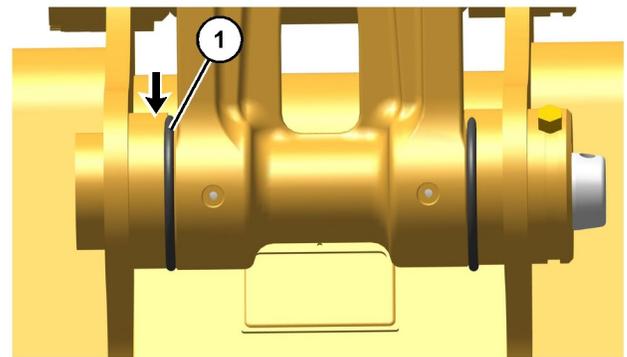


Illustration 372

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.

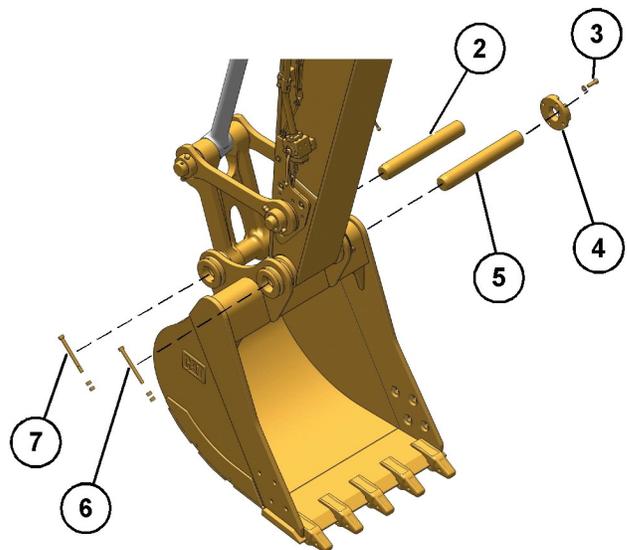


Illustration 373

g06186090

3. Remove nuts and retaining bolt (7) from support pin (2). Remove the support pin.

Operation Section
Bucket - Remove and Install

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.

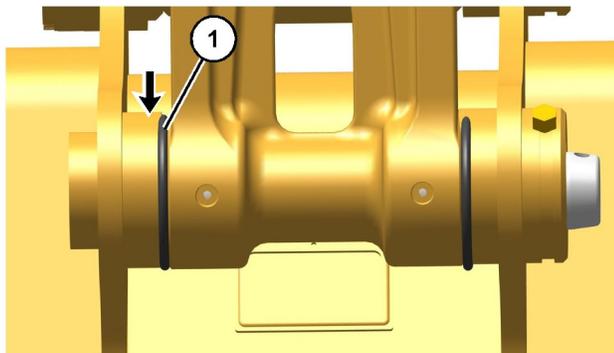


Illustration 374

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.

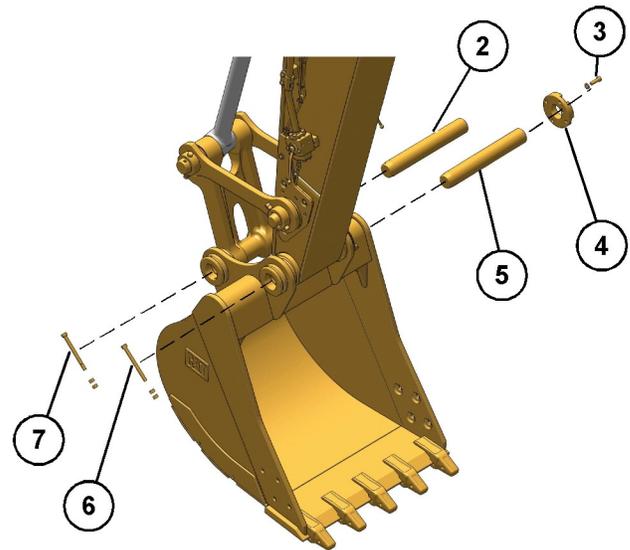


Illustration 375

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 between the bucket and the link assembly.

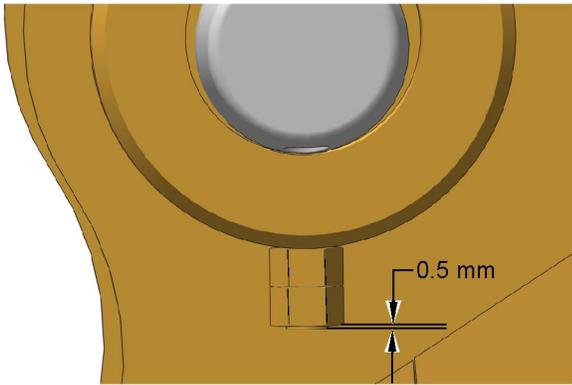


Illustration 376

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".

i07757775

Quick Coupler Operation (Circuit for CW Coupler (If Equipped))

SMCS Code: 6129; 6522; 7000

NOTICE

The Cat Quick Coupler (CW Coupler) is not designed to be used in applications where there is long exposure to excessive vibration. The vibration caused by extensive use of a hydraulic hammer as well as the added weight of certain demolition tools such as shears, crushers, and pulverizers may cause premature wear and decreased service life of the coupler.

Be sure to carefully inspect the coupler daily for cracks, bent components, wear, distressed welds, etc. when operating with any of the above work tools.

General Operation

The quick coupler is used to change work tools while the operator remains in the cab. The quick coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins in order for the quick coupler to work properly.

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a 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

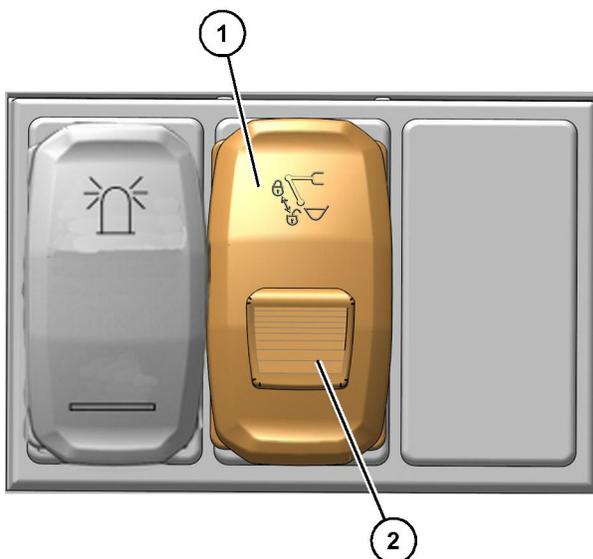


Illustration 377

g06184557

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 forward 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.

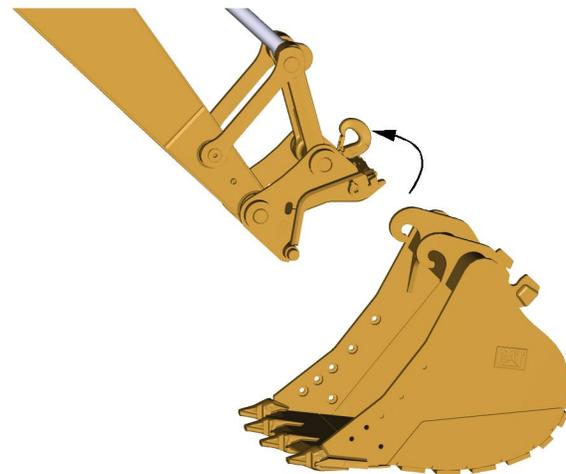


Illustration 378

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.

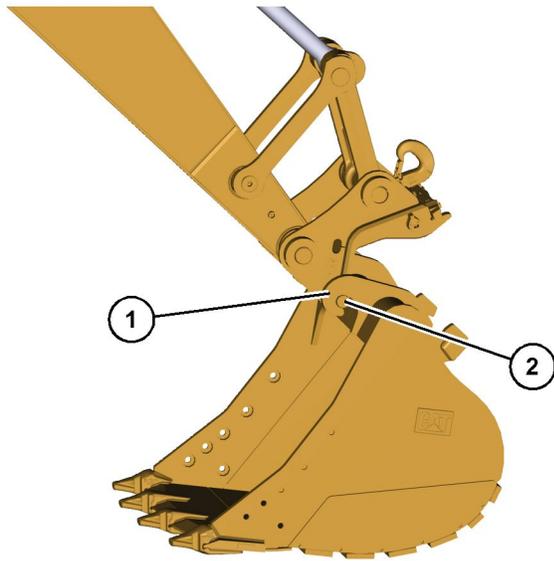


Illustration 379

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.
4. There are two possible settings for locking the quick coupler in Cat ET, "Alarm" and "Hold to Run". For the "Hold to Run" setting, push the locking tab on the switch forward and then depress and hold the rear of the switch until the quick coupler engages the work tool. The message "Quick Coupler Locking" will display on the monitor. For the "Alarm" setting, push the locking tab on the switch forward and then depress, but do not hold, the rear of the switch until the quick coupler engages the work tool. The message "Quick Coupler Locking" will display on the monitor.

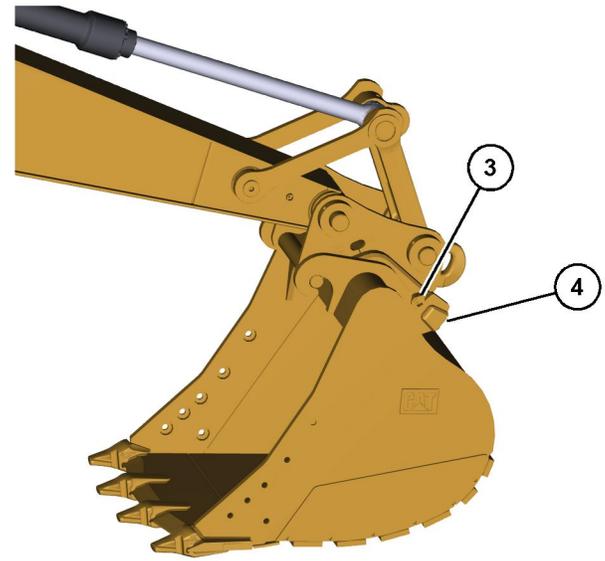


Illustration 380

g06220887

- (3) Center bosses
- (4) Locking area

5. Extend the bucket cylinder to rotate the quick coupler toward the work tool.
Center bosses (3) must engage with the cutout of the hinge.
6. Release the quick coupler switch to lock the work tool.
The springs in the quick coupler will move the wedge into the locking area (4).
The monitor will display the message "Verify Tool Locking" .

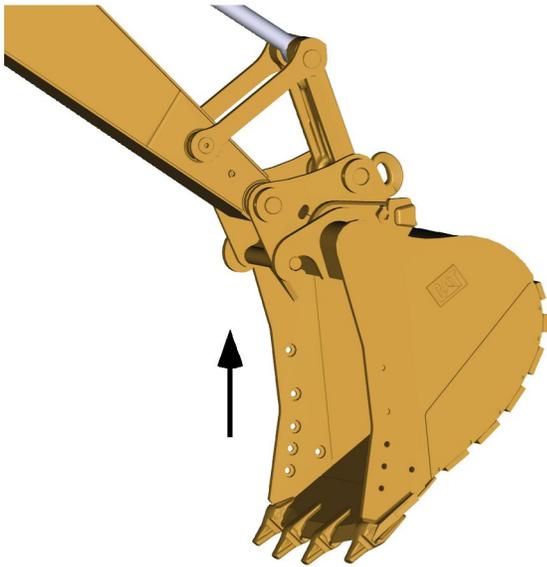


Illustration 381

g06220888

7. 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.

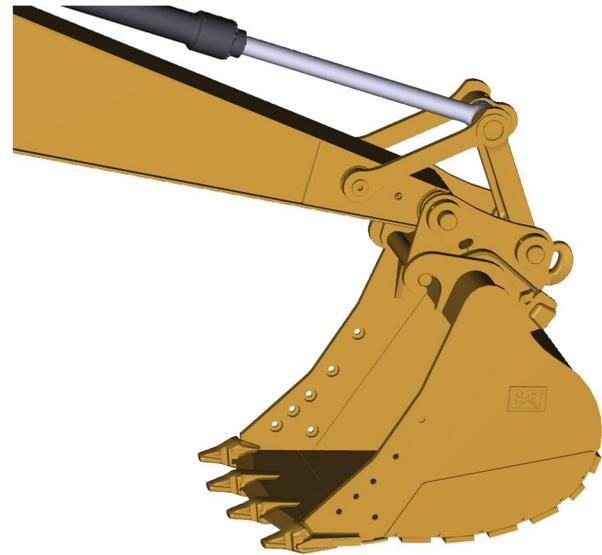


Illustration 382

g06220889

1. Level the bucket or level the work tool on the ground.
2. Push the locking tab on the switch forward and then depress the rear of the switch until the quick coupler releases the work tool. The message "Quick Coupler Unlock" will display on the monitor. For the "Alarm" setting, push the locking tab on the switch forward and then depress, but do not hold, the rear of the switch until the quick coupler engages the work tool. The message "Quick Coupler Locking" will display on the monitor.

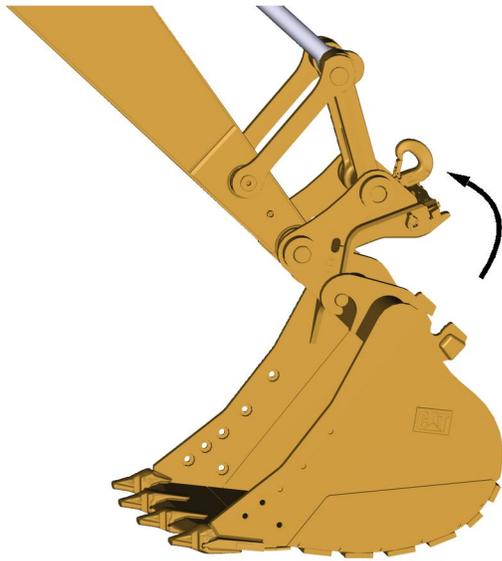


Illustration 383

g06220891

3. Retract the bucket cylinder to move the quick coupler toward the machine.
4. Release the quick coupler switch to retract the wedge.

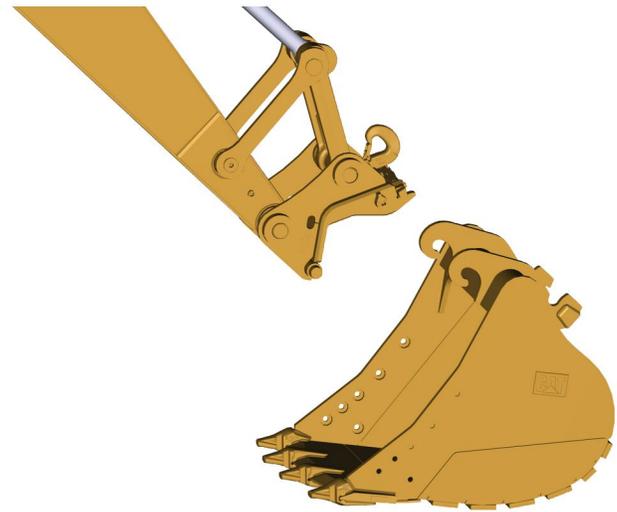


Illustration 384

g06220892

5. Lower the stick and move the stick toward the machine to disengage the quick coupler.

i07852525

Quick Coupler Operation (Hydraulic Pin Grabber Quick Coupler (If Equipped))

SMCS Code: 6129; 6522; 7000

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.

General Operation

The quick coupler is used to change work tools while the operator remains in the cab. The quick coupler can be used with a broad range of buckets and work tools. Each work tool must have a set of pins in order for the quick coupler to work properly.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)

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

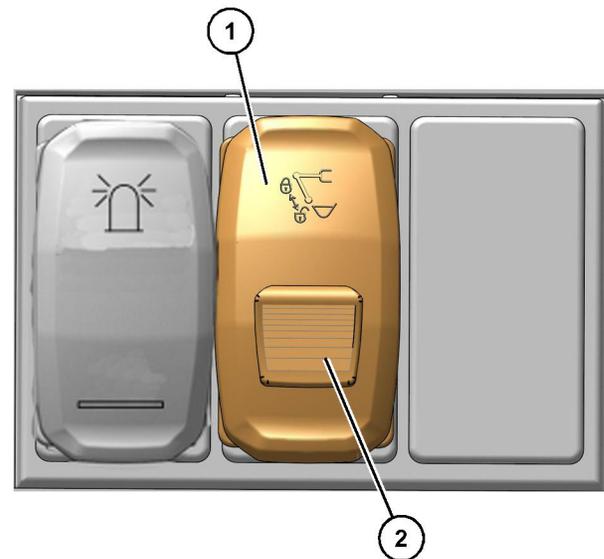


Illustration 385

g06184557

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 safety lock (2). The locking tab must be pushed forward before the switch can be pressed.

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.

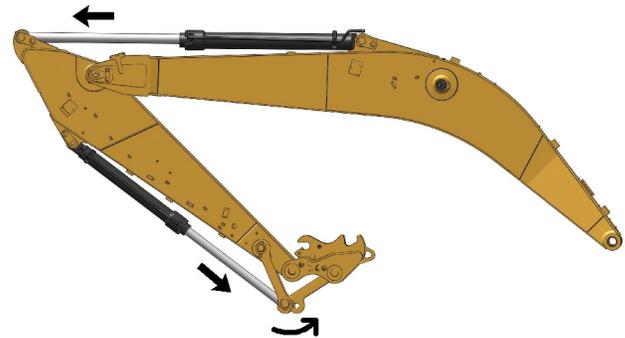


Illustration 386

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.



Illustration 387

g06300078

4. Push the lock mechanism on the switch forward and then depress the rear of the switch. The alarm will sound continuously and the message "Quick Coupler Unlock" will display on the monitor.
5. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds to unlock the hook.



Illustration 388

g06187063

6. Align the quick coupler with the work tool.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)



Illustration 389

g06187068

7. Rotate the quick coupler to grab the top pin.



Illustration 390

g06187086

8. Rotate the quick coupler downward to grab the bottom pin.

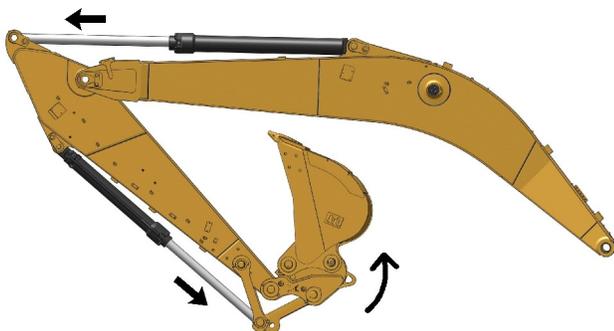


Illustration 391

g06187108

9. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.



Illustration 392

g06300088

10. Push the lock mechanism on the switch forward and then depress the rear of the switch. The alarm will sound continuously and the message “Quick Coupler Locking” will display on the monitor.

11. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds to lock the hook. The monitor will display the message “Verify Tool Locking” and the alarm will stop.

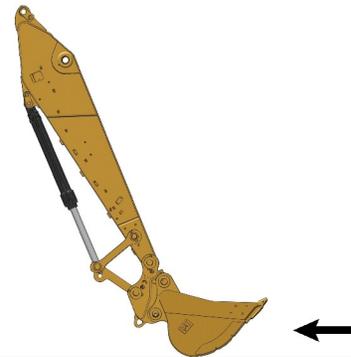


Illustration 393

g06187115

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.

- a. Retract the bucket cylinder and place the work tool on the ground.
- b. Apply pressure to the work tool against the ground.

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.

c. Drag the work tool backward.

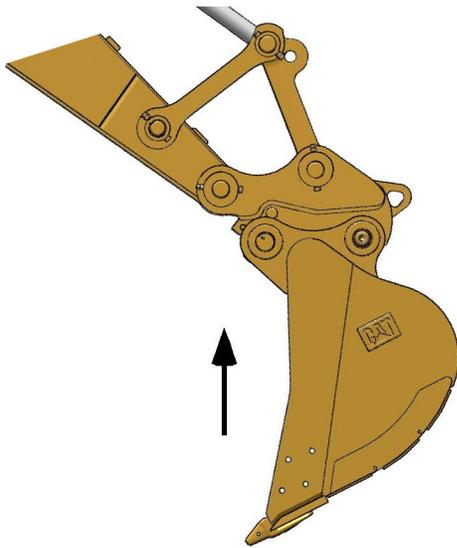


Illustration 394

g06458083

13. Raise the boom or raise the stick. Retract the bucket cylinder to confirm that the coupler is fully engaged. If the coupler 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.

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.

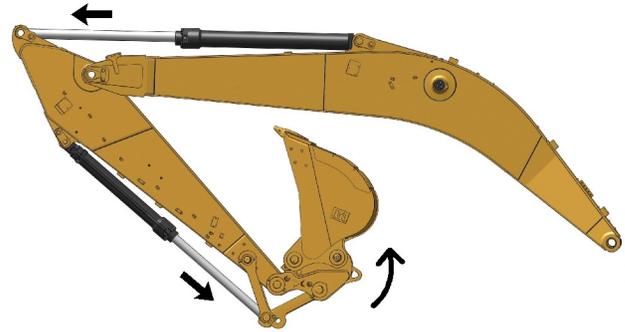


Illustration 395

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.
2. Push the lock mechanism on the switch forward and then depress the rear of the switch to unlock the work tool. The alarm will sound continuously and the message "Quick Coupler Unlock" will display on the monitor.

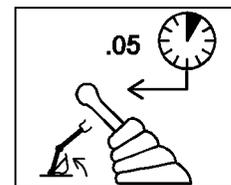


Illustration 396

g01231447

3. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds to unlock the hook.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)



Illustration 397

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.

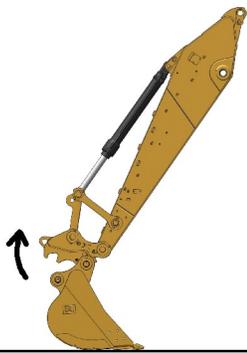


Illustration 398

g06187151

5. Rotate the quick coupler upward to release the bottom pin.

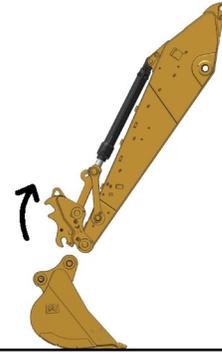


Illustration 399

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.

Note: 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

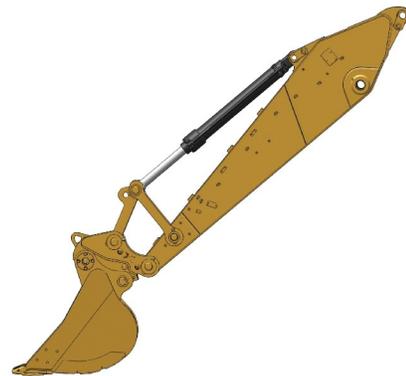


Illustration 400

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 400 for an example of connecting to a bucket that is in a reversed position.

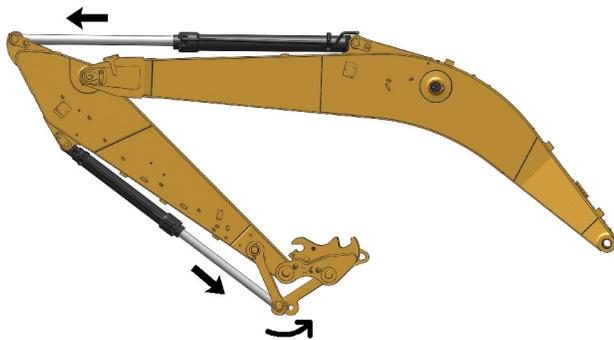


Illustration 401

g06187057

2. 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.
3. 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.

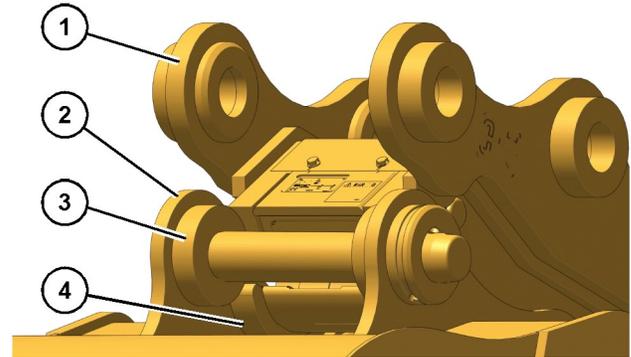


Illustration 402

g06187418

- (1) Quick coupler
- (2) Bucket
- (3) Boss
- (4) Hook

Coupler Lifting Eye Operation without Bucket

1. Remove the work tool. Refer to "Uncoupling the Work Tool" for the proper procedure.

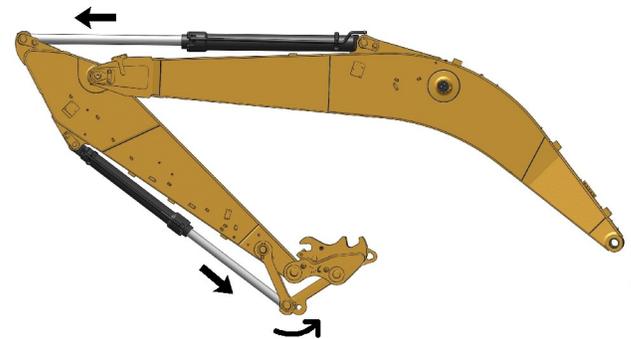


Illustration 403

g06187057

2. The quick coupler must be curled past a vertical position before depressing the switch. Extend the stick cylinder and fully extend the bucket cylinder until the quick coupler is curled past a vertical position.

Operation Section
Hydraulic Pin Grabber Quick Coupler (If Equipped)



Illustration 404

g06300088

3. Push the lock mechanism on the switch forward and then depress the rear of the switch to lock the quick coupler. The alarm will sound continuously and the message “Quick Coupler Locking” will display on the monitor.

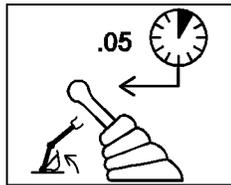


Illustration 405

g01231447

4. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds to lock the hook. The monitor will display the message “Verify Tool Locking” and the alarm will stop.



Illustration 406

g06187164

5. Rotate the quick coupler downward and move the stick to a position that is clear of the work tool.



Illustration 407

g06223888

6. Use the lifting eye of the quick coupler, as needed.

7. To reinstall the bucket or the work tool, refer to “Coupling the Work Tool” for the proper procedure.

i07349163

Work Tool Operation (If Equipped)

SMCS Code: 6700; 7000

Hammer Operation (If Equipped)



Illustration 408

g06222793

NOTICE

Use only a hydraulic hammer that is recommended by Caterpillar.

The use of a hydraulic hammer that is not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for information on recommended hydraulic hammers.

