SEBU8757-17 (en-us)
May 2020

Operation and Maintenance Manual

349F, 352F Excavators

TEW 1-UP (349F)
HLB 1-UP (349F)
WNA 1-UP (352F)
HPD 1-UP (349F)
KEA 1-UP (349F)
BZ2 1-UP (349F)
YEG 1-UP (352F)
A9J 1-UP (352F)
KBP 1-UP (352F)
NDC 1-UP (352F)

Language: Original Instructions

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

Important Safety Information

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

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

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

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

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



The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

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

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

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

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

NOTICE

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

Other parts may not meet certain original equipment specifications.

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

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

Table of Contents

Foreword 5

Safety Section

Safety Messages 7
Additional Messages 21
General Hazard Information 28
Crushing Prevention and Cutting Prevention .. 31
Burn Prevention 31
Fire Prevention and Explosion Prevention 32
Fire Safety 36
Fire Extinguisher Location 36
Track Information 37
High Pressure Fuel Lines 37
Electrical Storm Injury Prevention 38
Before Starting Engine 38
Visibility Information 38
Restricted Visibility 39
Engine Starting 41
Before Operation 41
Work Tools 42
Operation 42
Engine Stopping 46
Lifting Objects 46
Demolition 46
Parking 47
Slope Operation 47
Equipment Lowering with Engine Stopped 48
Sound Information and Vibration Information . 48
Operator Station 51
Guards (Operator Protection) 51

Product Information Section

General Information 53
Identification Information 108

Operation Section

Before Operation 113
Machine Operation 116
Engine Starting 195
Operation 199
Operating Techniques 204
Parking 235
Transportation Information 240
Towing Information 258
Engine Starting (Alternate Methods) 262

Maintenance Section

Maintenance Access 265
Lubricant Viscosities and Refill Capacities ... 267
Maintenance Support 277
Maintenance Interval Schedule 284

Warranty Section

Warranty Information 363

Reference Information Section

Reference Materials 364

Index Section

Index 365

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:

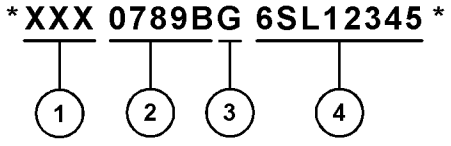


Illustration 1 g03891925

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

i08061512

Safety Messages

SMCS Code: 7000; 7405

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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. Become familiarized with all safety messages.