Only use the hydraulic hammer to break rocks, concrete, and other hard objects. Before you start hydraulic hammer operation, place the machine on a level, stable surface.

Before you start hydraulic hammer operation, close the front window. Caterpillar recommends the installation of a window guard on the front window for protection from flying debris.

NOTICE

In order to avoid structural damage to the host machine or the hydraulic hammer, comply with the following:

Do not attempt to break rocks or concrete by burying the hammer tool completely into the rocks or concrete.

Do not apply a prying force to the hammer tool in order to remove the hammer tool from the material.

Do not allow the hydraulic hammer to operate at one location and for more than 15 seconds. Change the location of the hydraulic hammer and repeat the procedure. Failure to change the location of the hydraulic hammer could cause the hydraulic oil to overheat. Overheated hydraulic oil could damage the accumulator.

Stop the hydraulic hammer immediately if the jumper lines are pulsating violently. This indicates that the accumulator nitrogen charge is lost. Consult your 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 409. 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

Operation Section
If Equipped

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.

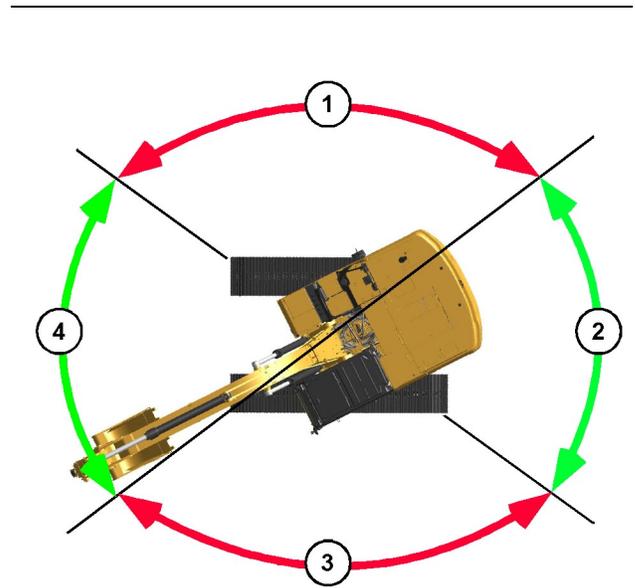


Illustration 409

g06192837

- (1) Incorrect working position
- (2) Correct working position
- (3) Incorrect working position
- (4) Correct working position

Shear Operation (If Equipped)

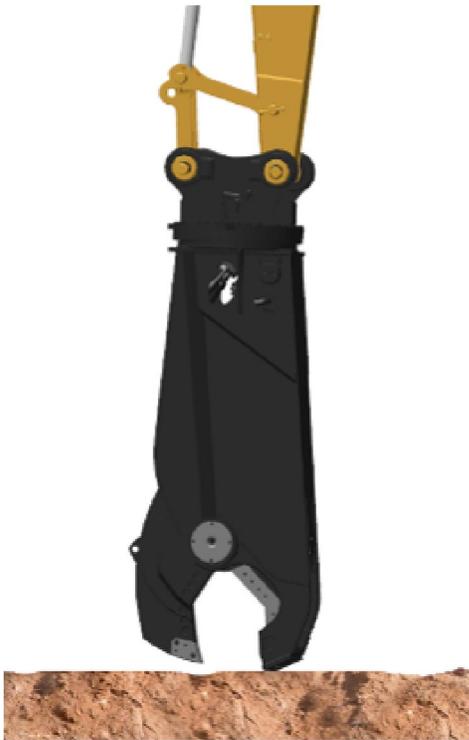


Illustration 410

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.

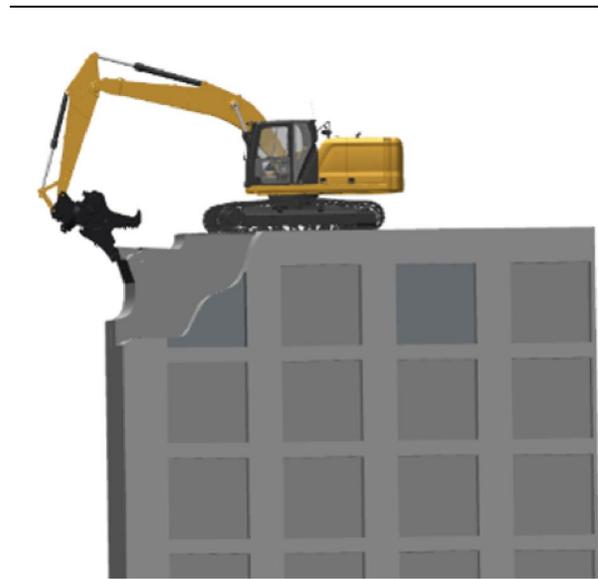


Illustration 411

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 412

g06222803

Crushing work above your head must be avoided because objects can fall and damage the machine.

X



Illustration 413

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

X



Illustration 415

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.

X



Illustration 414

g06222809

Do not suddenly lower or stop the work tool, otherwise the excavator could turn over.

X

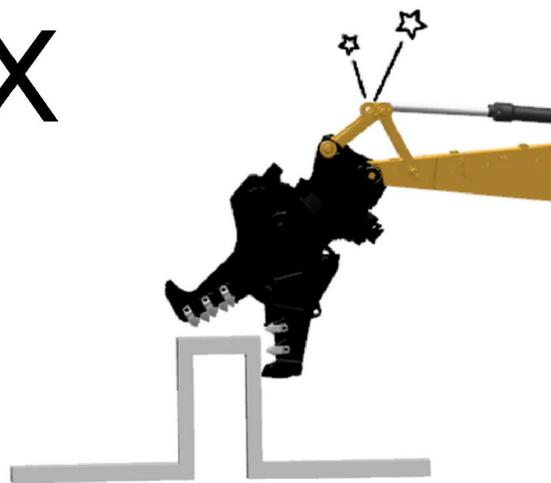


Illustration 416

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 417

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 419

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 418

g06222829

When working sideways, the track can lift. Avoid abrupt operation and operate slowly.

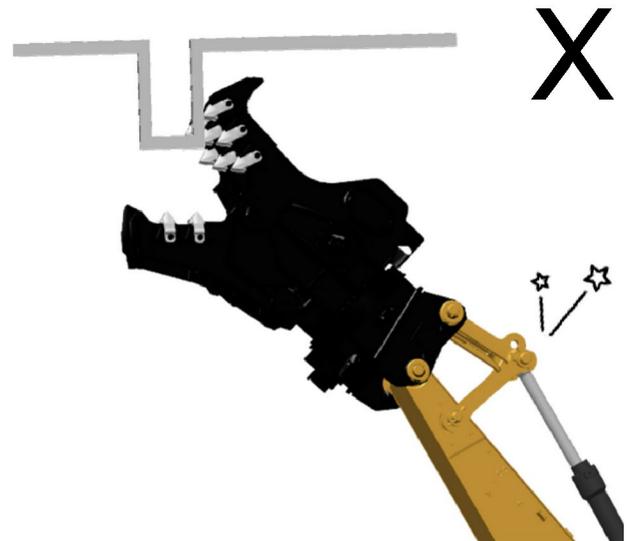


Illustration 420

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 421

g06222836

Never extend the boom cylinder suddenly. Sudden extension of the boom could cause tip backwards.



Illustration 422

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.

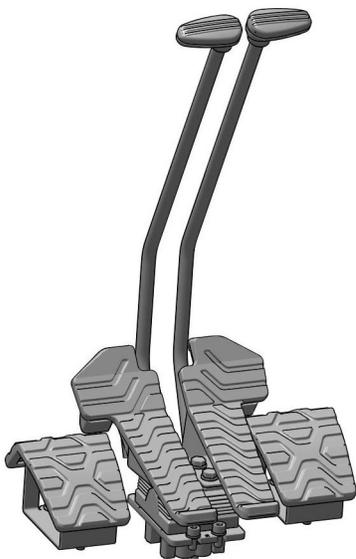


Illustration 423

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 424

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.

i07889731

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.

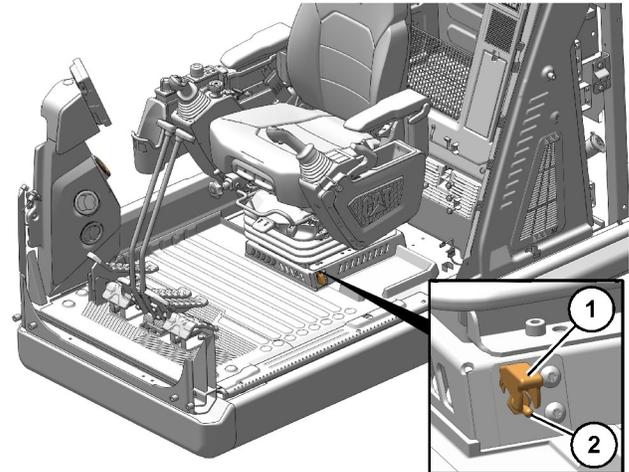


Illustration 425

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.

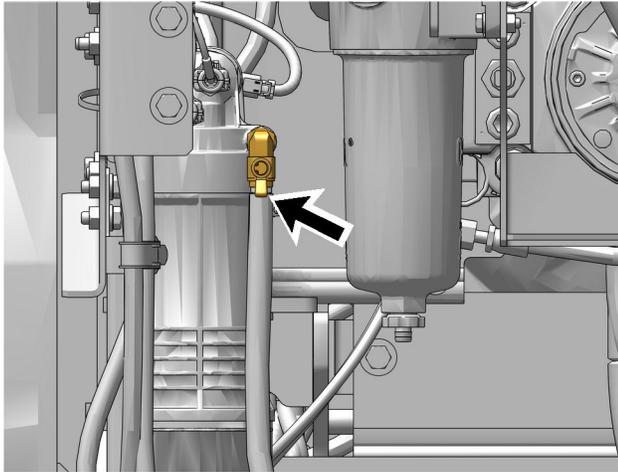


Illustration 426

g06426077

The fuel shutoff valve is located behind the right access door.

Shut off the fuel supply by turning the fuel shutoff valve clockwise. The engine will stop after consuming the fuel in the fuel line. The engine may continue to run for a few minutes.

Repair the engine before you restart the engine. The fuel system may need to be primed. See Operation and Maintenance Manual, "Fuel System - Prime" for instructions.

i07103299

Leaving the Machine

SMCS Code: 7000



Illustration 427

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).

i07735116

Machine Storage and Specified Storage Period

SMCS Code: 7000

Machine Storage

The Safety Section of this Operation and Maintenance Manual contains storage information for fuels, lubricants, and ether (if equipped).

The Operation Section of this Operation and Maintenance Manual contains information for short-term storage of this machine, including engine shutdown, parking, and instructions for leaving the machine.

For detailed steps on long-term storage refer to Special Instruction, SEHS9031, "Storage Procedure for Caterpillar Products".

Specified Storage Period

The specified storage period of this machine is 1 year.

After the specified storage period has expired, consult your Cat dealer for inspect, repair, rebuild, install remanufactured, or install new components, and disposal options, and to establish a new specified storage period.

If a decision is made to remove the machine from service, refer to Decommissioning and Disposal for further information.

Transportation Information

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.

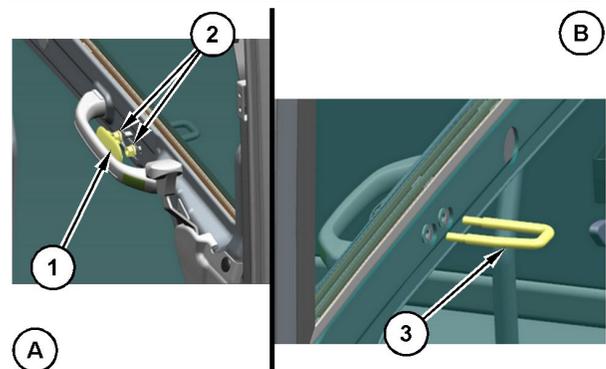


Illustration 428

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).

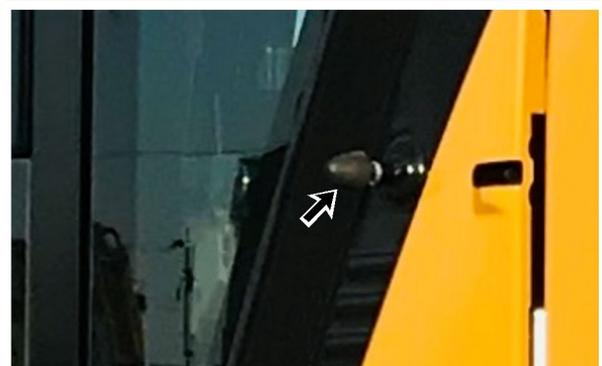


Illustration 429

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.

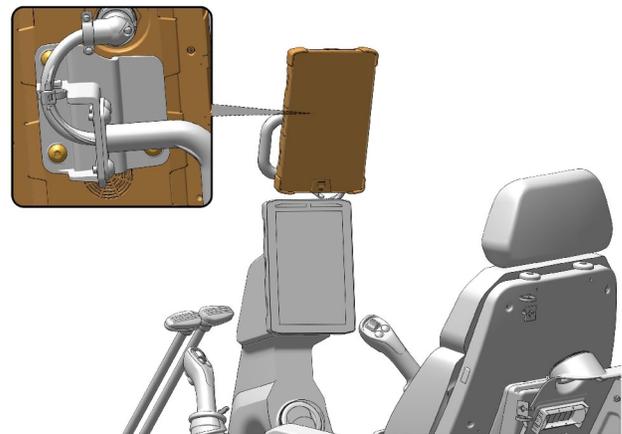


Illustration 430

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.

i07785977

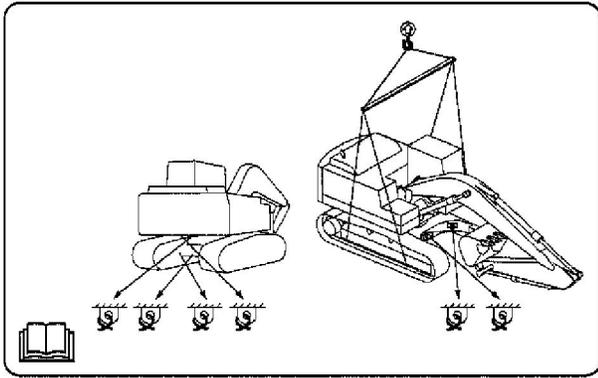


Illustration 431

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.

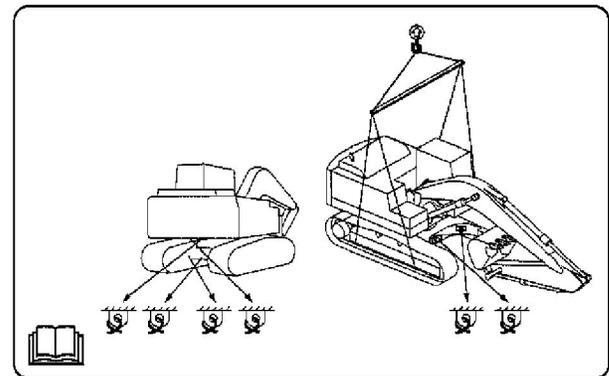


Illustration 432

g06289667

The lift and tie-down film is located near the base of the boom.

Lifting the machine



Illustration 433

g06184026

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 Operation and Maintenance, “Specifications” for specific weight information.

Note: Only lift objects from approved lifting points and with approved lifting devices

1. Use proper rated cables and slings for lifting. The crane should be positioned so that the machine is lifted parallel to the ground.
2. To prevent contact with the machine, lifting cables should have sufficient length.
3. Move the hydraulic lockout control to the LOCKED position.
4. Thread the cable between the first and second rollers at each end of the track.
5. Do not use the foot step as a lifting point.

6. If the full length roller guard is equipped, remove the guard.
7. Apply the proper protector to prevent machine/wire damage and slippage. Make sure that the rollers are not affected by the load.

Tying Down the Machine

There are two methods that can be used to tie down a machine. Local and/or regional regulations will determine which method to use.

Note: Obey all local and regional governmental regulations.

Frictional and Direct Lashing

When allowed, a combination of frictional lashing and direct lashing is the preferred method to tie down a machine.

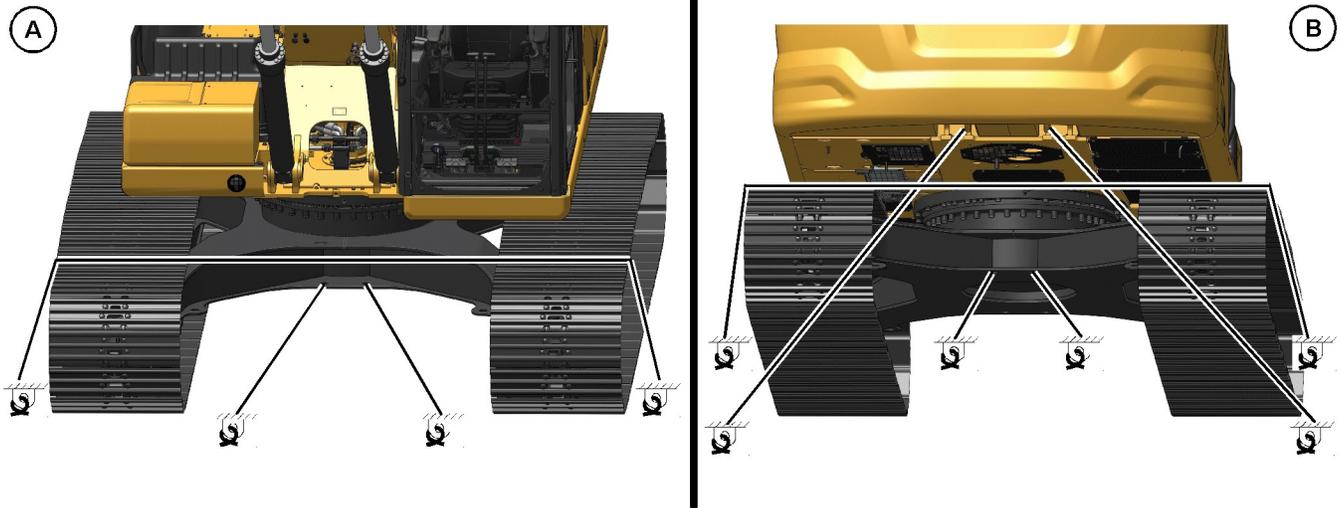


Illustration 434

g06184145

(A) Front of the machine

(B) Rear of the machine

Diagonal Lashing

In areas where frictional lashing is not allowed, diagonal lashing can be used as shown below.

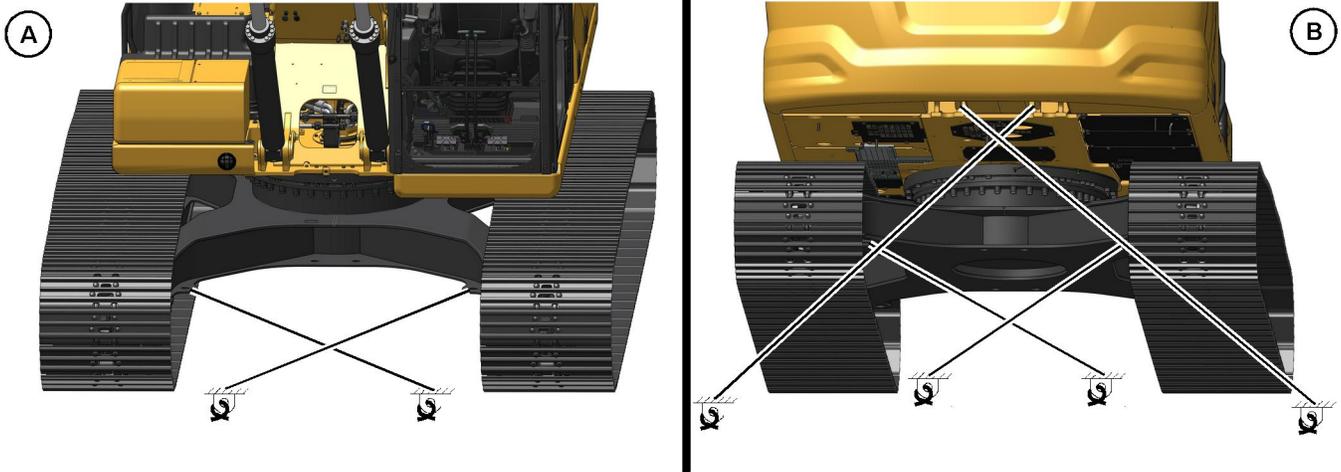


Illustration 435

g06435607

(A) Front of the machine

(B) Rear of the machine

Tying Down the Machine



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

The weight and the instructions that are given herein describe the machine as the machine is manufactured by Caterpillar.

Refer to the Operation and Maintenance, “Specifications” for specific weight information.

1. Use proper rated cables and shackles for tying down the machine.
2. Use the rear eyes and the front eyes that are provided on the lower frame to fasten tie-downs. Use corner protectors for sharp corners.
3. Move the hydraulic lockout control to the LOCKED position.
4. If there is a requirement of diagonal lashing for tying down, use the proper tie-down point on the lower frame. Set the lashing angle which is on the longitudinal axis of the machine and the cable, at 30 to 50 degrees.
5. Keep the transport vehicle surface clean (for example, trailer deck).
6. For steel deck transport vehicles use skid-inhibiting or anti-slip mats (for example, rubber mats) with a friction coefficient of at least 0.3.

Lifting the Machine Segments

Bucket

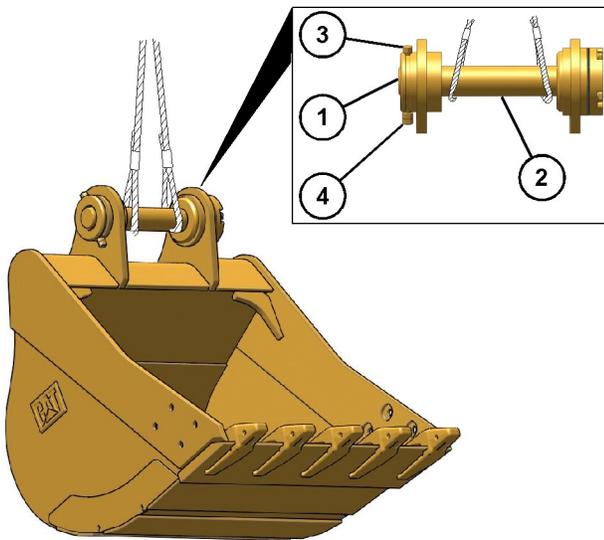


Illustration 436

g06184591

(1) Pin.(2) Sleeve.(3) Bolts.(4) Nuts.

Install pin (1) and install sleeve (2) in the brackets of the bucket. The previous illustration indicates the method to secure pin (1) with bolts (3) and nuts (4). Fasten two proper rated wire cables to pin (1).

Towing Information

i07348733

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 Operation and Maintenance Manual, "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

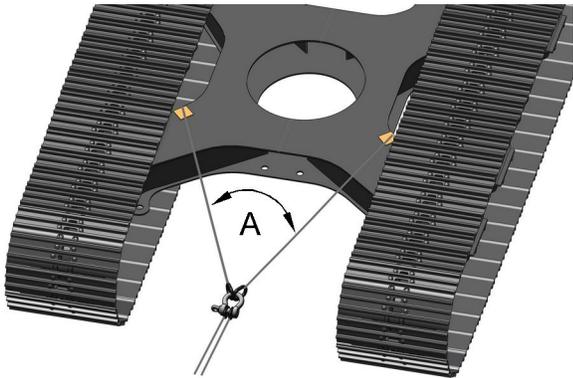


Illustration 437

g06289671

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. The angle (A) between each wire rope should be 60 degree maximum. Operate the machine at a low speed.

Lightweight Towing

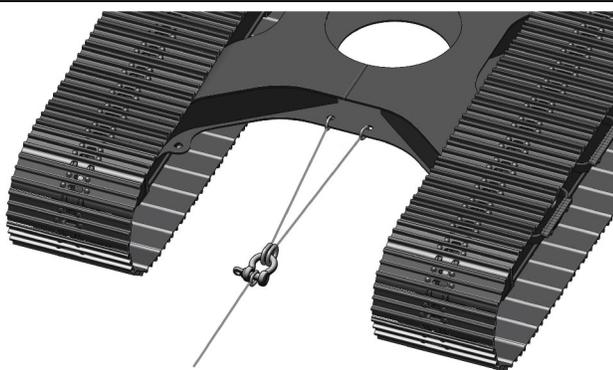


Illustration 438

g06186106

The maximum load for lightweight towing is 102900 N (75895 lb).

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

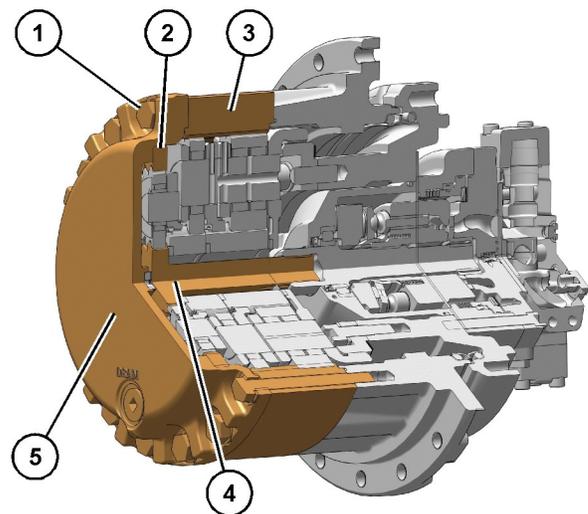


Illustration 439

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.

Operation Section
Final Drive Sun Gear Removal

- 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 440

g06181546

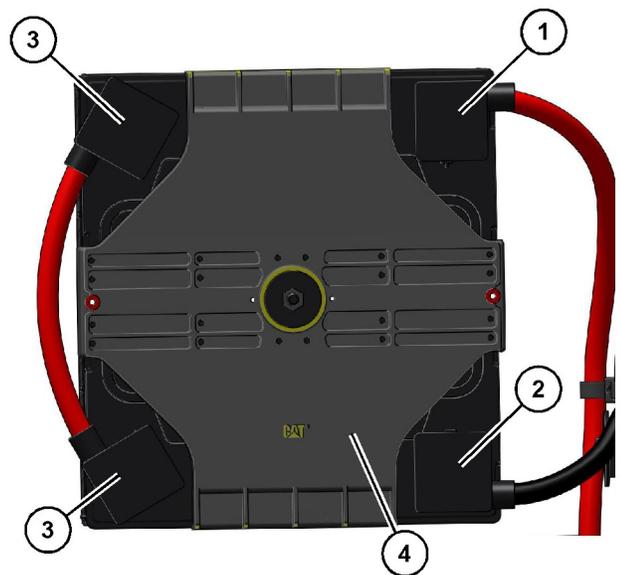


Illustration 441

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.

i07349165

Engine Starting with Auxiliary Start Receptacle (If Equipped)

SMCS Code: 1000; 7000



Illustration 442

g06179792

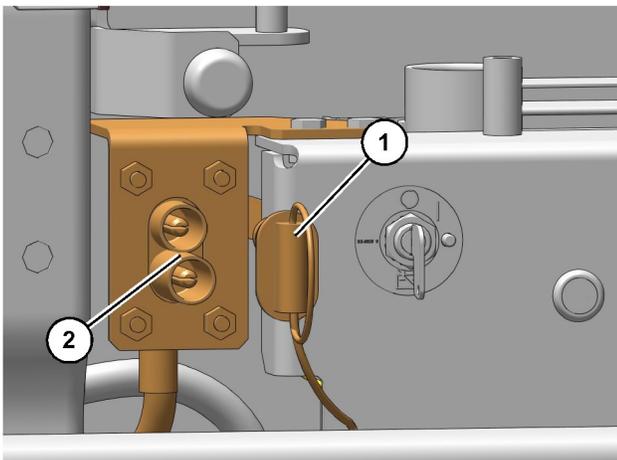


Illustration 443

g06181572

- (1) Cover
(2) Receptacle

Some Cat products may be equipped with an auxiliary start receptacle as a standard part. If your machine is not equipped with an auxiliary start receptacle, the machine can be equipped with an auxiliary start receptacle from parts service. This will ensure that a permanent receptacle is always available to jump-start the machine.

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

1. Determine the reason that the engine will not start.

Reference: Refer to Special Instruction, SEHS7633, "Battery Test Procedure" for more information.

2. Ensure that the travel control levers on the stalled machine are in the CENTER position. Engage the hydraulic lockout control. Engage the parking brake. Lower all work tools to the ground. Move all controls to HOLD.
3. Turn the engine start switch key on the stalled machine to the OFF position. Turn off all accessories.
4. Turn the battery disconnect switch on the stalled machine to ON.
5. Move the machine that is being used as a power source close to the stalled machine. The jump-start cables should reach the batteries on both machines. **DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.**
6. Stop the engine on the machine that is being used as a power source. If you use an auxiliary power source, turn off the charging system.
7. Connect the appropriate jump-start cable to the auxiliary start receptacle on the stalled machine.
8. Connect the other end of the jump-start cable to the auxiliary start receptacle of the machine that is being used as a power source.
9. Start the engine on the machine that is being used as a power source or energize the charging system on the auxiliary power source.
10. Wait for a minimum of 2 minutes while the batteries in the stalled machine partially charge.
11. Attempt to start the stalled engine.
12. Immediately after the stalled engine starts, disconnect the jump-start cable from the power source.
13. Disconnect the other end of the jump-start cable from the stalled machine.
14. Conclude the failure analysis on the starting charging system of the stalled machine, as required. Check the machine while the engine is running and the charging system is in operation.

Maintenance Section

Maintenance Access

i07945107

Access Door and Cover Locations

SMCS Code: 726A-CH

Engine Hood

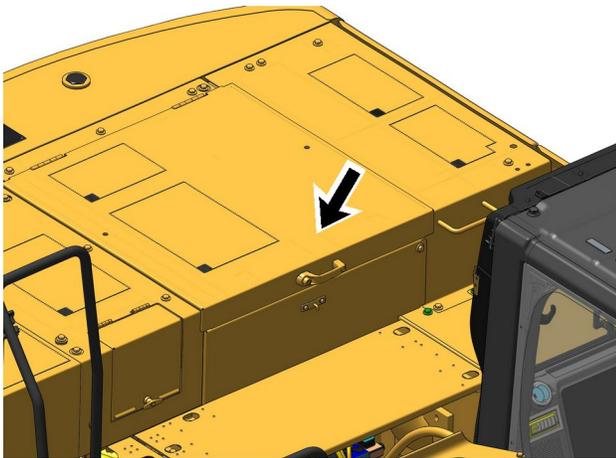


Illustration 444

g06225770

Allows access to engine and coolant tank.

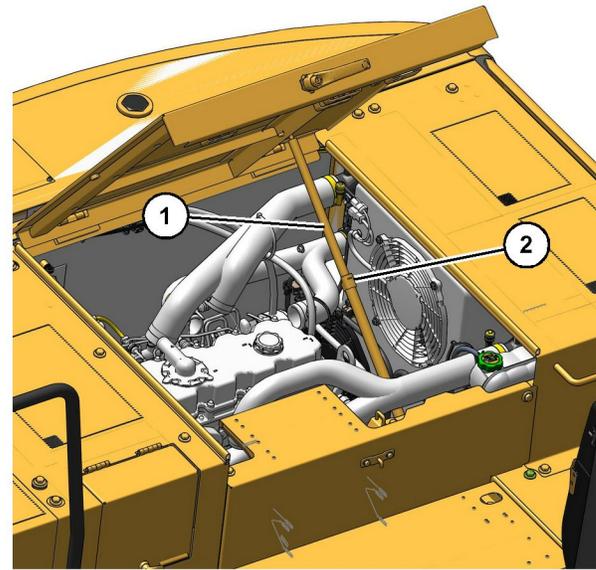


Illustration 445

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.

3. 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.

Engine Service Door

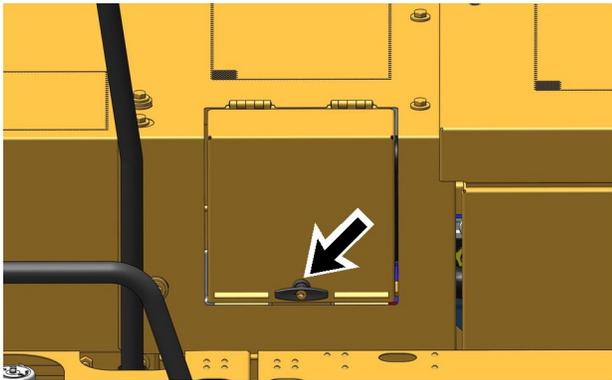


Illustration 446

g06183460

Allows access to the engine oil filler cap and the upper dipstick.

Left Rear Access Door

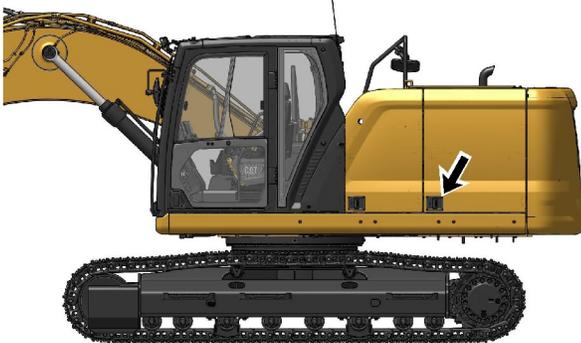


Illustration 447

g06179792

Allows access to the coolant sample port, coolant drain, cooling cores, power fuses, battery disconnect switch, and coolant reservoir.

Left Front Access Door



Illustration 448

g06181546

Allows access to engine air filter, batteries, and window washer reservoir.

Right Side Access Door



Illustration 449

g06182545

Allows access to the engine oil filter, engine oil sampling port, and ground level dipstick. Additionally, the compartment houses the hydraulic pump, fuel filters, refueling pump, fuel tank drain valve, and hydraulic tank sight gauge.

Storage Box

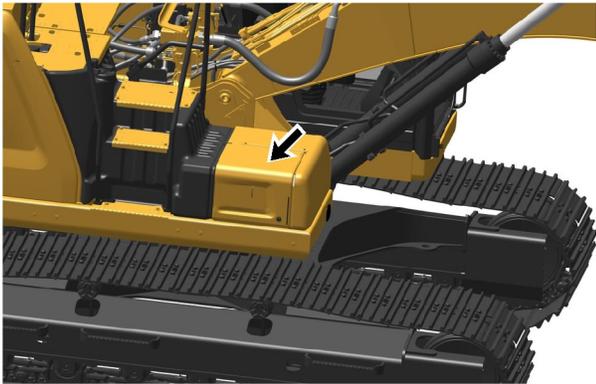


Illustration 450

g06183098

Allows access to the storage box.

Note: The storage box has a maximum allowable weight of 15 kg (33 lbs).

Lubricant Viscosities and Refill Capacities

i07279902

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 7581

General Information for Lubricants

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

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

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

Selecting the Viscosity

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

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Measure the temperature when the machine is started and while the machine is operated. To determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the "Lubricant Viscosities for Ambient Temperatures" tables, use the highest oil viscosity that is allowed for the ambient temperature.

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

NOTICE

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

Engine Oil

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

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

Note: SAE 10W-30 is the preferred viscosity grade for the 3116, 3126, C7, C-9, and C9 diesel engines when the ambient temperature is between -18°C (0°F) and 40°C (104°F).

Table 22

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

Note: API engine oil categories are backwards compatible. Cat DEO-ULS (API CK-4) oil can be used in all engines with some restrictions related to fuel sulfur level. Cat DEO (API CI-4/API CI-4 PLUS) can be used in engines that are Tier 3 emissions certified and prior, and in engines that do not use aftertreatment devices.

Hydraulic Systems

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

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

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

Cat HYDO Advanced 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 SYN
- Cat DEO SYN
- 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 23

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 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 Cat DEO SYN	SAE 5W-40	-30	40	-22	104
	Cat DEO-ULS Cold Weather	SAE0W-40	-40	40	-40	104
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104

Other Fluid Applications

Table 24

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 Cat TDTO-TMS Cat TDTO SYN Cold Weather commercial TO-4	SAE 0W-20	-40	0	-40	32
		SAE 0W-30	-40	10	-40	50
		SAE 5W-30	-30	10	-22	50
		SAE 10W	-30	0	-22	32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		Cat TDTO-TMS	-30	25	-22	77
Track Roller Frame Recoil Spring and Pivot Shaft Bearings	Cat TDTO Cat TDTO-TMS Cat TDTO SYN Cold Weather commercial TO-4	SAE 0W-20	-40	0	-40	32
		SAE 0W-30	-40	10	-40	50
		SAE 5W-30	-35	0	-31	32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-4	77
		SAE 40	-10	40	14	104
		SAE 50	0	50	32	122
Cat TDTO-TMS	-25	25	-13	77		

(continued)

Maintenance Section
Fluids Recommendations

(Table 24, 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
Track Idlers and Track Rollers	Cat DEO (single grade) Cat DEO SYN	SAE 30	-20	25	-4	77
	Cat DEO-ULS SYN Cat ECF-1-a Cat ECF-2 Cat ECF-3 API CF	SAE 5W-40	-35	40	-31	104

Table 25

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
Variable Pitch Flexxaire Fan (If Equipped)	Cat Full Synthetic Multi-grade DEO commercial Full Synthetic Multigrade Diesel Engine Oil meeting either Cat ECF-1 or API CG-4	SAE 0W40 ⁽¹⁾	-40	50	-40	122
		SAE 5W40 ⁽¹⁾	-40	50	-40	122
	Caterpillar Non-Synthetic TO-4	SAE 30 ⁽²⁾	-15	25	-5	77
		SAE 50 ⁽²⁾	-10	50	14	122

(1) This is the first choice. Full synthetic oils are recommended. Synthetic oils may provide longer service life for the fan. Synthetic oils allow for increased service intervals over non-synthetic oils.

(2) This is the second choice. Caterpillar TDTO is acceptable. Commercial oils that meet the TO-4 specification are also acceptable. TDTO is non-synthetic. Commercial TO-4 oils are typically non-synthetic.

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 26

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

(continued)

(Table 26, contd)

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
	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

Grease for the Autolube System (if Equipped)

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

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

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

Table 27

Recommended Grease for the Autolube System						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
Cat Autolube System	Cat Extreme Application Grease	NLGI Grade 1	-35	40	-31	104
		NLGI Grade 2	-30	50	-22	122

Diesel Fuel Recommendations

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

The preferred fuels are distillate fuels. These fuels are commonly called diesel fuel, furnace oil, gas oil, or kerosene. These fuels must meet the “Caterpillar Specification for Distillate Diesel Fuel for Off-Highway Diesel Engines”. Diesel Fuels that meet the Caterpillar specification will help provide maximum engine service life and performance.

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

- Reduce engine efficiency and durability
- Increase the wear

- Increase the corrosion
- Increase the deposits
- Lower fuel economy
- Shorten the time period between oil drain intervals (more frequent oil drain intervals)
- Increase overall operating costs
- Negatively impact engine emissions

Failures that result from the use of improper fuels are not Caterpillar factory defects. Therefore the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in off road and machine applications that are not Tier 4/ Stage IIIB certified engines. ULSD is not required in engines that are not equipped with after treatment devices.

Follow operating instructions and fuel tank inlet labels, if available, to ensure that the correct fuels are used.

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

Fuel Additives

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

Biodiesel

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

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

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

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

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

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

Coolant Information

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

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

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/Coolant)

NOTICE

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

i07896240

Capacities (Refill)**SMCS Code:** 1000; 7000

Table 28

Approximate Capacities (Refill)			
Component or System	Liters	US gal	Recommended Type
Cooling System	25	6.6	Refer to Operation and Maintenance Manual, "Lubricant Viscosities".
Fuel Tank	474	125	
Engine Crankcase with Filter	25	6.6	
Hydraulic System ⁽¹⁾	147	38.8	
Swing Drive	10	2.6	
Each Final Drive	5.5	1.45	
	kg	lbs	
Swing Gear	14.9	32.8	Refer to Operation and Maintenance Manual, "Lubricant Viscosities".
Refrigerant ⁽²⁾	0.9	2.0	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 Operation and Maintenance Manual, "Hydraulic System Oil - Change"

⁽²⁾ Refer to Service Manual, "Air Conditioning and Heating R-134a for All Caterpillar Machines" for additional information

i07445339

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.

i07214904

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.

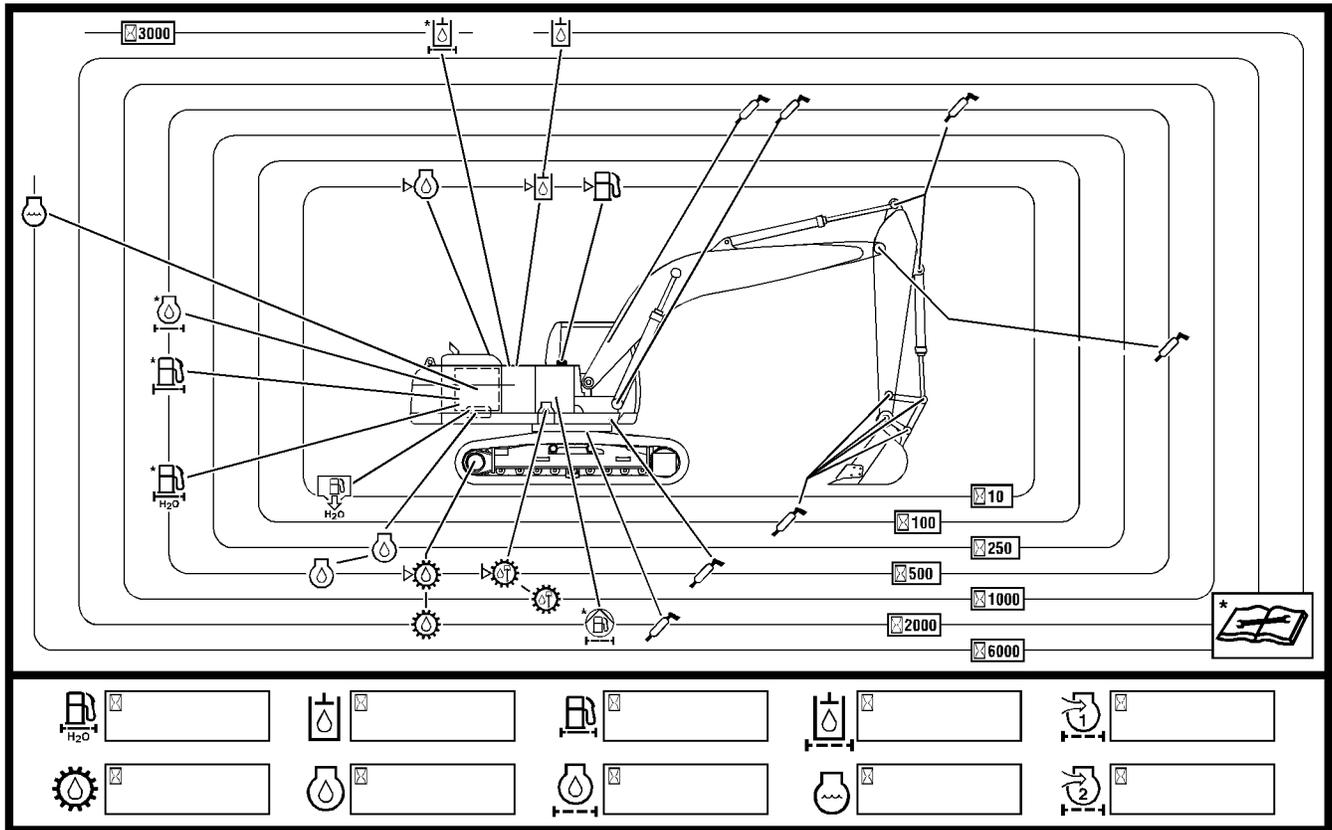


Illustration 451

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- | | | | |
|---|---|---|---|
|  | Operation and Maintenance Manual – Refer to the OMM for maintenance instructions and guidelines. |  | Engine oil filter – Change the engine oil filter. |
|  | Service hour interval – Hourly interval in which a maintenance procedure should be performed. |  | Final drive oil level – Check the final drive oil level. |
|  | Cooling system coolant – Change the ELC (Extended Life Coolant) . |  | Final drive oil – Change the final drive oil. |
|  | Engine air filter primary element – Clean or replace the primary air filter element. |  | Fuel cap filter – Replace the fuel cap filter. |
|  | Engine air filter secondary element – Replace the secondary air filter element. |  | Fuel level – Check the fuel level. |
|  | Engine oil level – Check the engine oil level. |  | Fuel system filter – Replace the fuel system filters. |
|  | Engine oil – Change the engine oil. |  | Fuel system water separator – Drain the water separator. |



Fuel system water separator element – Replace the fuel system water separator element.



Fumes Disposal Filter Element – Replace the fumes disposal filter element.



Grease zerk – Lubricate the designated locations.



Hydraulic oil level – Check the hydraulic oil level.



Hydraulic oil – Change the hydraulic oil.



Hydraulic oil filter – Change the hydraulic oil filter.



Swing drive oil level – Check the swing drive oil level.



Swing drive oil – Change the swing drive oil.

i07107723

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.

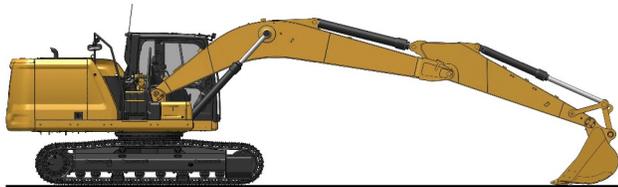


Illustration 452

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 452 .
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.

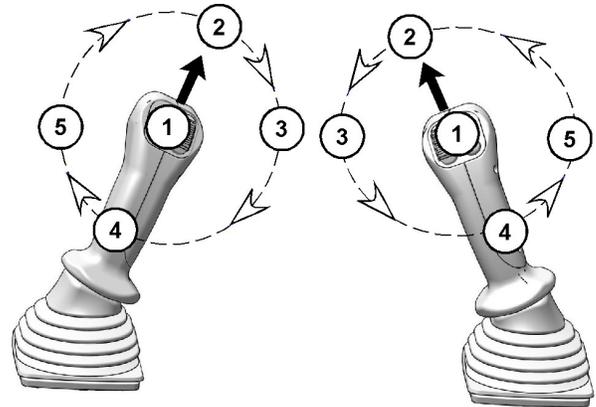


Illustration 453

g06184822

- 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.

Maintenance Section
System Pressure Release

4. Release hydraulic system pressure in the attachment circuits.
 - a. Start the engine to charge pilot accumulator.
 - b. Shut off the engine.

Note: Perform Step 4c through Step 4e immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

 - c. Turn the engine start switch to the ON position without starting the engine.
 - d. Place the hydraulic activation control lever in the UNLOCKED position.
 - e. Activate the switch or pedal for the attachment circuit.
 - f. Place the hydraulic activation control lever in the LOCKED position.
 - g. Start the engine to recharge pilot accumulator.

Note: Do not activate any 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.

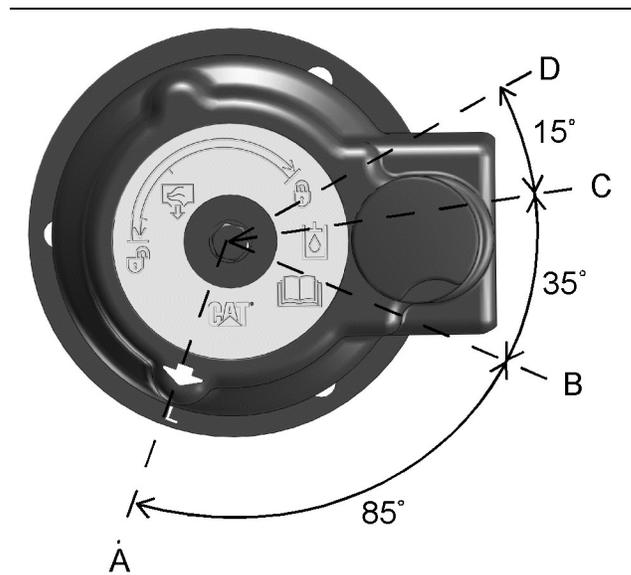


Illustration 454

g06184990

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 454 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.

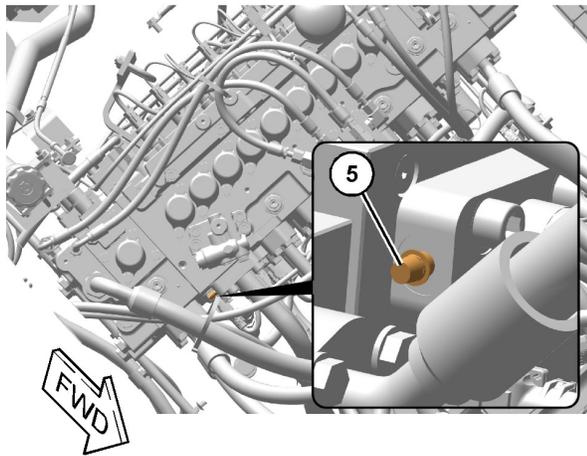


Illustration 455

g06205184

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.

i07746333

Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Cat dealer.

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

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

NOTICE

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

3. Clamp the ground cable from the welder to the component that will be welded. Place the clamp as close as possible to the weld. Make sure that the electrical path from the ground cable to the component does not go through any bearing. Use this procedure to reduce the possibility of damage to the following components:
 - Bearings of the drive train
 - Hydraulic components
 - Electrical components
 - Other components of the machine
4. Protect any wiring harnesses and components from the debris and the spatter which is created from welding.

5. Use standard welding procedures to weld the materials together.

i08368294

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: 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”	259
“ Battery Electrolyte Level - Check”	259
“ Battery or Battery Cable - Inspect/Replace”	260
“ Bucket Linkage - Inspect/Adjust”	262
“ Bucket Tips - Inspect/Replace”	264
“ Cab Air Filter (Fresh Air) - Clean/Replace”	270
“ Camera - Clean”	271
“ Condenser (Refrigerant) - Clean”	272
“ Engine Air Filter Primary and/or Secondary Element - Replace”	278

“ Ether Starting Aid Cylinder - Replace”	289
“ Film (Product Identification) - Clean”	290
“ Fuel System - Prime”	292
“ Fuel Tank Strainer - Clean”	297
“ Fuses - Replace”	298
“ High Intensity Discharge Lamp (HID) - Replace”	302
“ Oil Filter - Inspect”	315
“ Radiator, Aftercooler and Oil Cooler Cores - Clean”	316
“ Rollover Protective Structure (ROPS) - Inspect”	317
“ Track Adjustment - Adjust”	323
“ Undercarriage - Check”	326
“ Window Washer Reservoir - Fill”	326
“ Window Wiper - Inspect/Replace”	327
“ Windows - Clean”	327

Every 10 Service Hours or Daily for First 50 Hours

“ Boom and Stick Linkage - Lubricate”	261
“ Bucket Linkage - Lubricate”	263

Every 10 Service Hours or Daily

“ Cooling System Coolant Level - Check”	276
“ Engine Oil Level - Check”	282
“ Fuel System Water Separator - Drain”	296
“ Fuel Tank Water and Sediment - Drain”	297
“ Hydraulic System Oil Level - Check”	311
“ Indicators and Gauges - Test”	313
“ Track Adjustment - Inspect”	325
“ Travel Alarm - Test”	325
“ Seat Belt - Inspect”	318

Every 100 Service Hours

“ Bucket Linkage - Lubricate”	263
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“ Oil Filter (Hydraulic Hammer) - Replace“ 313

Every 250 Service Hours

“ Cooling System Coolant Sample - Obtain“ 277

“ Engine Oil Sample - Obtain“ 284

Initial 500 Service Hours

“ Engine Oil and Filter - Change“ 284

“ Final Drive Oil - Change“ 290

“ Swing Drive Oil - Change“ 319

Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

“ Cooling System Coolant Sample - Obtain“ 277

Every 500 Service Hours

“ Boom and Stick Linkage - Lubricate“ 261

“ Final Drive Oil Level - Check“ 291

“ Final Drive Oil Sample - Obtain“ 292

“ Hydraulic System Oil Sample - Obtain“ 313

“ Swing Bearing - Lubricate“ 318

“ Swing Drive Oil Level - Check“ 320

“ Swing Drive Oil Sample - Obtain“ 321

Every 1000 Service Hours

“ Battery - Clean“ 259

“ Battery Hold-Down - Tighten“ 260

“ Belt - Inspect/Adjust/Replace“ 260

“ Engine Oil and Filter - Change“ 284

“ Engine Valve Lash - Check“ 288

“ Fuel System Primary Filter (Water Separator) Element - Replace“ 293

“ Fuel System Secondary Filter - Replace“ 295

“ Swing Drive Oil - Change“ 319

Every 2000 Service Hours

“ Final Drive Oil - Change“ 290

“ Fuel Cap Filter - Replace“ 292

“ Swing Gear - Lubricate“ 321

Every Year

“ Cooling System Coolant Sample - Obtain“ 277

Every 3000 Service Hours

“ Hydraulic System Oil Filter (Return) - Replace“ 308

Every 3 Years

“ Seat Belt - Replace“ 318

Every 5000 Service Hours

“ Receiver Dryer (Refrigerant) - Replace“ 317

Every 6000 Service Hours or 3 Years

“ Cooling System Coolant Extender (ELC) - Add“ 275

“ Hydraulic System Oil - Change“ 302

Every 12 000 Service Hours or 6 Years

“ Cooling System Coolant (ELC) - Change“ 272

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.

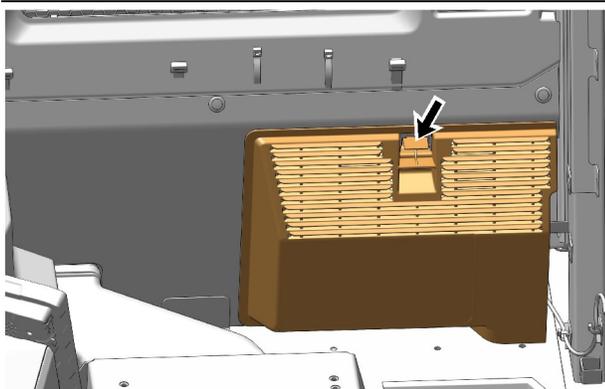


Illustration 456

g06181599

2. Release the cover latch.

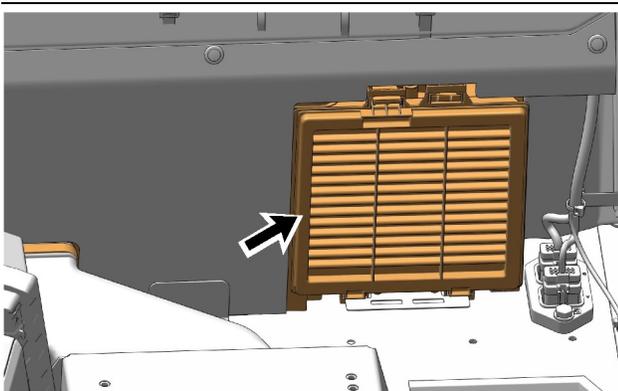


Illustration 457

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; 1401-535-FLV

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: 1401-510; 1401-040; 1401-561; 1401; 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

i07041934

Belt - Inspect/Adjust/Replace

SMCS Code: 1357-510; 1357-025; 1357-040; 1397-510; 1397-025; 1397-040

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.

i07531958

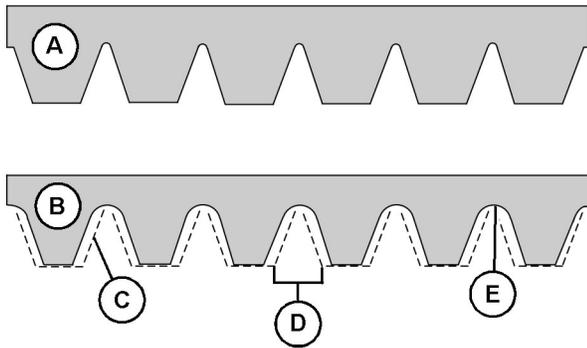


Illustration 458

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.

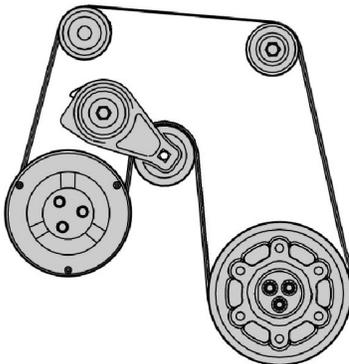


Illustration 459

g06206669

- b. Rotate the belt tensioner clockwise to remove the belt.
- c. Remove the belt.
- d. Install a new belt.
- e. Rotate the belt tensioner clockwise to install the belt.
- f. Install the upper fan guard.
- g. Lower the engine hood and latch the engine hood.

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.

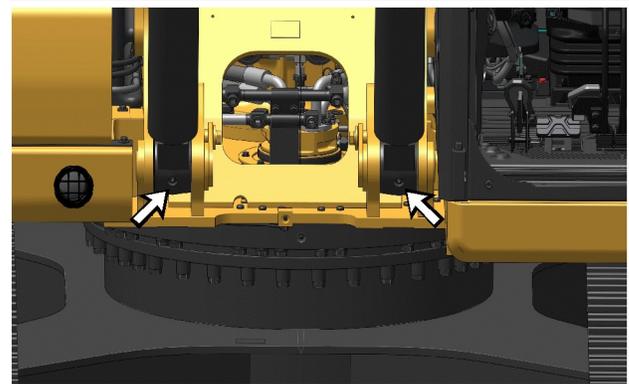


Illustration 460

g06183509

1. Apply lubricant through the fitting at the base of each boom cylinder.

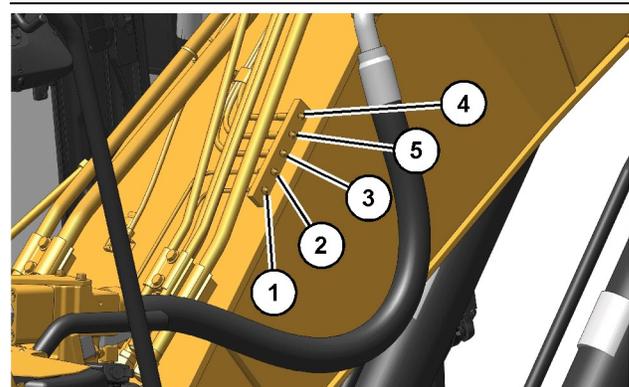


Illustration 461

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.

Maintenance Section
Bucket Linkage - Inspect/Adjust

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.

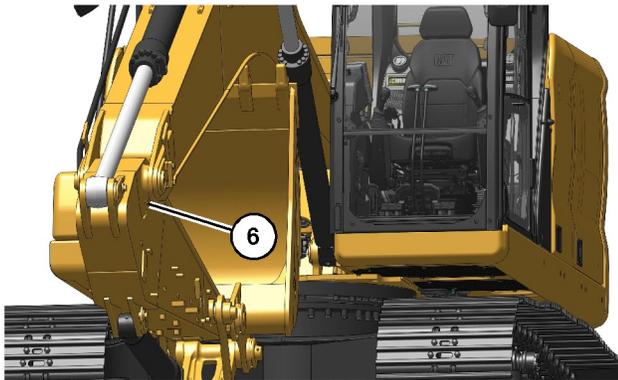


Illustration 462

g06183854

5. Apply lubricant through fitting (6). Fitting (6) is at the connection point of the boom and of the stick.

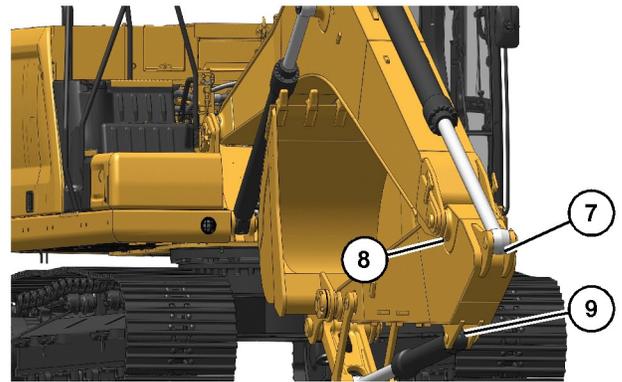


Illustration 463

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.

i06980273

Bucket Linkage - Inspect/Adjust

SMCS Code: 6513-025; 6513-040

WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the **LOCKED** position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

NOTICE

Improperly adjusted bucket clearance could cause galling on the contact surfaces of the bucket and stick, resulting in excessive noise and/or damaged O-ring seals.

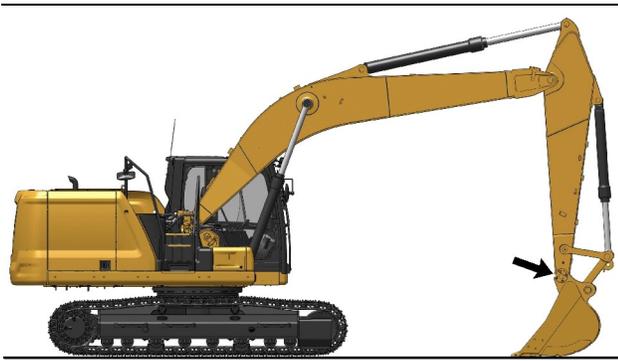


Illustration 464

g06185692

Area for linkage adjustment

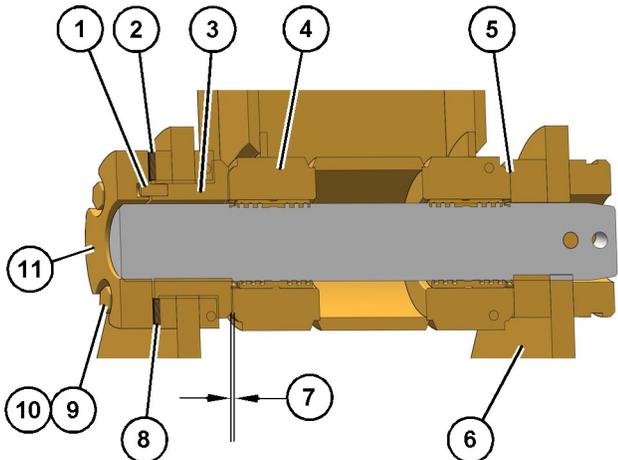


Illustration 465

g06185866

- (1) Pin
- (2) Shims
- (3) Flange
- (4) Stick boss
- (5) No gap
- (6) Bucket boss
- (7) Bucket clearance
- (8) Location
- (9) Bolts
- (10) Washers
- (11) Plate

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 (7) to 0.5 to 1 mm (0.02 to 0.04 inch).

Two shims of different thickness are used at location (8). 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. Stop the engine.
4. Measure bucket clearance (7), which is the existing total clearance.
5. 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 (7).
6. Remove the appropriate number of shims at location (8) 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 (9), washers (10), and plate (11).
7. After the correct number of shims has been removed and pin (1) is aligned with the pin hole, install plate (11), bolts (9), and washers (10). Tighten the bolts to $240 \pm 40 \text{ N}\cdot\text{m}$ ($175 \pm 30 \text{ lb ft}$).
8. After installation, make sure that bucket clearance (7) 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.

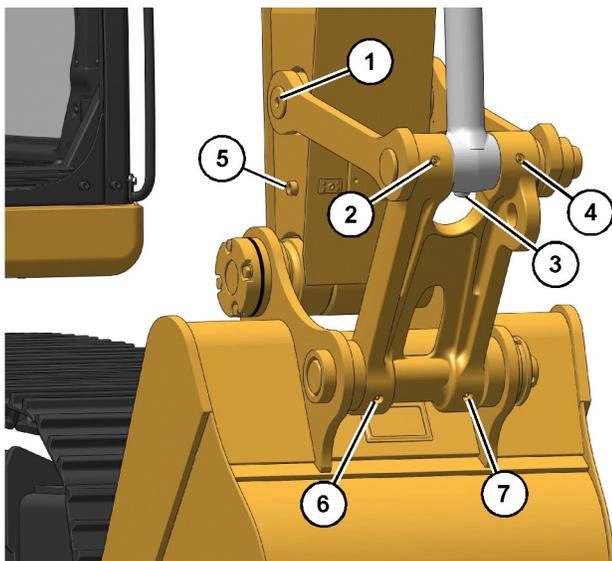


Illustration 466

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.

i08059817

Bucket Tips - Inspect/Replace

SMCS Code: 6805-510; 6805-040

WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket tips or side cutters.

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 467

g01055179

Acceptable wear



Illustration 468

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.

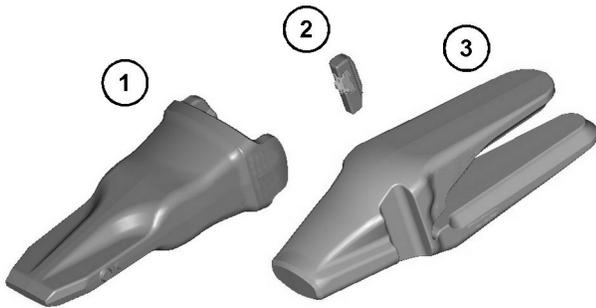


Illustration 469 g06528662

- (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.

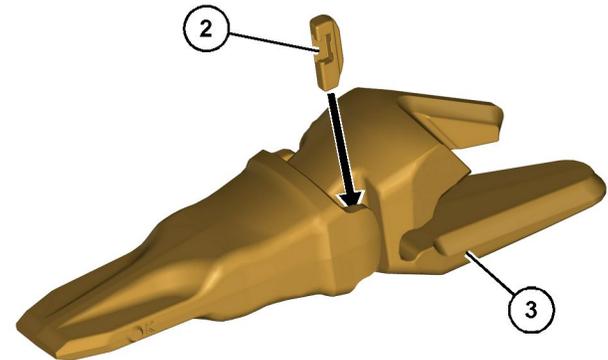


Illustration 471 g06528668

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).

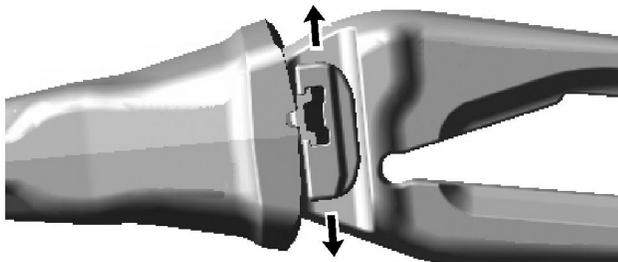


Illustration 470 g01054386

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.

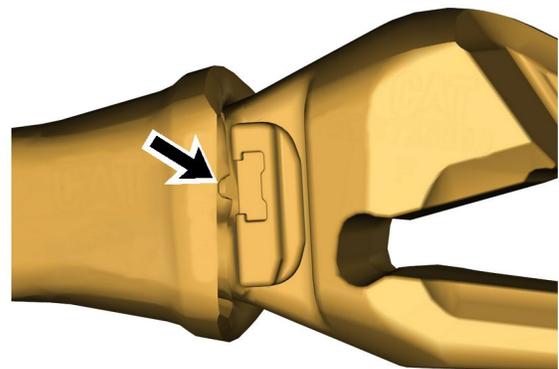


Illustration 472 g06528672

Internal View

The latch of the retainer is properly seated in the recess of the bucket tip.

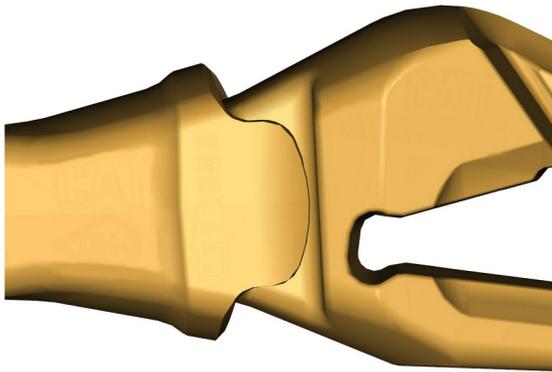


Illustration 473

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.

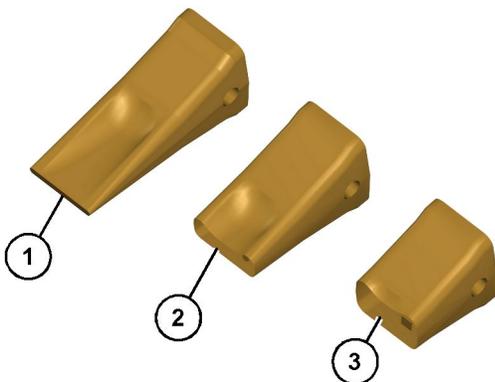


Illustration 474

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.

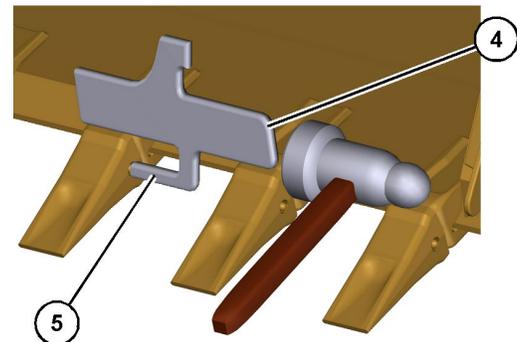


Illustration 475

g06214793

- (4) Back of Pin-Master
- (5) Extractor

- a. Place the Pin-Master on the bucket tip.
- b. Align extractor (5) with the pin.
- c. 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.

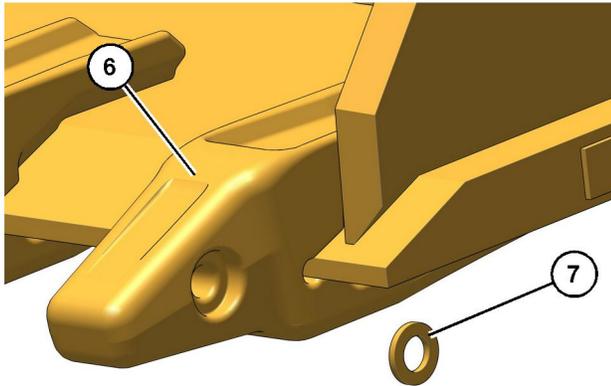


Illustration 476

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.

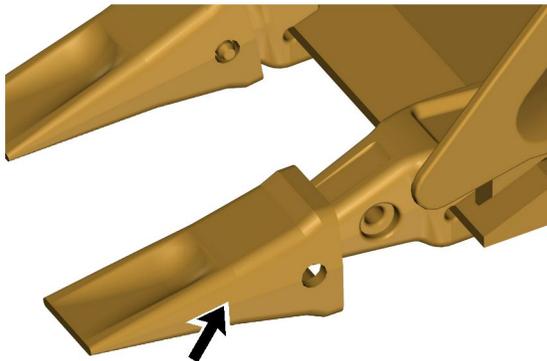


Illustration 477

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.

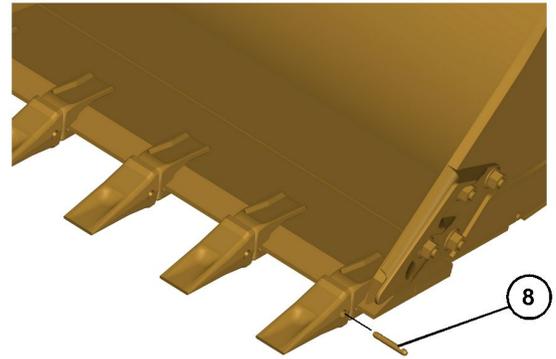


Illustration 478

g06214803

(8) Pin

a. Insert pin (8) through the bucket tip.

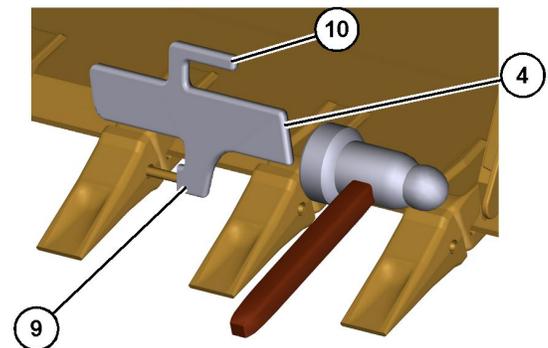


Illustration 479

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.

Maintenance Section
Bucket Tips - Inspect/Replace

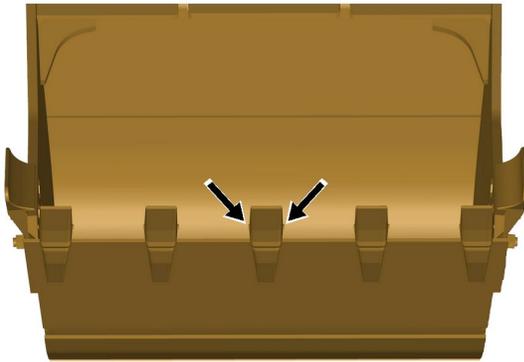


Illustration 480

g06214812

Final assembly of pin into bucket tip

- e. Strike the end of the tool until the pin is fully inserted.

Bucket Tips (Cat® Advansys) - If Equipped

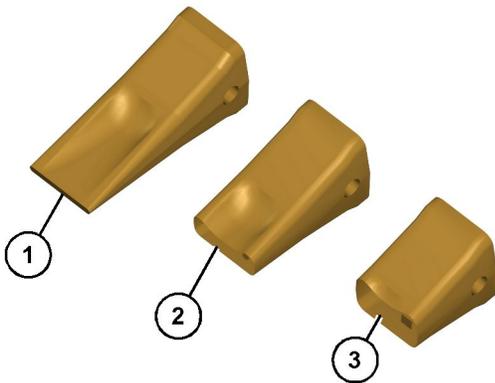


Illustration 481

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.

Removal

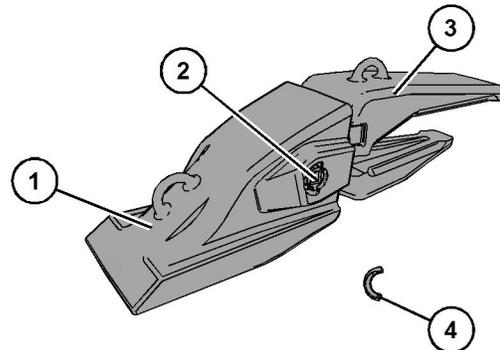


Illustration 482

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).

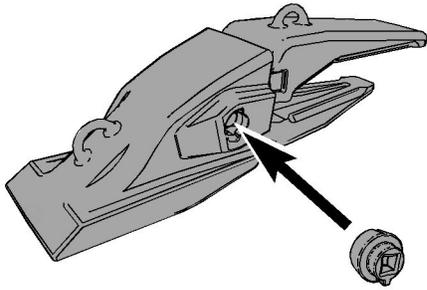


Illustration 483

g06528728

- Use a 1/2" ratchet to rotate the retainer (2) 180 degrees to the locked position.

Side Cutters

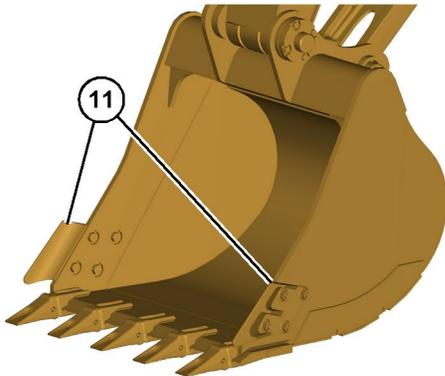


Illustration 484

g06214814

Bucket With Side Cutters

- Remove the mounting bolts and the side cutters (11).
- 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.

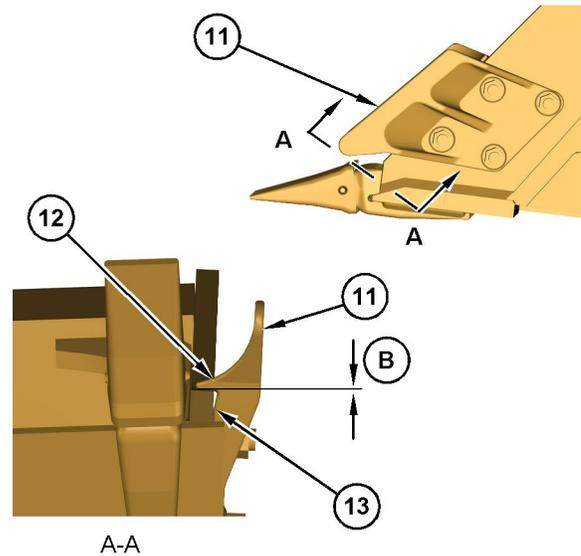


Illustration 485

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.

- Install the side cutter.

Note: Certain bolts may require thread compound.

- Hand tighten the bolts.
- Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.
- Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

Maintenance Section
Cab Air Filter (Fresh Air) - Clean/Replace

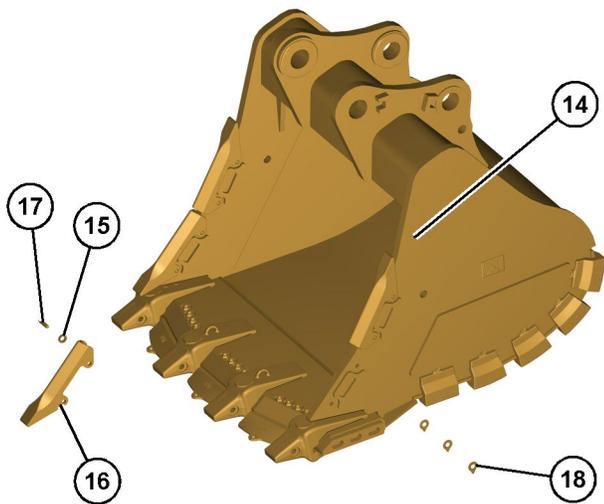


Illustration 486

g06219766

i07092323

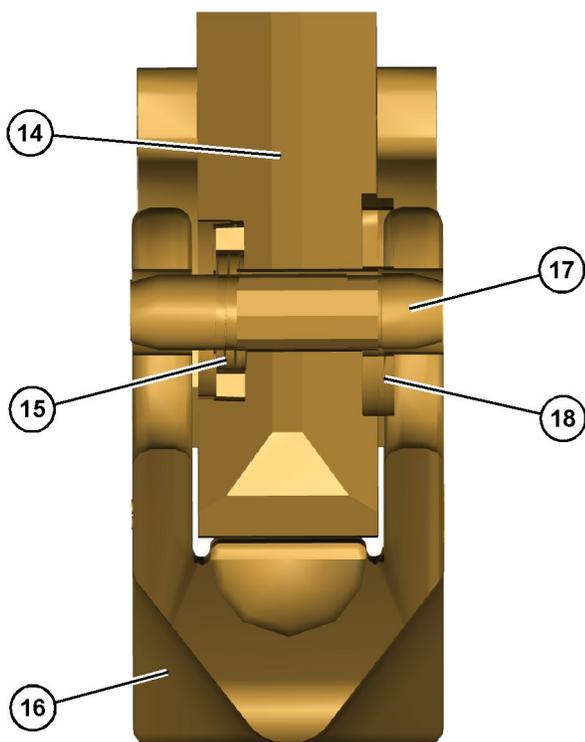


Illustration 487

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.

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 488

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.

i07243995

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 489

g06184579

The rear view camera is on 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 490

g06214504

If equipped, clean the right side view camera.



Illustration 491

g06263435

If equipped, clean the left side view camera.

Maintenance Section
Condenser (Refrigerant) - Clean

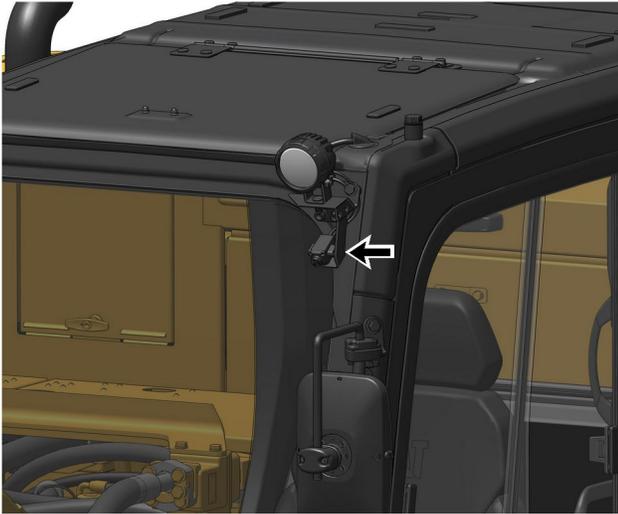


Illustration 492

g06263449

If equipped, clean the front view camera.

i06969907

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 493

g06179792

1. Open the access door on the left side of the machine. The condenser is located in front of the radiator.

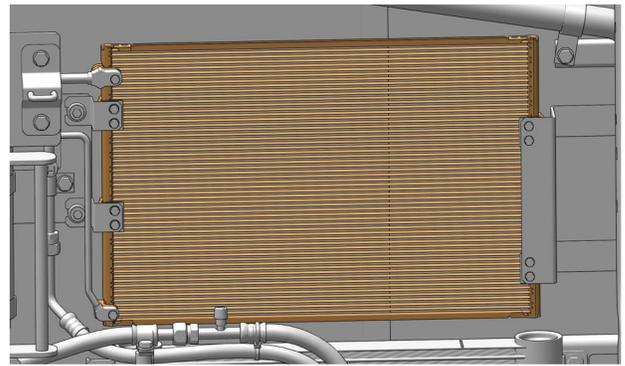


Illustration 494

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.

i06971000

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".

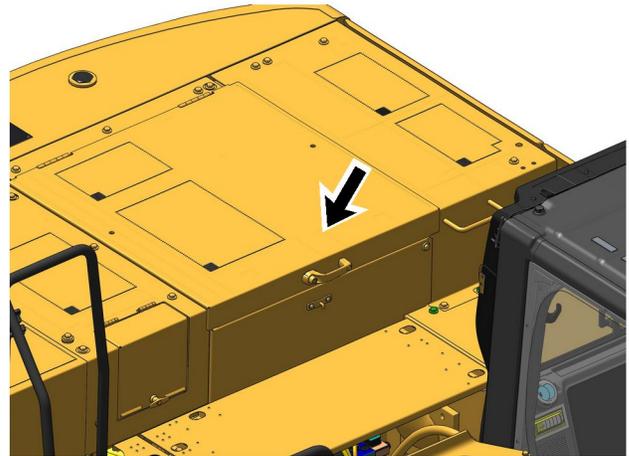


Illustration 495

g06225770

1. Unlatch the engine hood and raise the engine hood.

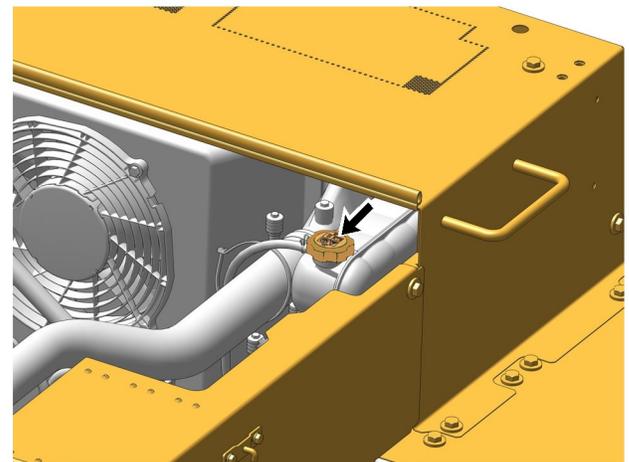


Illustration 496

g06183808

2. Slowly loosen the pressure cap that is on the coolant reservoir to release pressure from the cooling system.
3. Remove the pressure cap.
4. Inspect the gasket on the pressure cap. If the gasket is damaged, replace the pressure cap.

Maintenance Section
Cooling System Coolant (ELC) - Change



Illustration 497

g06179792

5. Open the rear access door on the left side of the machine.

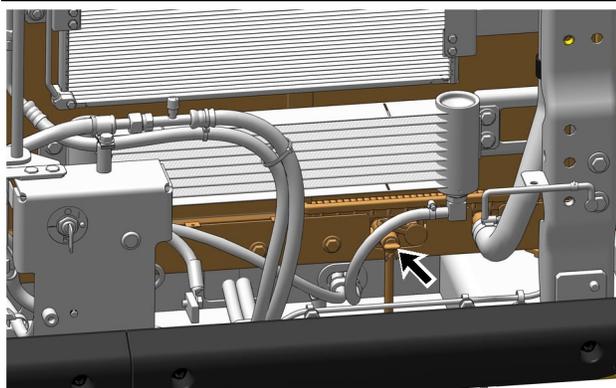


Illustration 498

g06183531

6. 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.

7. Flush the cooling system. Follow Step 7a through Step 7h to flush the cooling system.
- Close the drain valve.
 - Fill the cooling system with clean water.
 - Install the pressure cap.
 - Start the engine and run the engine until the engine reaches operating temperature.
 - Stop the engine and allow the engine to cool.
 - Loosen the pressure cap slowly to relieve any pressure in the cooling system.

- Open the drain valve that is on the bottom of the radiator and allow the coolant to drain into a suitable container.
- Flush the radiator with clean water until the draining water is transparent.

8. Close the drain valve.

9. Add the Extended Life Coolant. Refer to the following topics:

- Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Operation and Maintenance Manual, “Capacities (Refill)”

10. After the cooling system has been filled, perform the following procedures during initial start-up:

- Start the engine without the filler cap.
- Run the engine at low idle for 10 minutes.
- Then, increase the engine speed to a high idle until the water temperature regulator is open and the coolant level is stabilized.
- 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”.

11. Install the cooling system pressure cap.

12. Stop the engine.

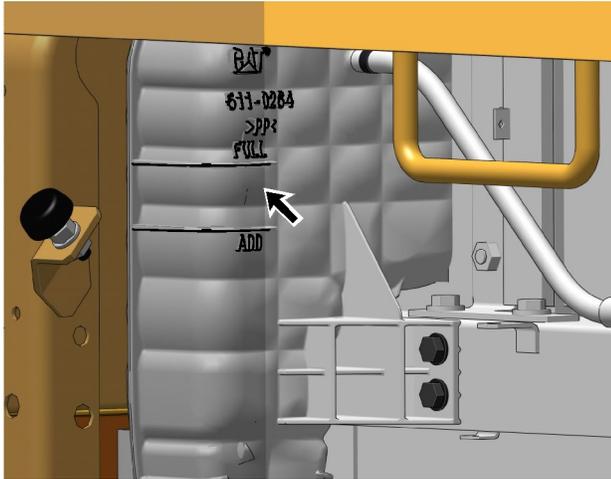


Illustration 499

g06205196

13. Check the coolant reservoir. Maintain the coolant level so that coolant is between the “ADD” and “FULL” lines. If more coolant is needed, see Operation and Maintenance Manual, “Cooling system Coolant Extender (ELC) - Add”.
14. If more coolant is necessary, remove the pressure cap and add the appropriate coolant solution.
15. Install the pressure cap.
16. Close and latch the engine hood. Close the left access door.

i06972485

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.

Maintenance Section
Cooling System Coolant Level - Check

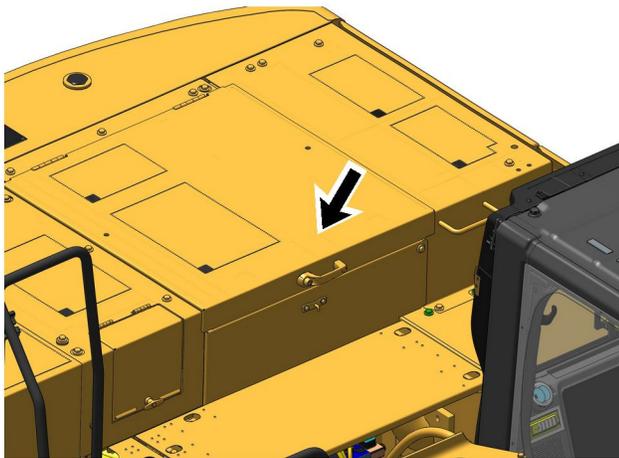


Illustration 500

g06225770

3. Unlatch the engine hood and raise the hood.

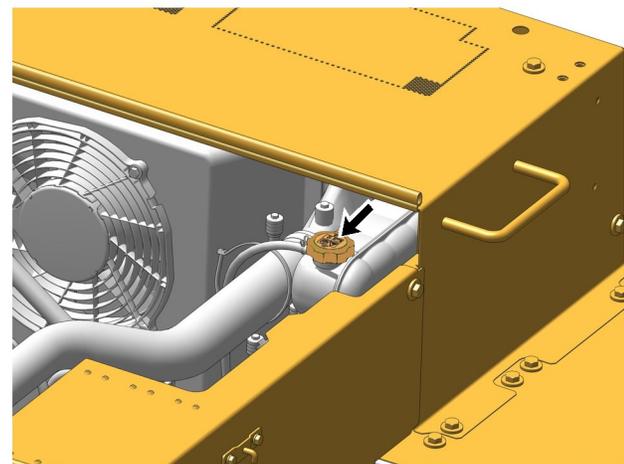


Illustration 501

g06183808

4. 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.

5. You may need to drain some coolant from the radiator so that Cat Extender can be added to the cooling system.

Note: Always discard drained fluids according to local regulations.

6. Add Cat Extended Life Coolant (ELC) to the cooling system. Refer to the following topics for the proper amount of Cat Extender:

- Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Operation and Maintenance Manual, “Capacities (Refill)”

7. Inspect the o-ring of the cooling system pressure cap. If the o-ring is damaged, replace the pressure cap.

8. Install the cooling system pressure cap.

9. Close and latch the engine hood.

i07038988

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.

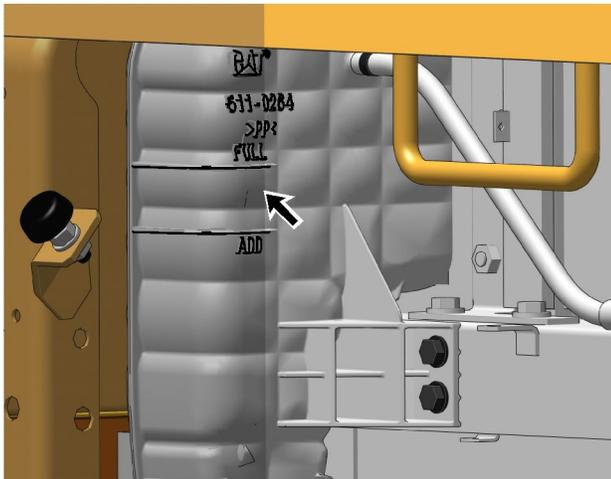


Illustration 502

g06205196

4. Maintain the coolant level so that coolant is between the "ADD" and "FULL" marks. If more coolant is needed, see Operation and Maintenance Manual, "Cooling system Coolant Extender (ELC) - Add".
5. Close the access door.

i07836536

Cooling System Coolant Sample - Obtain

SMCS Code: 1395-554; 1395-008

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 Year

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.

Maintenance Section
Engine Air Filter Primary and/or Secondary Element - Replace

NOTICE

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

Refer to Special Publication, 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 503

g06179792

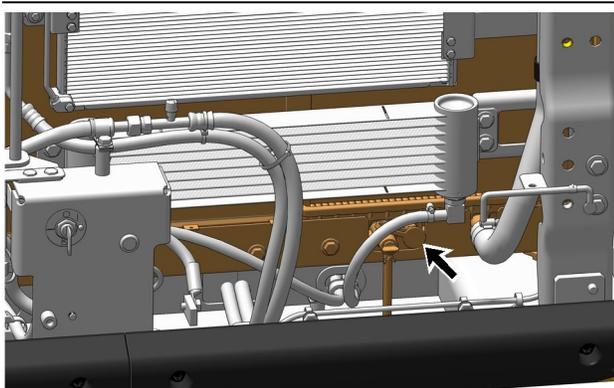


Illustration 504

g06183525

The coolant sampling port is on the radiator.

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.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample 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, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Cat dealer.

i08165097

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 front access door on the left side of the machine.

1. Park the machine on a level surface. Stop the engine.



Illustration 505

g06181546

2. Open the front access door on the left side of the machine.

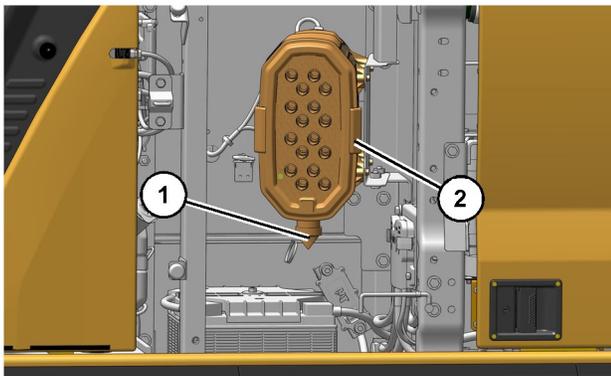


Illustration 506

g06183302

3. Squeeze outlet tube (1) to purge the dirt from the outlet tube.

Note: Purge the dirt from the outlet tube every 10 service hours or daily in a dirty environment.

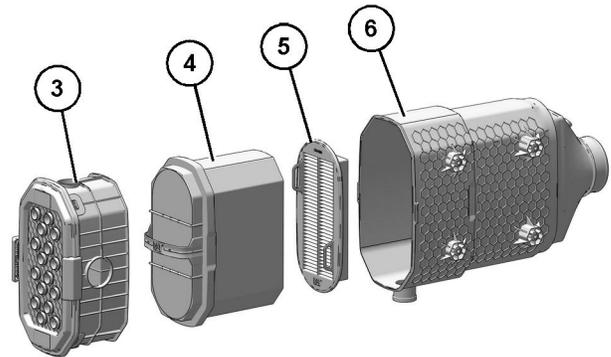


Illustration 507

g06222467

4. Release latches (2) that secure pre-cleaner (3) to engine air filter housing (6).
5. Remove pre-cleaner (3).
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 500 kPa (73 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.

Maintenance Section

Engine Air Filter Primary and/or Secondary Element - Replace

- 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.

- Clean inside the air filter assembly housing.

Note: Do not allow any dirt or debris to contact the secondary air filter element (5).

- 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

- 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.

- Install the secondary air filter element.

- 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.

- Install the pre-cleaner and secure the latches that hold the pre-cleaner to the air filter housing.

- 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.

- Open the front access door on the left side of the machine.

- 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.

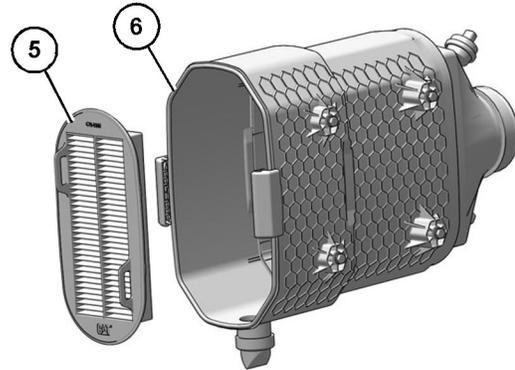


Illustration 508

g06183315

- 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.
- Cover the air inlet opening. Clean inside the air cleaner housing.
- Clean all surfaces of the pre-cleaner cover and body.
- Uncover the air inlet opening.
- 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.

- Install the primary air filter element and the pre-cleaner.
- Close the access door.

Engine Air Pre-Cleaner - Clean

Note: Do not attempt to clean the pre-cleaner by hitting the filter against another object. Damage to the filter is likely to occur.

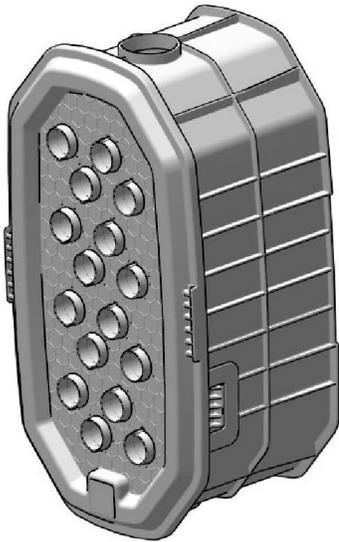


Illustration 509

g06183310

After removing the pre-cleaner from the air filter housing, inspect the interior of the pre-cleaner through the ejection ports around the perimeter.

In general, dust and debris will clear automatically through normal pre-cleaner operation and no further service will be required.

If the ejection ports are blocked, or dust is packed between the pre-cleaner tubes, first try to clear any accumulation by vigorously shaking the pre-cleaner.

If the pre-cleaner is still blocked with dirt, the pre-cleaner may be separated by releasing the snap features holding the front cover to the pre-cleaner body.



Illustration 510

g06069263

1. Place the pre-cleaner assembly on a suitable work surface. The interior of the pre-cleaner may have accumulated debris. Protect your work surface to collect excess debris and to avoid scattering debris.

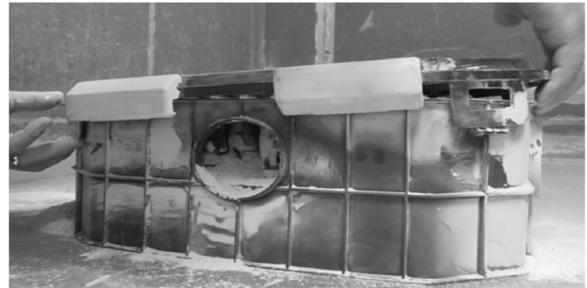


Illustration 511

g06069266

2. Lift the locking tabs on one end of the cover away from the retainers. Move the locking tabs only far enough to clear the retention posts.

Note: Do not bend the locking tabs farther than necessary to release the tabs. Damage to the air cleaner can result. Do not use tools to force the snap features off the retainers.

3. Pull one end of the top cover away from the bottom half.
4. Hold one end of the cover sections apart and separate one of the locking tabs on the other end of the pre-cleaner.



Illustration 512

g06069264

5. Pull the top cover up and away from the bottom.
6. Clear any blockage by shaking the pre-cleaner components and/or brushing away accumulated debris.

Note: Do not use picks or other stiff implements to clear debris, you may damage the pre-cleaner components

Maintenance Section
Engine Oil Level - Check

Note: Do not attempt to remove the pre-cleaner tubes from the top cover or you will damage the air cleaner.

- If the blockage is still not cleared, you may attempt to clear the debris by use of an air nozzle limited to 500 kPa (73 psi).

Alternately, each part of the pre-cleaner may be submerged in water to loosen mud or other debris that may have dried on the interior surface of the air cleaner.

Note: Never attempt to use a pressure washer or other high-pressure water sources to clean the pre-cleaner. Use of high-pressure water may damage the pre-cleaner tubes and reduce the pre-cleaner effectiveness.

- After cleaning, reassemble the pre-cleaner by lining up the tubes on the pre-cleaner top with the tubes in the pre-cleaner bottom.
- Allow the pre-cleaner top to rest on the pre-cleaner bottom and ensure that the four snap features are aligned.



Illustration 513

g06069247

- If all the tabs are aligned, gently push the pre-cleaner top down into place. Ensure that all the snap features have engaged.

- Before installing the pre-cleaner to the air filter housing, inspect the pre-cleaner gasket for damage. Replace if damaged.

i06970869

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.

This machine is equipped with both an automated function for checking fluid levels and dipsticks. Refer to Operation and Maintenance Manual, "Monitoring System" regarding the automated system. If the machine is on an incline or the engine has been stopped only for a short time, 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 514

g06183460

- Open the access door on top of the machine.

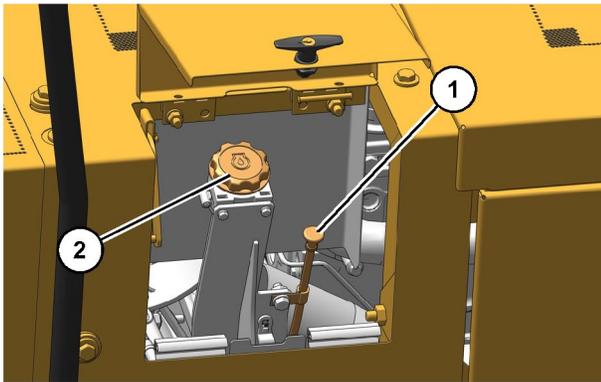


Illustration 515

g06183463

2. Remove dipstick (1). Wipe the oil off the dipstick and reinsert the dipstick.

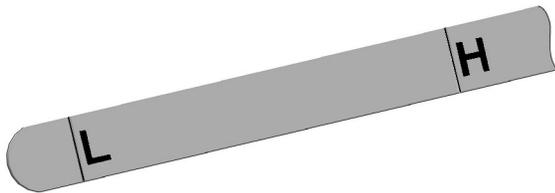


Illustration 516

g06183475

3. Remove the dipstick and check the dipstick. The oil level should be between the "L" mark and the "H" mark.

NOTICE

Operating your engine when the oil level is above the "H" mark could cause the crankshaft to dip into the oil. This could lead to excessively high oil temperatures which can reduce the lubricating characteristics of the oil, lead to bearing damage, and could result in loss of engine power.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on Containing Fluid Spillage.

4. Remove oil filler plug (2) to add oil, if necessary.
See Operation and Maintenance Manual, "Lubricant Viscosities".

Note: If the oil is deteriorated or badly contaminated, change the oil regardless of the maintenance interval.

5. Clean the oil filler plug. Install the oil filler plug.
6. Close the access door.

Ground Level Dipstick



Illustration 517

g06182545

To access the ground level dipstick, open the right access door.

i08290580

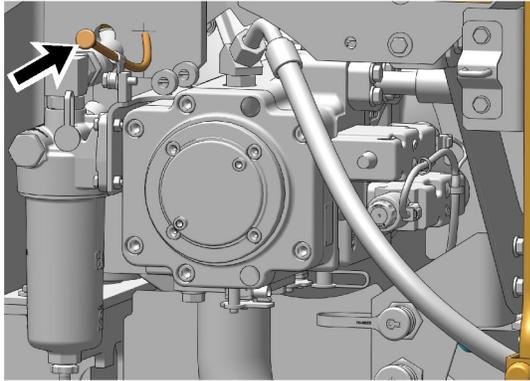


Illustration 518

g06211545

The ground level dipstick is located near the engine oil filter and main hydraulic pump.

i07088417

Engine Oil Sample - Obtain

SMCS Code: 1000-008; 1000; 1348-008; 1348-554-SM; 7542-554-SM; 7542-008; 7542-554-OC

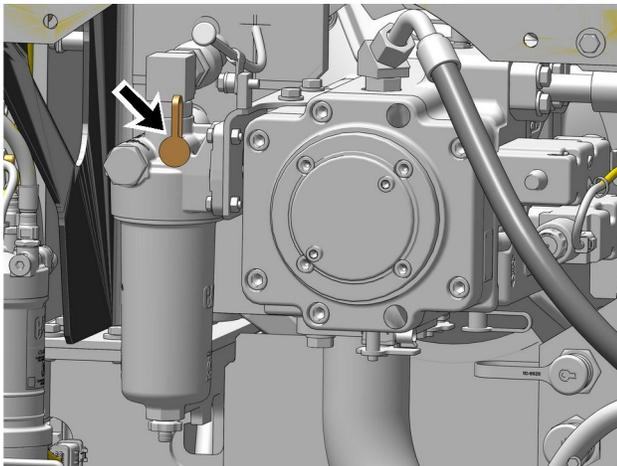


Illustration 519

g06220379

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.

Engine Oil and Filter - Change

SMCS Code: 1318-510

NOTICE

The engine oil and filter change interval for standard service application is every 1000 hours when the following requirements are met:

- Utilize Cat Recommended Fluids
- Utilize Cat Filters
- Utilize S·O·S Services at recommended interval

When these requirements are not met, the oil and filter change interval should be every 500 hours, or use S·O·S Services oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

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.

Table 29

Selection of Oil and Filter Change Interval				
	Conditions			Interval
	Cat Recommended Fluids	Cat Filters	S·O·S Services	
Standard Service Application	YES	YES	YES	1000 hours
	YES	YES	NO	500 hours
	YES	NO	YES	500 hours
	NO	YES	YES	500 hours
	NO	NO	NO	250 hours
Severe Service Application	NO	NO	NO	250 hours
	YES	YES	NO	250 hours
	YES	YES	YES	Use S·O·S ⁽¹⁾
	YES	NO	YES	Use S·O·S ⁽¹⁾
	NO	YES	YES	Use S·O·S ⁽¹⁾

⁽¹⁾ If operating in any of the conditions or environments outlined in the Severe Service Application, use S·O·S Services oil analysis to determine the best oil change interval.

Note: Initial oil and filter change is required at initial 500 hours.

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. Prepare the machine for maintenance. Refer to “Prepare the Machine for Maintenance”.

Note: Refer to “General Hazard Information” for information on Containing Fluid Spillage.

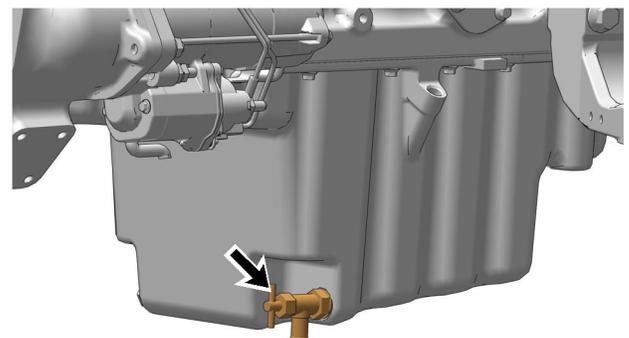


Illustration 520

g06183508

2. Open the crankcase drain valve. Allow the oil to drain into a suitable container.

Note: Discard any drained fluids according to local regulations.

3. Close the drain valve.



Illustration 521

g06182545

4. Open the access door at the right side of the machine.

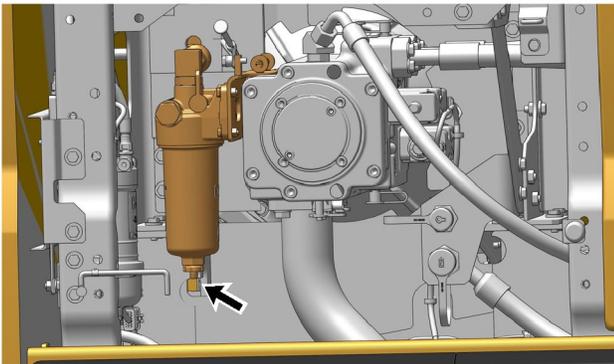


Illustration 522

g06183511

5. Loosen drain valve and allow the oil to drain out of the housing. The drain valve is on the bottom of the engine oil filter housing.

Note: If equipped with a fast fill system, the oil can be drained and filled using the fast fill coupler. Refer to "Fast Fill (If Equipped)" in this chapter.

6. Remove the oil filter housing. Refer to Operation and Maintenance Manual, "Oil Filter - Inspect". Dispose of the used filter according to local regulations.



Illustration 523

g06183515

7. Remove the filter from the housing.
8. Clean the filter housing and the base thread.
9. Install the new filter element into the housing.
10. After installing the new element, hand tighten the drain valve at the bottom of the housing.

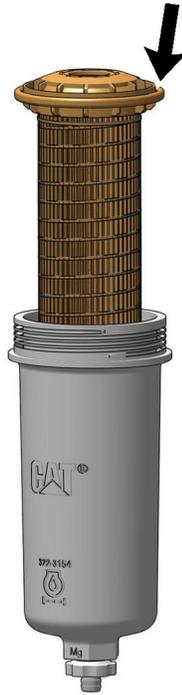


Illustration 524

g06604084

11. Apply a thin coat of engine oil to the gasket of the filter. Refer to Illustration 524 for lubrication points on the gasket.
 12. Install the filter housing with element to the filter base utilizing a socket wrench.
- Note:** Apply a tightening torque of 90 N·m (66 lb ft) and tighten until metal to metal contact is achieved.
13. Re-tighten the drain valve to a torque of 2.5 N·m (22.1 lb in).
 14. Close the access door.



Illustration 525

g06183460

15. Open the access door on top of the machine. Refer to "Access Door and Cover Locations".

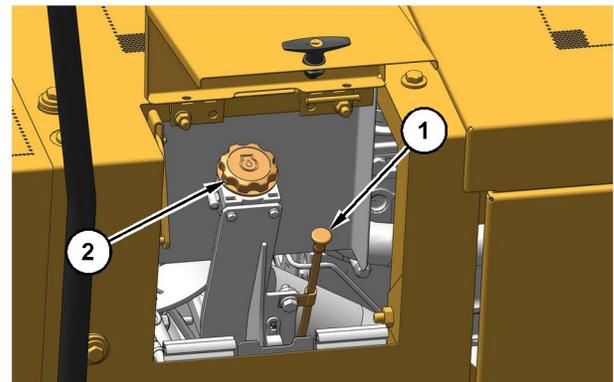


Illustration 526

g06614930

- (1) Oil level gauge
- (2) Oil filler cap

16. Remove oil filler cap (2). Fill the crankcase with new oil. Refer to Operation and Maintenance Manual, "Capacities (Refill)". Clean the oil filler cap and install the oil filler cap.

NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

17. Start the engine and allow the oil to warm. Refer to Operation and Maintenance Manual, "Engine Starting". Check the engine for leaks. Stop the engine.

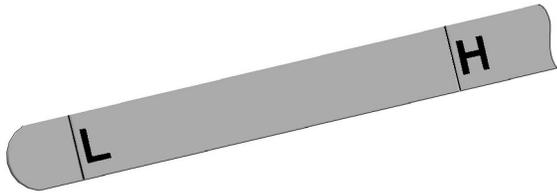


Illustration 527

g06183475

18. Wait for 30 minutes to allow the oil to drain back into the crankcase. Check the oil level with oil level gauge (1). Maintain the oil between the “L” and “H” marks on the oil level gauge. If necessary, add oil.

19. Close the access door.

Fast Fill (If Equipped)

If your machine is equipped with a deluxe service center, you may drain and add the engine oil through the fast fill port.



Illustration 528

g06182545

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

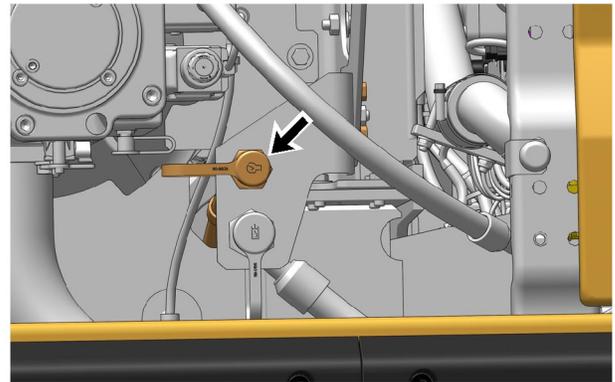


Illustration 529

g06183504

2. Remove the dust cover.

3. Attach a hose that is equipped with a nozzle.

Note: Make sure that the nozzle and the receiver are free from debris before attaching.

4. Drain the oil or add the oil, as needed.

5. Install the dust cover.

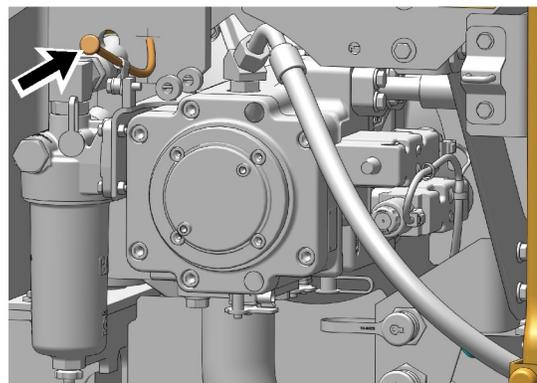


Illustration 530

g06211545

6. Verify that the correct amount of oil was added and add or remove oil as necessary. A ground level oil level gauge is located in the same compartment as the fast fill port.

i01747875

Engine Valve Lash - Check

SMCS Code: 1102; 1102-535; 1102-082; 1105-535; 1105-025; 1121-535; 1209-082; 1209; 1209-535; 7527

Refer to Engine Systems Operation/Testing and Adjusting in order to perform the complete procedure for the valve lash adjustment.

i07051358

Ether Starting Aid Cylinder - Replace

(If Equipped)

SMCS Code: 1456-510-CD

WARNING

Breathing ether vapors or repeated contact of ether with skin can cause personal injury. Personal injury may occur from failure to adhere to the following procedures.

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

Discard cylinders in a safe place. Do not puncture or burn cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.

The ether cylinder is located inside the rear access door on the left side of the machine.

Refer to Operation and Maintenance, "Fire Prevention and Explosion Prevention" before you replace the ether cylinder.



Illustration 531

g06179792

1. Open the rear access door at the left side of the machine.

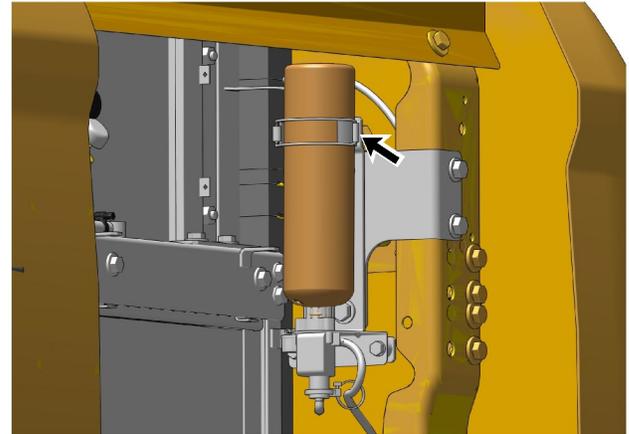


Illustration 532

g06211094

2. Loosen the cylinder retaining clamp.
3. Unscrew the empty ether starting aid cylinder and remove the empty ether starting aid cylinder.

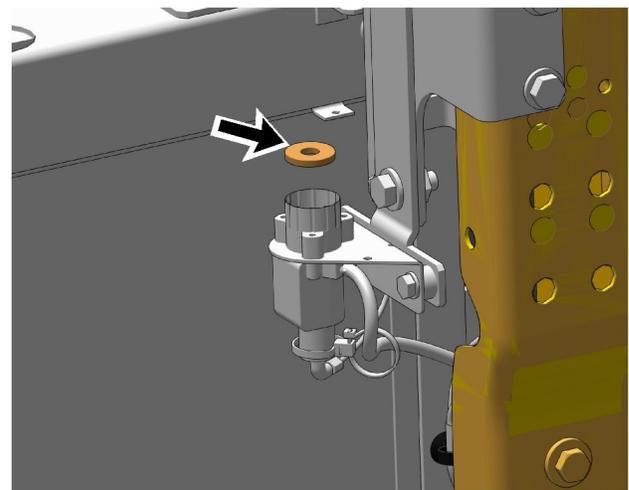


Illustration 533

g06211096

4. Remove the used gasket.
5. Install a new gasket.

Note: A new gasket and O-ring is provided with each new ether starting aid cylinder.

6. Install the new ether starting aid cylinder.
7. Tighten the ether starting aid cylinder hand tight.

8. Tighten the cylinder retaining clamp securely.
9. Close the access door.

i07786001

Film (Product Identification) - Clean

SMCS Code: 7405-070; 7557-070



Illustration 534

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.

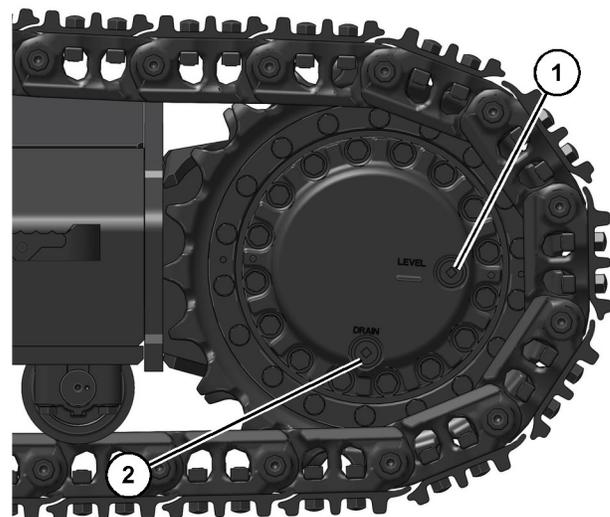


Illustration 535

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.

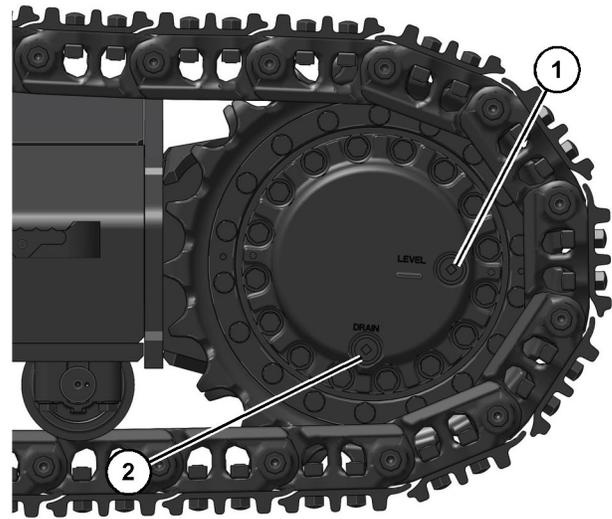


Illustration 536

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.

i06969816

i07088575

Final Drive Oil Sample - Obtain

SMCS Code: 4011-008; 4050-008; 4050-SM; 7542-008

WARNING

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

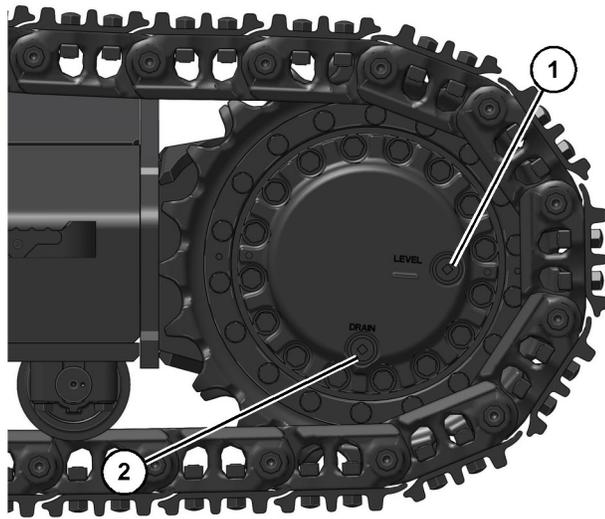


Illustration 537

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".

Fuel Cap Filter - Replace

SMCS Code: 1261-510

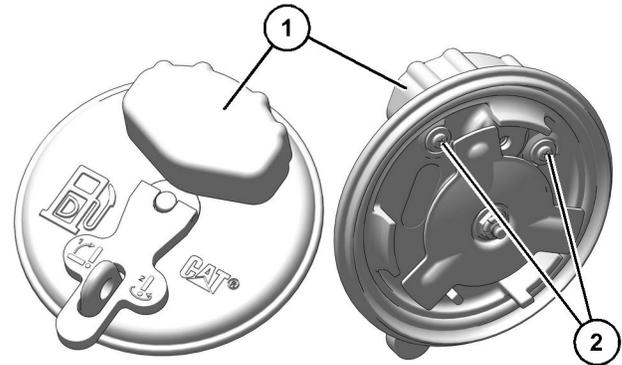


Illustration 538

g06220524

1. Remove the fuel cap.
2. Remove filter element screws (2) from the underside of the fuel cap and remove filter element (1).
3. Install a clean fuel cap filter element.
4. Install the screws to secure the filter element to the fuel cap.
5. Install the fuel tank cap.

Fuel System - Prime

SMCS Code: 1250-548

WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

i06674757

i07511456

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 any disconnected fuel system components.

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.

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1263-510-FQ

 **WARNING**

Personal injury or death may result from failure to adhere to the following procedures.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

NOTICE

Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

The primary filter/water separator is located behind the access door on the right side of the machine.

Maintenance Section
 Fuel System Primary Filter (Water Separator) Element - Replace



Illustration 539

g06182545

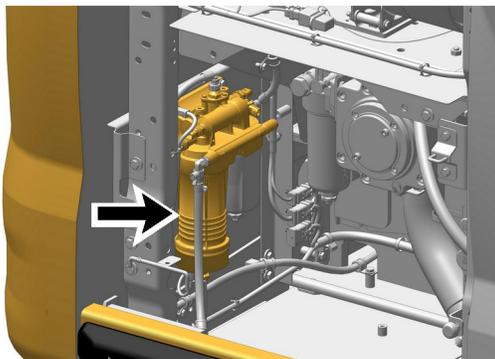


Illustration 540

g06342852

Typical Example

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

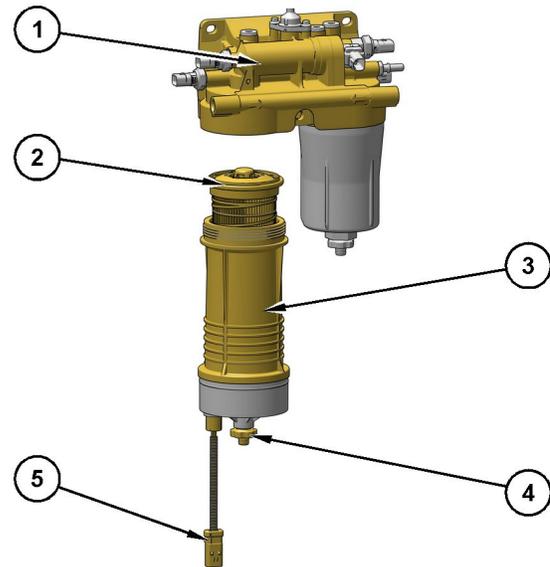


Illustration 541

g06344343

Typical example of primary filter water separator

- (1) Filter base
- (2) Filter
- (3) Filter housing
- (4) Drain valve
- (5) Sensor

2. 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.

3. Drain the water and the sediment into a suitable container.

Note: Dispose of used fluids according to local regulations.

4. Close the drain valve (4).

5. Disconnect the water sensor (5) 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.

6. Unscrew filter housing (3) and remove primary filter (2). A filter wrench may be used to loosen the filter housing. Properly discard the used filter.

7. Clean the mounting base (1).

8. Lubricate the seal of the new filter (2) with clean diesel fuel.

9. Install the new filter (2) into the housing.

10. Tighten the filter housing approximately 1/6 of a turn. Do not use tools to tighten the filter housing to the filter base.
11. Ensure that sensor (5) 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 $2.5 \pm 0.5 \text{ N}\cdot\text{m}$ ($22 \pm 4 \text{ lb in}$).
12. Open the fuel shutoff valve.
13. Close the access door.

i07506478

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510

WARNING

Personal injury or death can result from a fire.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.



Illustration 542

g06182545

1. Open access door on the right side of the machine.
2. Shut off the fuel supply. Refer to Fuel Tank Shutoff and Drain Control for additional information.

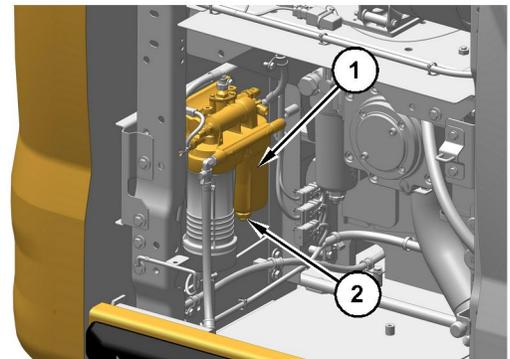


Illustration 543

g06342848

Typical Example

3. Loosen drain valve (2) and allow the fuel to drain out of the housing into a suitable container.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.

4. After all the fuel has been removed, tighten the drain.
5. Remove the secondary fuel filter housing (1) from the base.
6. Remove the filter element from the housing.
7. Clean the filter housing and the base.
8. Install the new filter element into the housing.
9. Apply a thin coat of clean diesel fuel to the sealing surface of the new fuel filter.

10. Install the new filter and tighten to 50 +/- 5 N·m (36.9 +/- 4 ft lb).
11. Turn on the fuel supply.
12. Close the access door.

i06969852

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 544

g06182545

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

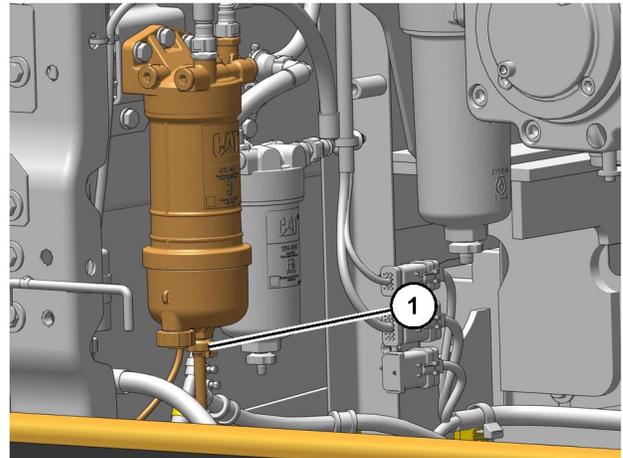


Illustration 545

g06182984

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.

i06969894

Fuel Tank Strainer - Clean

SMCS Code: 1273-070-STR

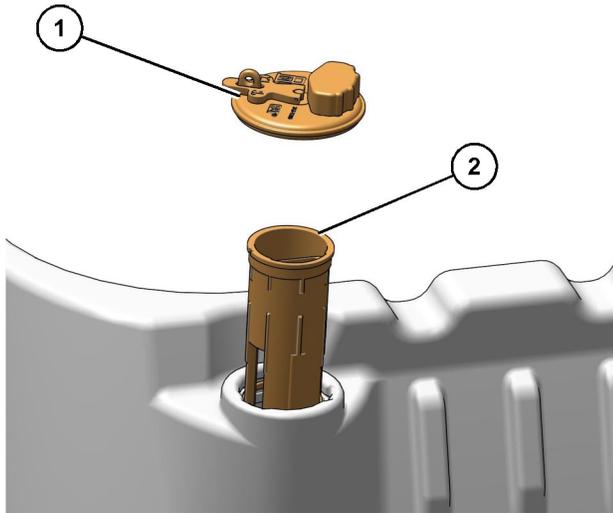


Illustration 546

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.



Illustration 547

g06182545

1. Open the right compartment door.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.

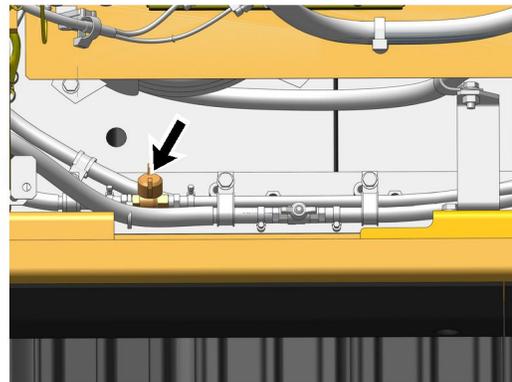


Illustration 548

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.

i07397104

Fuses - Replace

SMCS Code: 1417-510

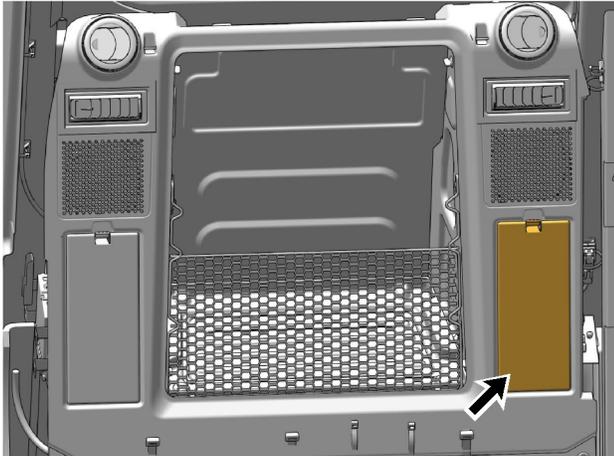


Illustration 549

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.

- (13) Spare – 15 Amp
- (14) Hydraulic Lock – 5 Amp
- (15) Spare – 5 Amp
- (16) Spare – 10 Amp
- (17) 24V Auxiliary Circuit – 10 Amp
- (18) 24V Auxiliary Circuit – 30 Amp
- (19) Spare – 20 Amp
- (20) Spare – 10 Amp
- (21) Spare – 25 Amp
- (22) Display and ET Connector – 10 Amp
- (23) Body Control Module – 15 Amp
- (24) Engine Electronic Control Module – 30 Amp
- (25) Dome Light – 15 Amp
- (26) Primary Electronic Control Module – 15 Amp
- (27) Secondary Electronic Control Module – 15 Amp
- (28) Boom Lamp – 10 Amp
- (29) Spare – 10 Amp
- (30) Product Link Module – 5 Amp
- (31) Air Conditioner and Heater Blower – 20 Amp
- (32) Horn – 10 Amp
- (33) Spare – 15 Amp
- (34) Spare – 15 Amp
- (35) 12V Converter – 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 – 15 Amp

Relays

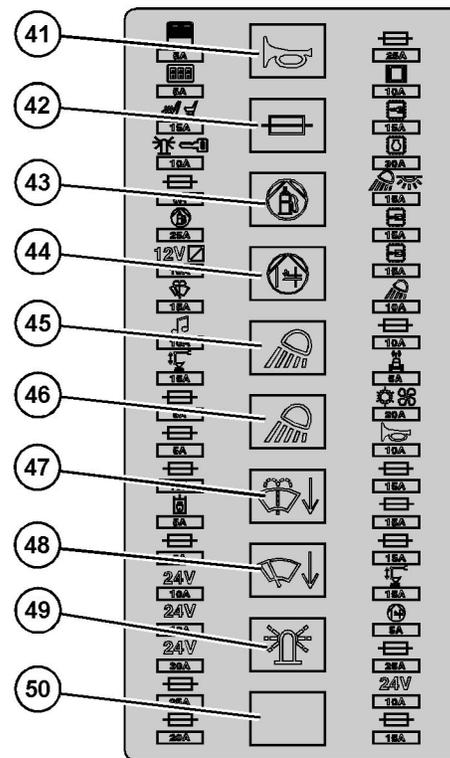


Illustration 551

g06223517

- (41) Horn – Relay
- (42) DEF Pump – Relay
- (43) Priming Pump – Relay
- (44) Lifting Pump – Relay
- (45) Boom Light – Relay
- (46) Chassis Light and Cab Light – Relay
- (47) Lower Washer – Relay
- (48) Lower Wiper – Relay
- (49) Caution – Relay
- (50) Spare – Relay

Power Fuse Module



Illustration 552

g06179792

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.

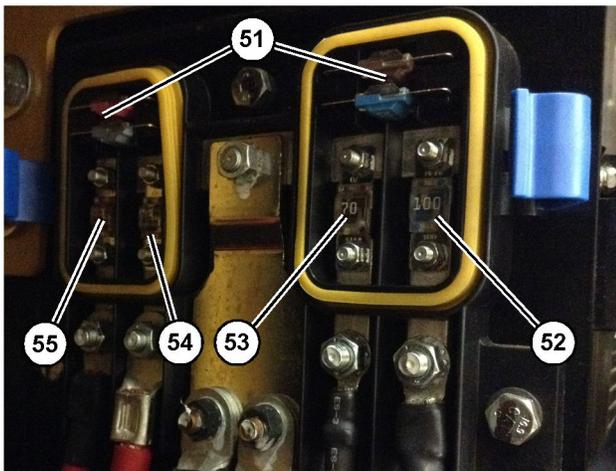


Illustration 553

g06225641

Typical Example



Spare (51) – The fuse module includes spare fuses which can be used if one of the installed fuses opens. One spare fuse is provided for each fuse in use.



Electric Cooling Fans 100 Amp (52)/(53) – This fuse is designed to protect the cooling fans.



Main Circuit 100 Amp (54) – This fuse is designed to protect the wires between the batteries and the fuses. If the wires are shorted to the machine body, this fuse would minimize the damage to the wires.



Alternator Circuit 150 Amp (55) – This fuse is designed to protect the alternator. If the batteries are installed with reversed polarity, the fuse would prevent the alternator from damaging the rectifier.

Secondary Power Fuse Module - Tier 4 Only

330 machines equipped with Tier 4 engines are equipped with a secondary power fuse module.



Illustration 554

g06181546

The secondary power fuse module is located behind the front access door on the left side of the machine. Remove the cover to access the fuses.

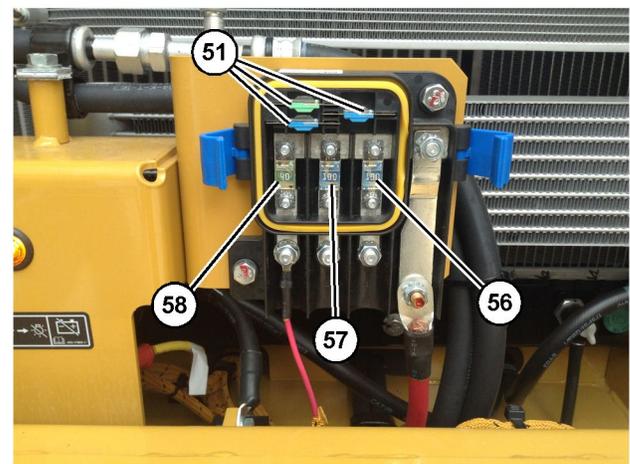


Illustration 555

g06308723

Typical Example

Maintenance Section
High Intensity Discharge Lamp (HID) - Replace



Spare (51) – The fuse module includes spare fuses which can be used if one of the installed fuses opens. One spare fuse is provided for each fuse in use.



Alternator Circuit 150 Amp (56) – This fuse is designed to protect the alternator. If the batteries are installed with reversed polarity, the fuse would prevent the alternator from damaging the rectifier.



Glow Plug Circuit 70 Amp (57) – This fuse is designed to protect the glow plugs.



Diesel Exhaust Fluid (DEF) Pump Circuit 40 Amp (58) – This fuse is designed to protect the DEF pump circuit.

i08067436

High Intensity Discharge Lamp (HID) - Replace (If Equipped)

SMCS Code: 1434-510

WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

WARNING

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

NOTICE

Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

1. Prepare the machine for maintenance. Refer to Operation and Maintenance Manual, "Prepare the Machine for Maintenance".
2. Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least 5 minutes, to ensure that the bulb is cool.
3. Disassemble the housing for the HID lamp to have access to the bulb.

Note: On some HID lamps, the bulb is a part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

4. Remove the bulb from the HID lamp.
5. Install the replacement bulb in the HID lamp.

If the bulb is a part of the lens assembly, install the replacement lens assembly in the HID lamp.

Note: To avoid failure to the bulb that is premature, avoid touching the bulb's surface with your bare hands. Clean any fingerprints from the bulb with alcohol prior to operation.

6. Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly for the HID lamp's mounting position on the machine.
7. Reattach the electrical power to the HID lamp.
8. Check the HID lamp for proper operation.

Note: Consult your Cat dealer for additional information on HID lamps.

i07833138

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 hydraulic oil change is strongly recommended when the oil deterioration or contamination is detected. The maintenance interval for the hydraulic oil filter is not changed.

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 30 for the intervals.

Table 30

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.

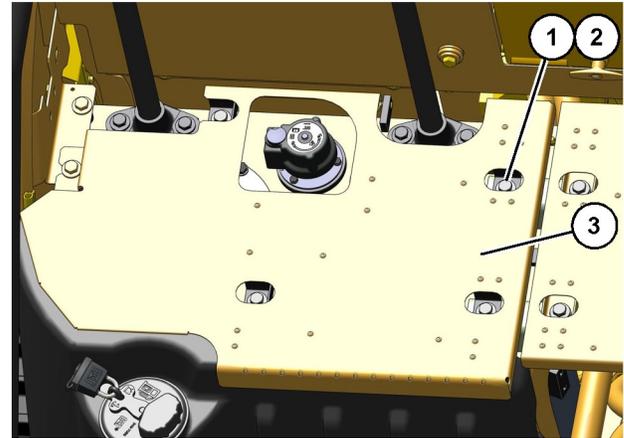


Illustration 556

g06182169

2. Remove five bolts (1) and washers (2). Remove cover (3) from the top of the hydraulic tank.



Illustration 557

g06182174

3. Clean the area thoroughly to keep dirt out of the screen cover and filler cap (4).

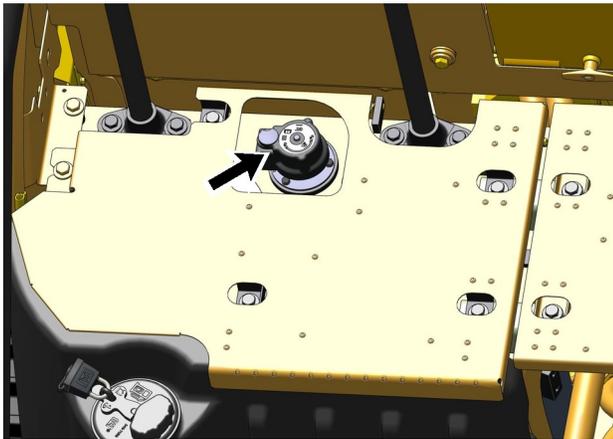


Illustration 558

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.

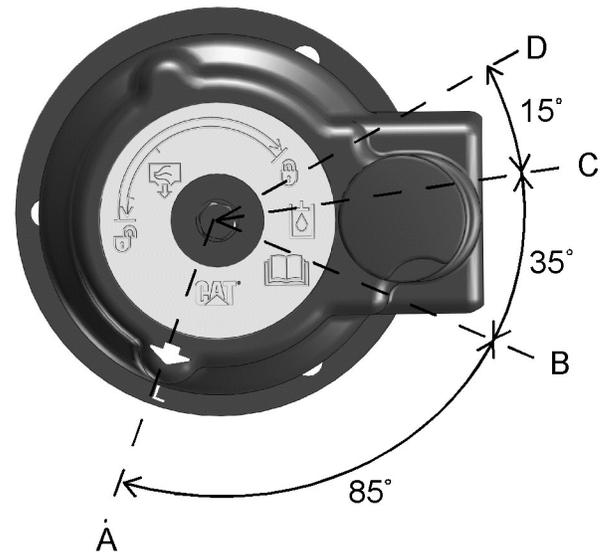


Illustration 559

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 559 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 560

g06182179

5. Remove the hydraulic tank access cover that is located under the upper structure. Removing the cover will allow access to the drain valve.

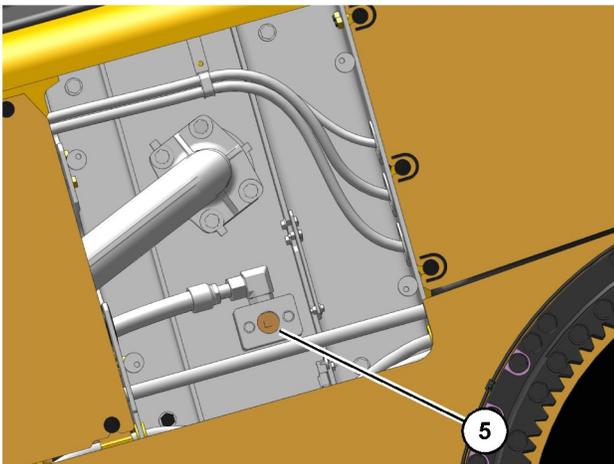


Illustration 561

g06182182

(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.

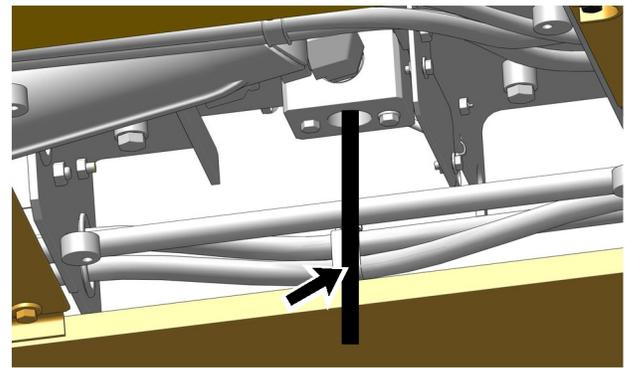


Illustration 562

g06182192

8. Use a bar to push the plunger up to allow the oil to drain.
9. Drain the oil into a suitable container.

Note: Dispose of used fluids according to local regulations.

10. After the oil has been drained, clean drain plug (5) and install. Tighten the plug to $68 \pm 7 \text{ N}\cdot\text{m}$ ($50 \pm 5 \text{ lb}\cdot\text{ft}$).
11. Open the access door on the right side of the machine.
12. Clean the pump, the hydraulic lines, and the hydraulic tank.

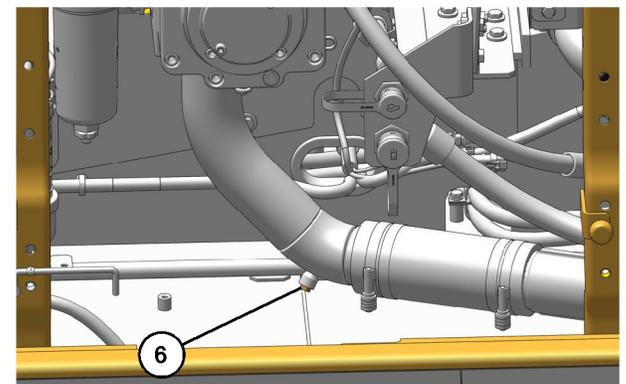


Illustration 563

g06182196

13. Remove plug (6) from the tube. Allow the oil to drain into a container.
14. Inspect the O-ring. Replace the O-ring if wear or damage is evident.
15. Clean the plug. Install the plug and the O-ring into the drain port.

Hydraulic Tank Screen - Clean

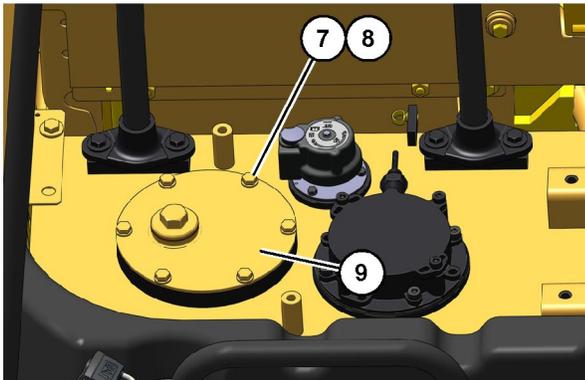


Illustration 564

g06182201

- (7) Bolts
- (8) Washers
- (9) Cover

1. Remove bolts (7), washers (8), and cover (9).

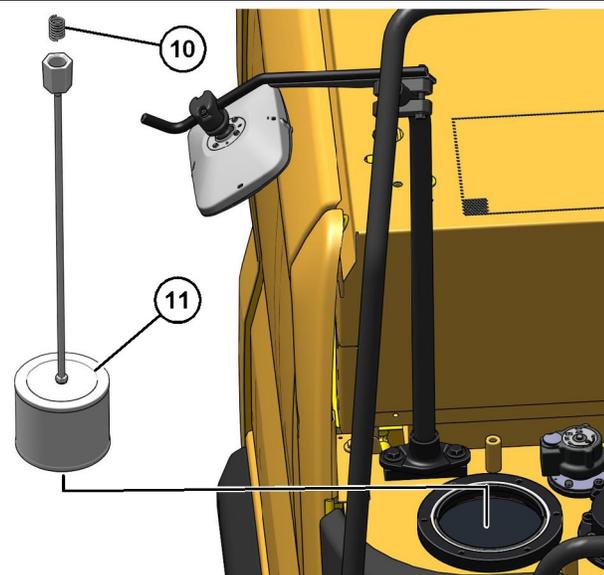


Illustration 565

g06182213

- (10) Spring
- (11) Screen

2. Remove spring (10) and screen (11).

Note: Do not allow spring (10) to fall back into the tank.

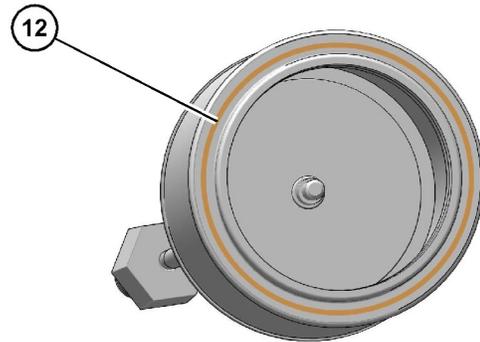


Illustration 566

g06182515

(12) O-ring seal

3. Remove O-ring seal (12) from the screen.

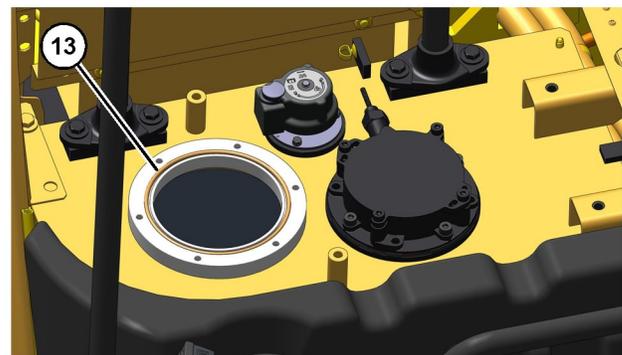


Illustration 567

g06182229

(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

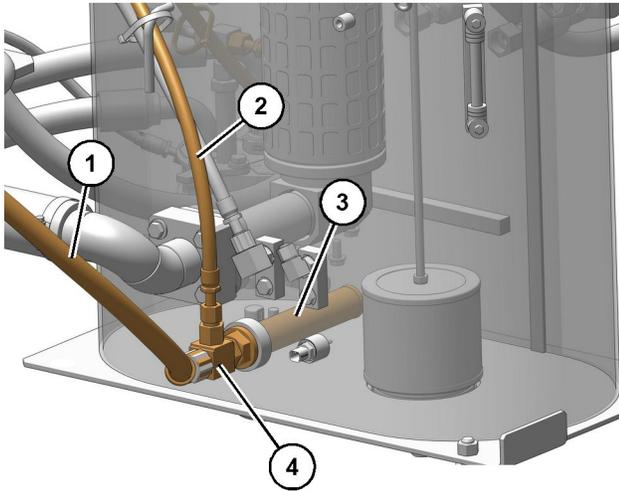


Illustration 568

g06220559

- (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.

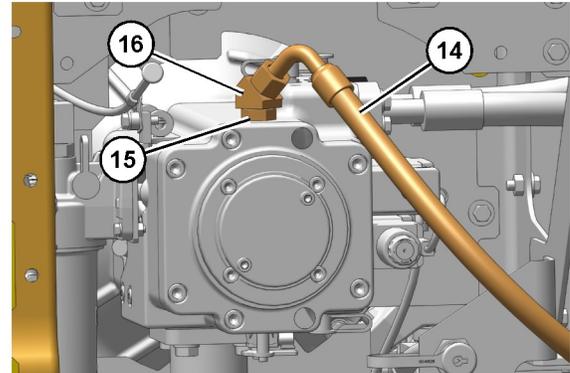


Illustration 569

g06205207

- (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.

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace



Illustration 570

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.

Fast Fill

If your machine is equipped with a deluxe service center, you may drain the hydraulic oil through the fast fill port. You may also add the hydraulic oil through a fast fill port.



Illustration 571

g06182545

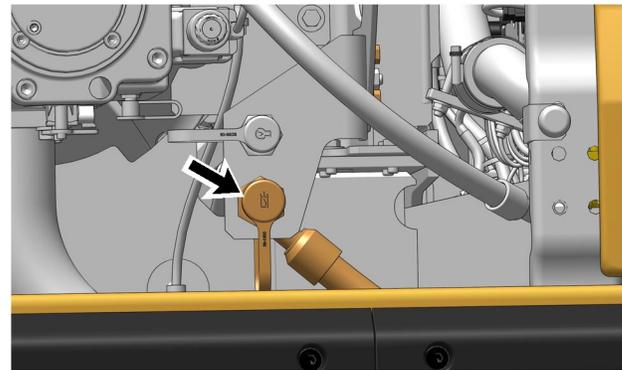


Illustration 572

g06182544

1. Remove the dust cover.
2. Attach the hose to the male coupling.
3. Drain the oil or add the oil, as needed.

i07833122

Hydraulic System Oil Filter (Return) - Replace

SMCS Code: 5068-510-RJ

WARNING

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

The return filter is a cartridge type filter. The amount of foreign material that enters the hydraulic system is reduced when the filter element is replaced.

Two different filters are available for the return filter. One filter is used for standard applications such as digging and normal use of a hammer. The second filter is used for an application such as demolishing a ceiling in a tunnel with a hammer.

Note: If the message display shows that the hydraulic return filter is plugged, turn off the machine. After you make sure that the warning has disappeared, start the machine and run the machine on level ground for approximately 10 minutes. If the warning still appears in the message display, inspect the filter and replace the filter, if necessary.

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 31 for the intervals.

Table 31

Percentage of Hammer Use	Hydraulic System Oil Filter (Return) - Replace
50%	Every 500 service hours
100%	Every 250 service hours

Return Filter Replacement Procedure

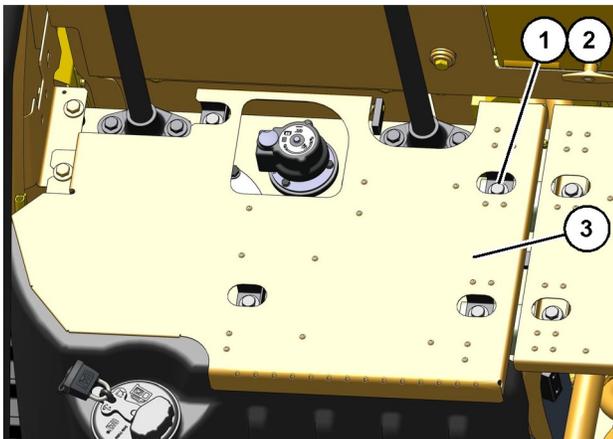


Illustration 573

g06182169

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.

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.

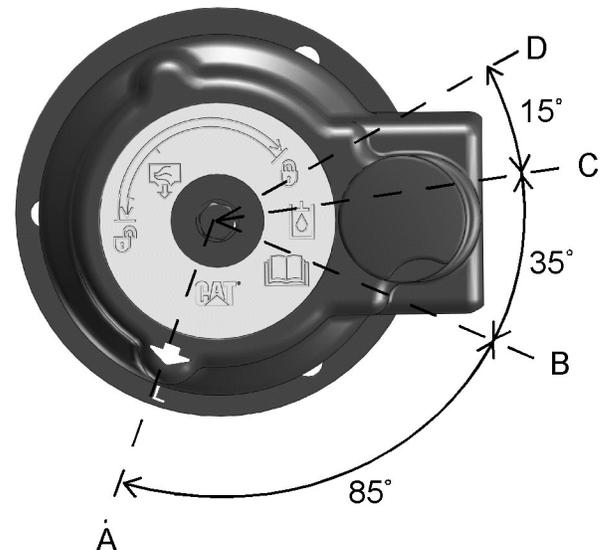


Illustration 574

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 574 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".

Maintenance Section
Hydraulic System Oil Filter (Return) - Replace

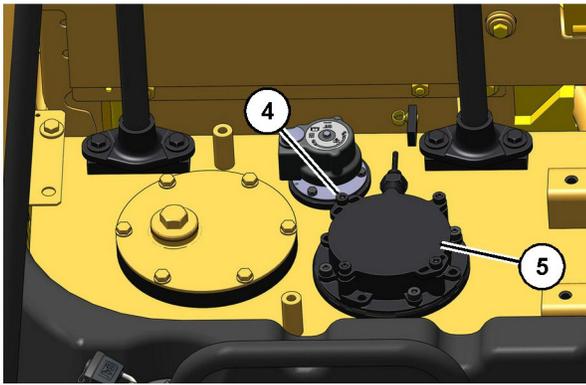


Illustration 575

g06254537

- 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.

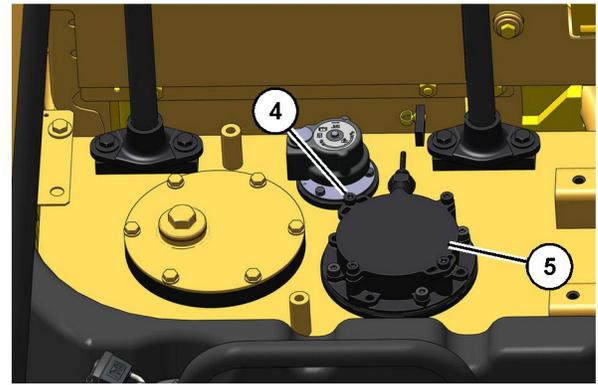


Illustration 577

g06254537

- 7.** Place cover assembly (5) into position in the tank. Install four bolts (4) and tighten to $30 \pm 7 \text{ N}\cdot\text{m}$ ($22 \pm 5 \text{ lb ft}$). Install the harness connector on the filter bypass switch.

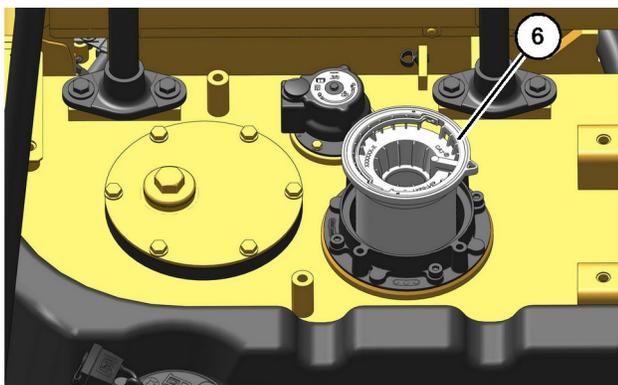


Illustration 576

g06254829

- 6.** Remove filter element (6) and discard. Install a new element into the filter case.

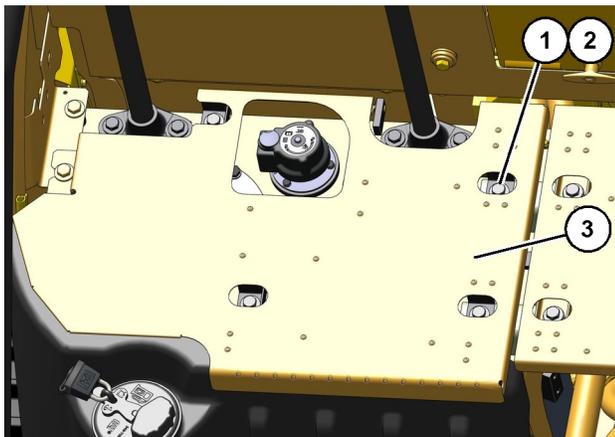


Illustration 578

g06182169

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 579

g06181120

1. Park the machine on level ground. Lower the bucket to the ground with the stick in a vertical position, as shown.



Illustration 580

g06219991

2. Open the access door on the right side of the machine.

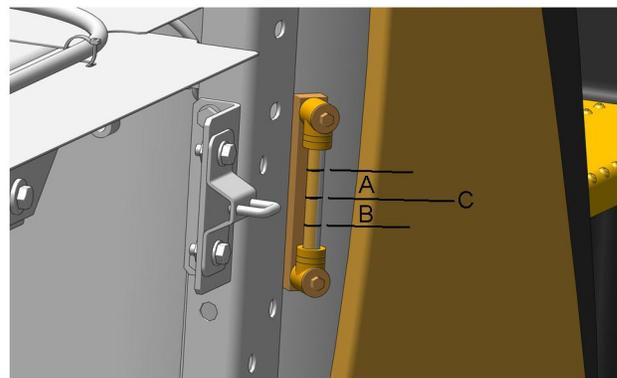


Illustration 581

g06182648

(A) High temperature range
(B) Low temperature range
(C) Mid temperature range

Maintenance Section
Hydraulic System Oil Level - Check

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.

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.

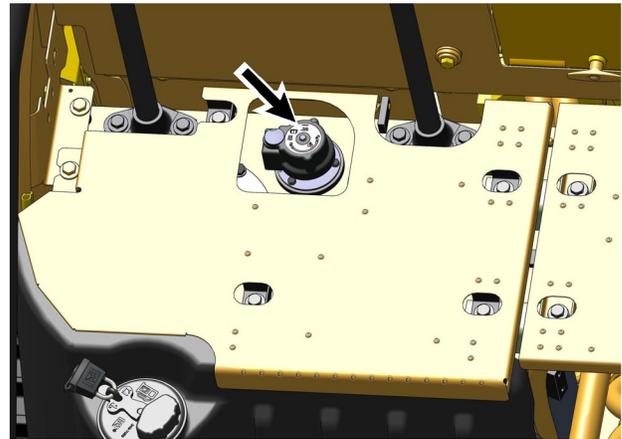


Illustration 582

g06182653

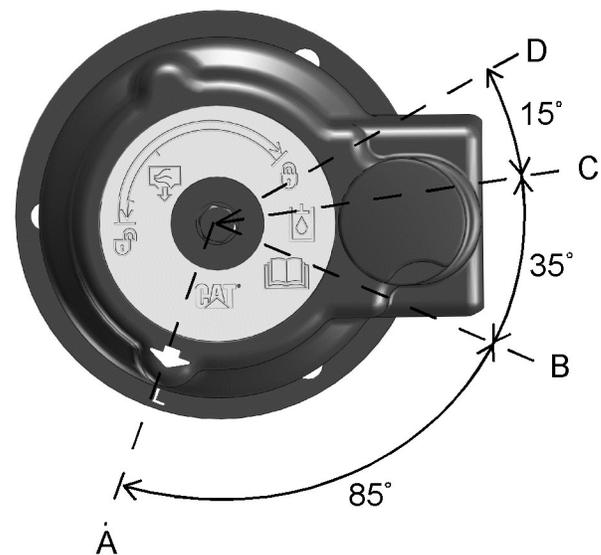


Illustration 583

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 583 for filler cap positions.

- a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

i03753191

- 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).

i07590874

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008-OC; 5095-SM; 5095-008; 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 hour is recommended. Consult your Cat dealer for details.

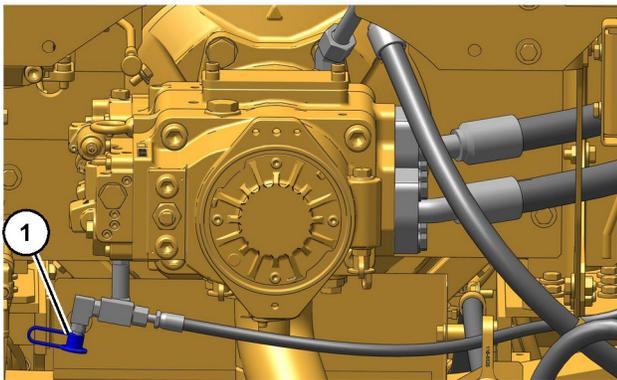


Illustration 584

g06373208

The hydraulic oil sampling valve (1) is connected to the pilot line of the main hydraulic pump regulator. Obtain a sample of the hydraulic oil from the hydraulic oil sampling valve. 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.

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.

i07833447

Oil Filter (Hydraulic Hammer) - Replace (If Equipped)

SMCS Code: 5068-510

WARNING

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

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 32 for the intervals.

Table 32

Percentage of Hammer Use	Oil Filter (Hydraulic Hammer) - Replace
50%	Every 250 service hours
100%	Every 100 service hours



Illustration 585

g06181120

1. Park the machine on level ground in the service position as shown.
2. Move the hydraulic lockout control to the UNLOCKED position.
3. Turn the engine start switch to the ON position.
4. Move the joysticks and the travel levers/pedals to the full stroke positions to relieve the pressure in the hydraulic lines.
5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off. Relieve pressure by slowly turning the cap until the cap reaches the secondary stop.

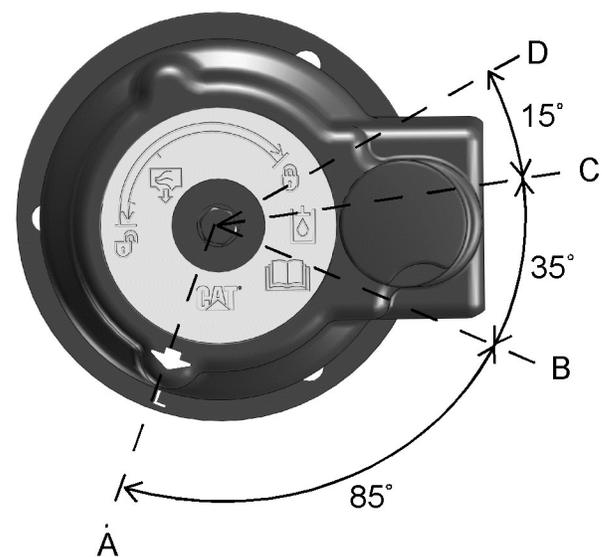


Illustration 586

g06184990

Filler cap

- (A) LOCK position
 (B) PRESSURE RELEASE - START position
 (C) PRESSURE RELEASE - END position
 (D) OPEN position

6. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 586 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.
7. The oil filter for the hammer is located near the base of the boom.

Note: Some configurations may invert the hammer filter installation.

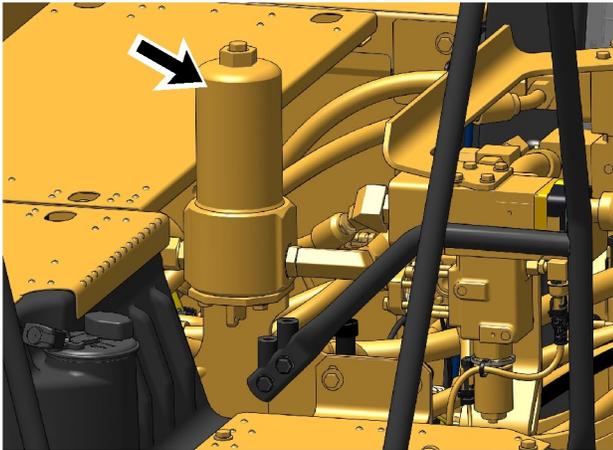


Illustration 587

g06211151

8. Position a suitable container to contain the oil.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.

9. Loosen the filter housing and remove. Inspect the plug on the top of the housing. If there are signs of leakage, replace the O-ring on the plug. Tighten the plug to $59 \pm 5 \text{ N}\cdot\text{m}$ ($44 \pm 4 \text{ lb ft}$).

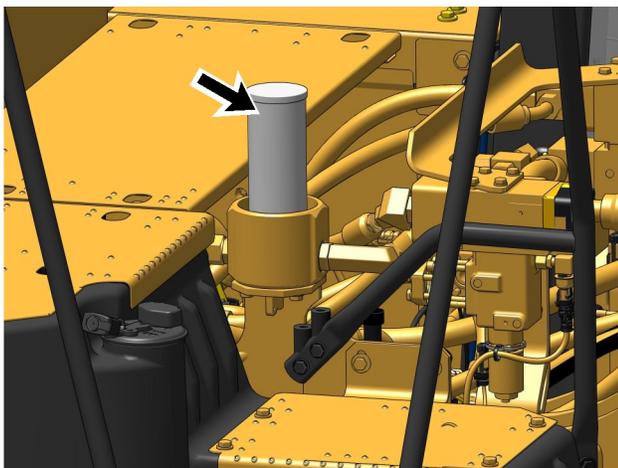


Illustration 588

g06211156

10. Remove the filter element and discard. The element cannot be reused.

Note: Used filter elements should always be disposed of according to local regulations.

11. Install the new filter element.

12. Clean the filter housing and install on the filter base. Tighten the nut on the filter case to $98 \pm 10 \text{ N}\cdot\text{m}$ ($72 \pm 7 \text{ lb ft}$).

13. Start the engine and operate the machine slowly for 10 to 15 minutes. Move each cylinder evenly through several cycles and operate the hammer.

14. Return the machine to the service position. Check the machine for oil leaks.

15. Stop the engine.

16. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

i07349186

Oil Filter - Inspect

SMCS Code: 1308-507; 5068-507

Inspect a Used Filter for Debris



Illustration 589

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.

Maintenance Section
Radiator, Aftercooler and Oil Cooler Cores - Clean

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 590

g06179792

1. Open the access door on the left side of the machine.

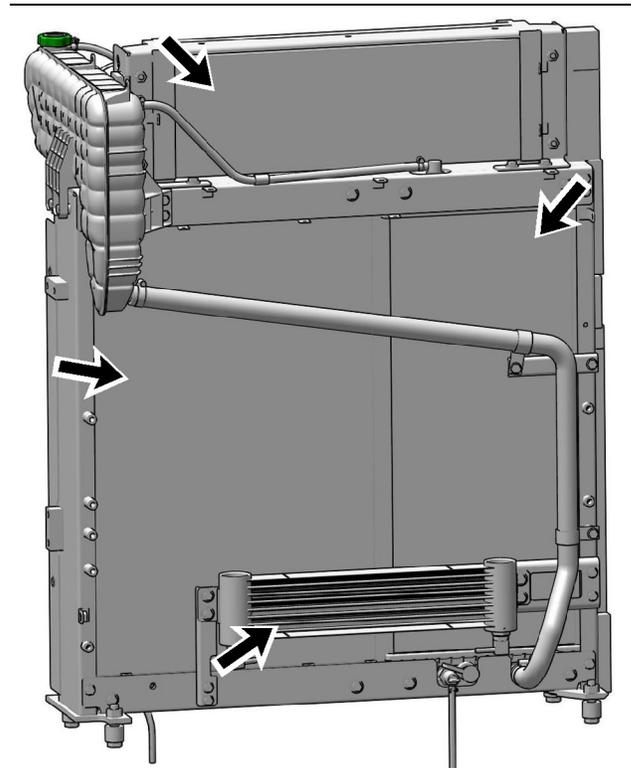


Illustration 591

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.

i08192239

i07349192

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-510; 7322-710

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.

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040; 7325-040

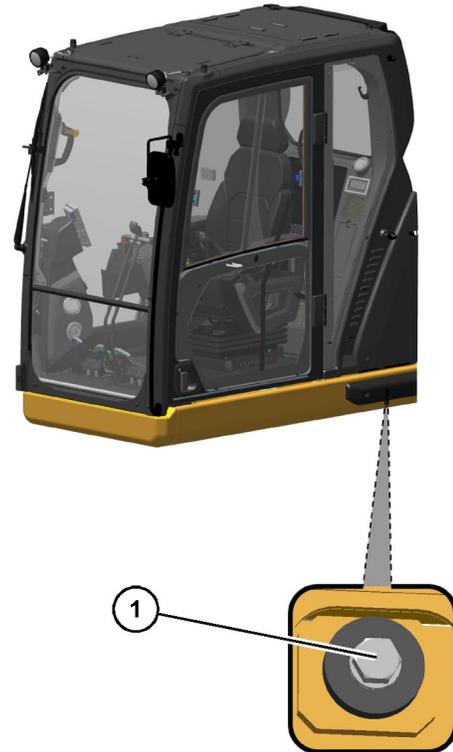


Illustration 592

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"

i07103309

i06970675

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.

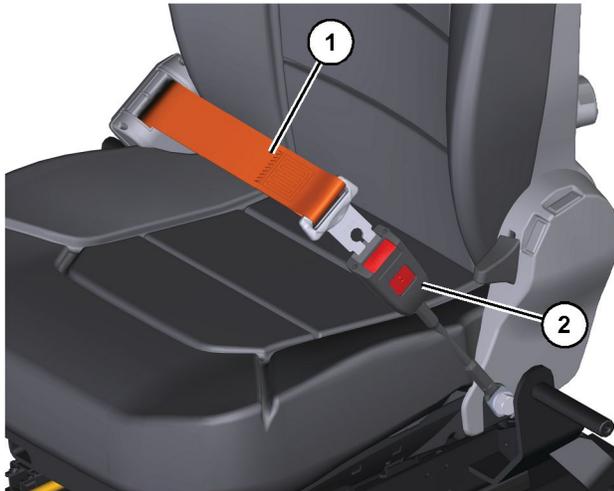


Illustration 593

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).

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).

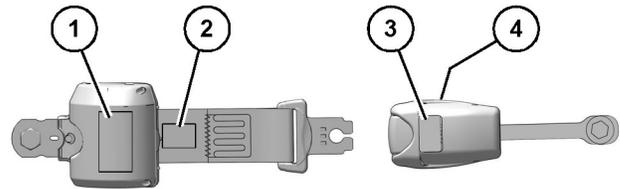


Illustration 594

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.

i06987212

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.

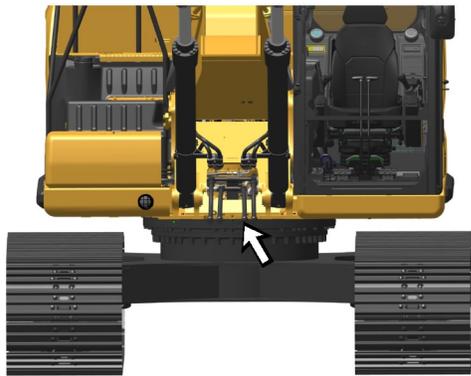


Illustration 595

g06210366

The swing bearing grease zerks are located at the front of the swing drive housing near the boom cylinders.

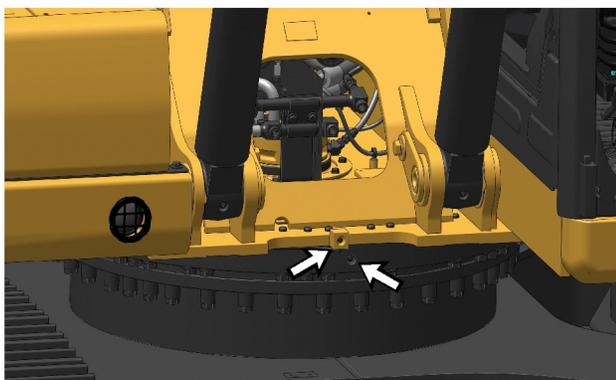


Illustration 596

g06188212

Apply lubricant through the fittings until the lubricant overflows the bearing seals.

i07349198

Swing Drive Oil - Change

SMCS Code: 5459-044

WARNING

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

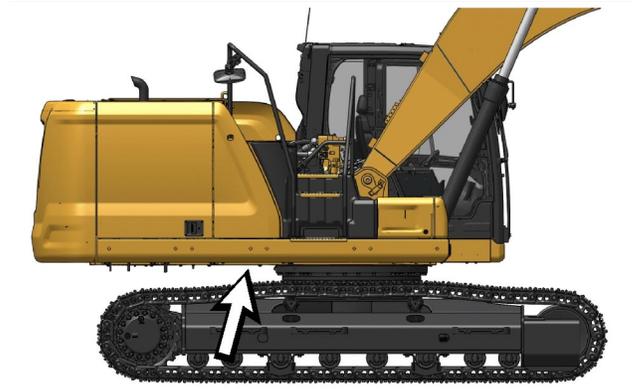


Illustration 597

g06188541

1. Remove the access cover that is located below the swing drives.

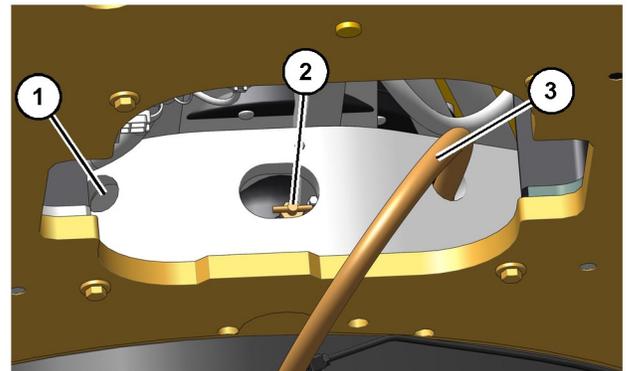


Illustration 598

g06192018

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information that pertains to Containing Fluid Spillage.

2. Remove drain hose (3) from holder (1) on the upper frame. Face the end of the hose toward the container.
3. Loosen drain valve (2). Drain the oil into a suitable container.

Note: Drained fluids should always be disposed of according to local regulations.

Maintenance Section
Swing Drive Oil Level - Check

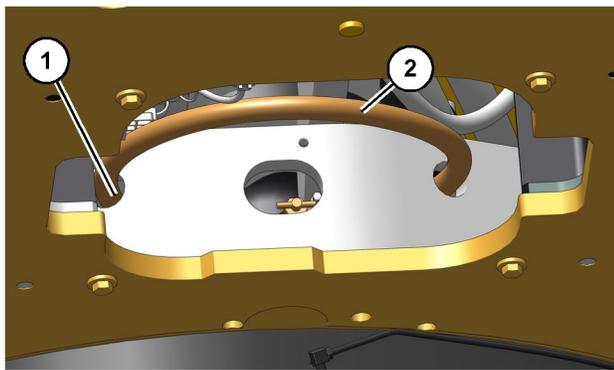


Illustration 599

g06192024

4. Tighten the drain valve. Return the drain hose to holder (1). Make sure that the end of the hose is facing upward.

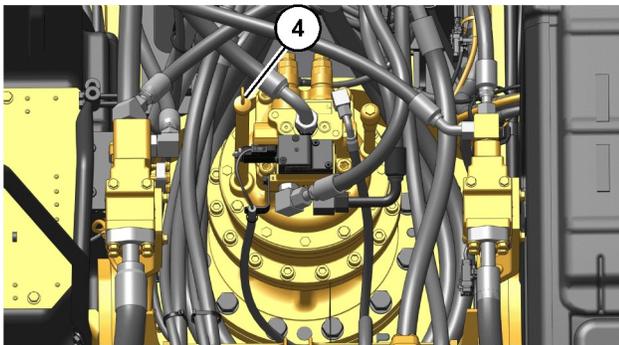


Illustration 600

g06188581

5. Remove dipstick (4).
6. Add the specified quantity of oil through the dipstick tube. See Operation and Maintenance, "Capacities (Refill)".

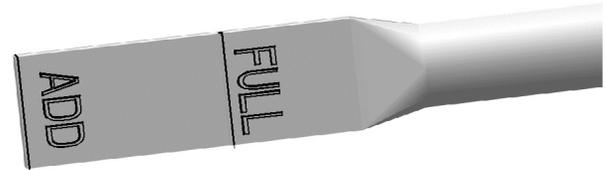


Illustration 601

g06188660

7. Maintain the oil level between the "ADD" and "FULL" marks on the dipstick.
8. Check the oil that has been drained for metal chips or metal particles. Consult your Cat dealer if any metal chips or metal particles are found.
9. Drained materials should always be disposed of according to local regulations.

i06988089

Swing Drive Oil Level - Check

SMCS Code: 5459-535-FLV

WARNING

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



Illustration 602

g06188672

The dipstick for the swing drive oil is on the swing drive at the rear base of the boom.

i06988143

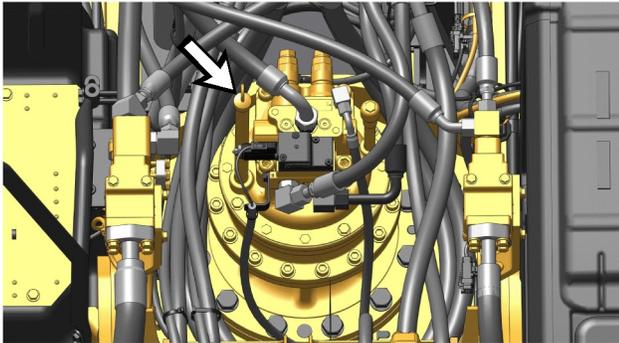


Illustration 603

g06188677

1. Remove the dipstick.

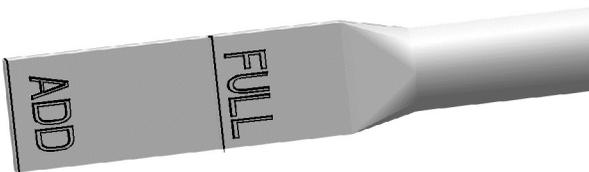


Illustration 604

g06188660

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information that pertains to Containing Fluid Spillage.

2. Check the dipstick. Maintain the oil level between the "ADD" and "FULL" marks on the dipstick. Add oil through the dipstick tube, if necessary. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" when you select an oil. If the oil level is above the "FULL" line, then remove oil from the system. Restore the oil to the correct level position.
3. Insert the dipstick.

Swing Drive Oil Sample - Obtain

SMCS Code: 5459-OC; 5459-554-OC; 5459-008-OC; 5459-008; 7542-008

WARNING

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

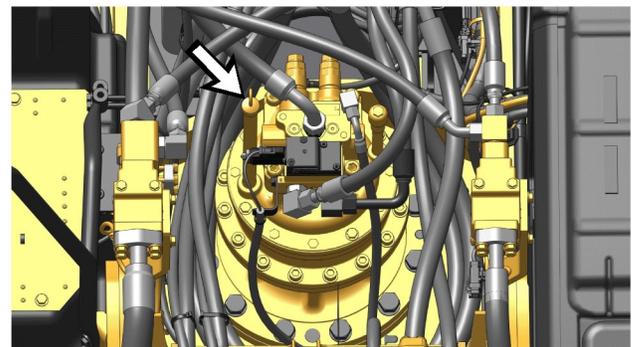


Illustration 605

g06188677

Obtain an oil sample of the swing drive oil through the opening for the dipstick. Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining an oil sample from the swing drive housing. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample from the swing drive housing.

i06988169

Swing Gear - Lubricate

SMCS Code: 7063-086

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.

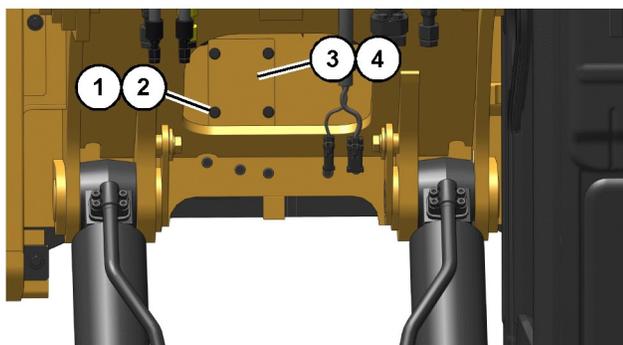


Illustration 606

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.

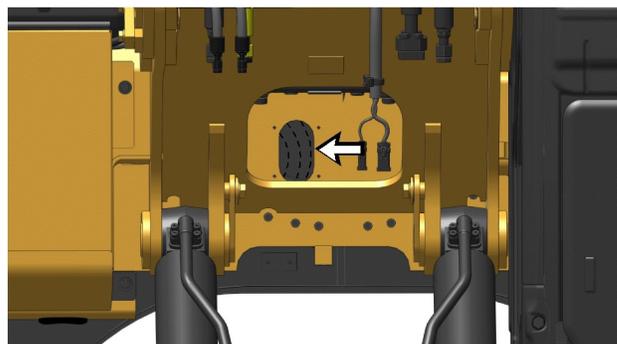


Illustration 607

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.

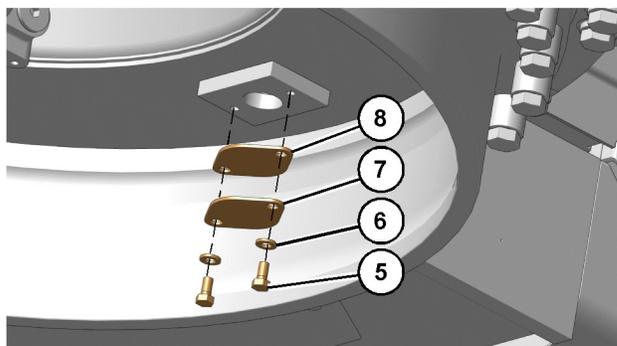


Illustration 608

g06188788

- (5) Bolts
- (6) Washers
- (7) Cover
- (8) Gasket

5. If the grease is contaminated or discolored with water, change the grease. Remove the covers from below the swing drive underneath the undercarriage frame.
6. Remove bolts (5), washers (6), cover (7), and gasket (8) to allow the water to drain. When you reinstall cover (7), inspect gasket (8). Replace the gasket if damage is evident.



Illustration 609

g06188791

7. Raise the boom and turn the upper structure by 1/4 turn. Lower the bucket to the ground.
8. Repeat Step 7 at every 1/4 turn in four places. Add grease, as needed.
9. Install gasket (4), cover (3), washers (2), and bolts (1).

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.

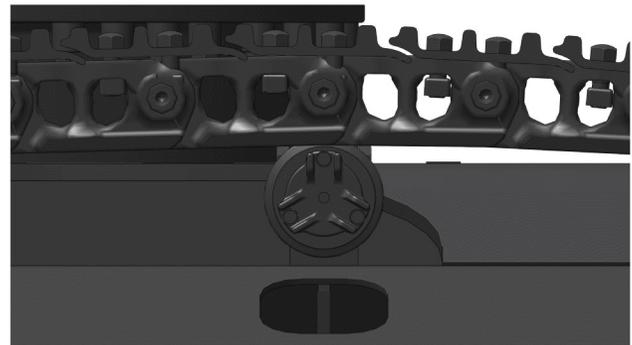


Illustration 610

g06188816

2. Stop with one track pin directly over the front carrier roller. Park the machine and turn off the engine.



Illustration 611

g06208711

- 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.

- 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).

- 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 612

g06188820

Typical example

The track adjuster is located on the track frame.

Tightening the Track

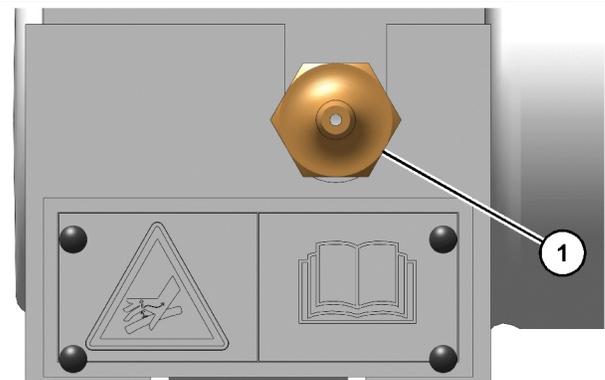


Illustration 613

g06188830

(1) Grease valve

Wipe the fitting before you add grease.

- Add grease through grease valve (1) until the correct track tension is reached.
- Operate the machine back and forth in order to equalize the pressure.
- Check the amount of sag. Adjust the track, as needed.

Loosening the Track

i06954313

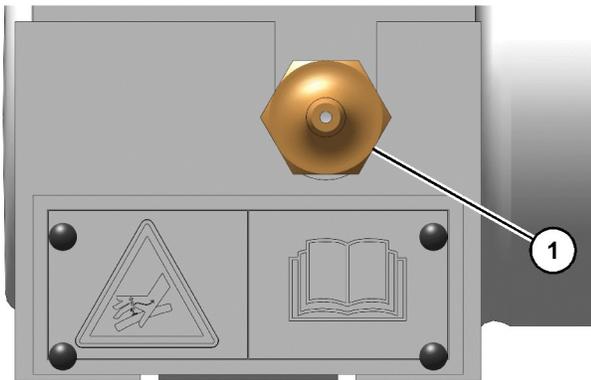


Illustration 614

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 $34 \pm 5 \text{ N}\cdot\text{m}$ ($25 \pm 4 \text{ lb ft}$) when the desired track tension is reached.
3. Operate the machine back and forth in order to equalize the pressure.
4. Check the amount of sag. Adjust the track, as needed.

i06969791

Track Adjustment - Inspect

SMCS Code: 4170-040

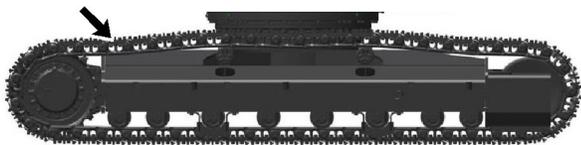


Illustration 615

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".

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.

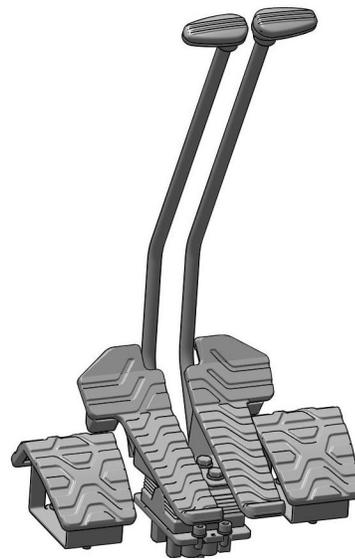


Illustration 616

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.

i08233399



Illustration 617

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.

Undercarriage - Check

SMCS Code: 4150-535

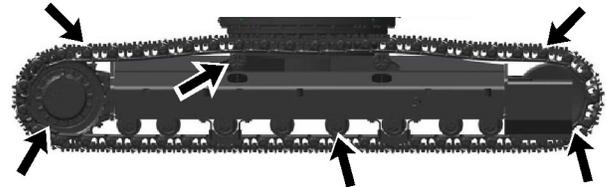


Illustration 618

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.

i07103291



Illustration 619

g06181546

1. Open the access door on the left side of the machine.

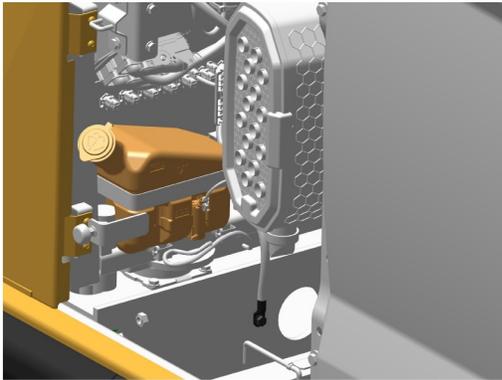


Illustration 620

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.

Windows - Clean

SMCS Code: 7310-070; 7340-070

Clean the outside of the windows from the ground, unless handholds are available.



Illustration 621

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

i06044323

Emissions Warranty Information

SMCS Code: 1000

The certifying engine manufacturer warrants to the ultimate purchaser and each subsequent purchaser that:

1. New non-road diesel engines and stationary diesel engines less than 10 liters per cylinder (including Tier 1 and Tier 2 marine engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the United States and Canada, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed by the United States Environmental Protection Agency (EPA) by way of regulation.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
2. New non-road diesel engines (including Tier 1 and Tier 2 marine propulsion engines < 37 kW and Tier 1 through Tier 4 marine auxiliary engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the state of California, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, to all applicable regulations adopted by the California Air Resources Board (ARB).
 - b. Free from defects in materials and workmanship which cause the failure of an emission-related component to be identical in all material respects to the component as described in the engine manufacturer's application for certification for the warranty period.

3. New non-road diesel engines installed in construction machines conforming to the South Korean regulations for construction machines manufactured after January 1, 2015, and operated and serviced in South Korea, including all parts of their emission control systems (“emission related components”), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed in the Enforcement Rule of the Clean Air Conservation Act promulgated by South Korea MOE.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

The aftertreatment system can be expected to function properly for the lifetime of the engine (emissions durability period) subject to prescribed maintenance requirements being followed.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in a supplemental Special Publication. Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty and to obtain a copy of the applicable Special Publication.

Reference Information Section

Reference Materials

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: _____



M0111427
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