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

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

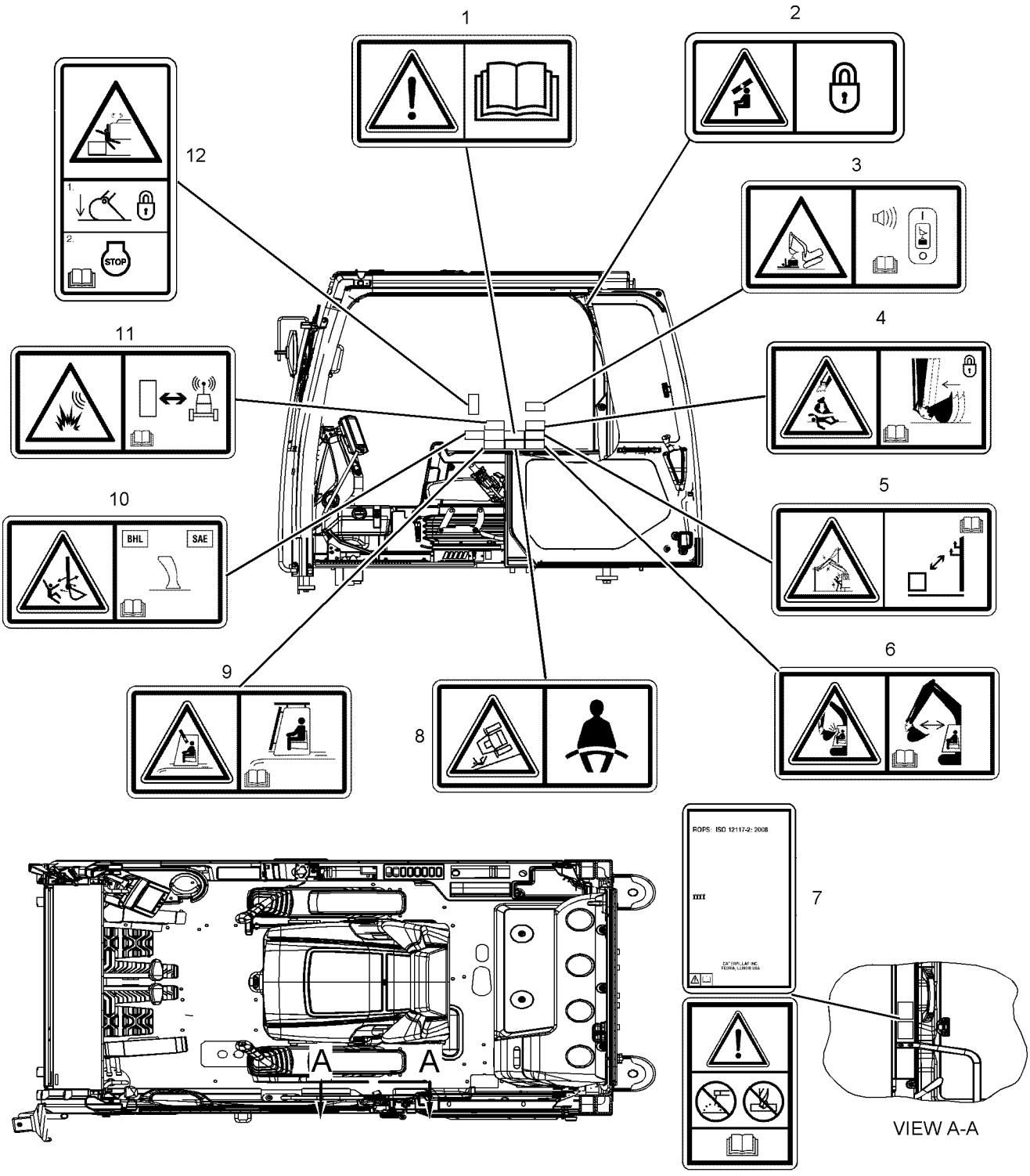


Illustration 2
g02282253

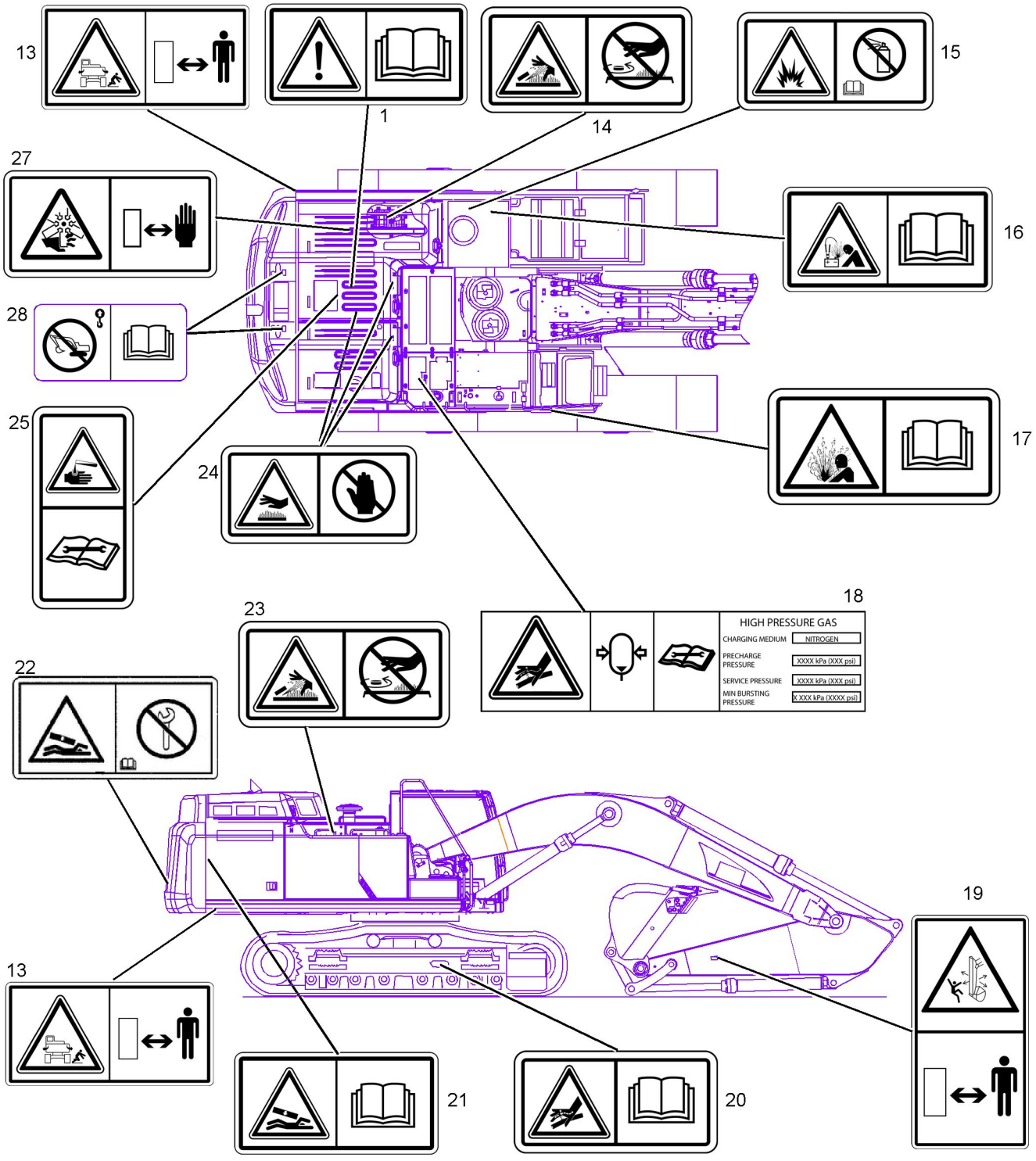


Illustration 3 g06528886

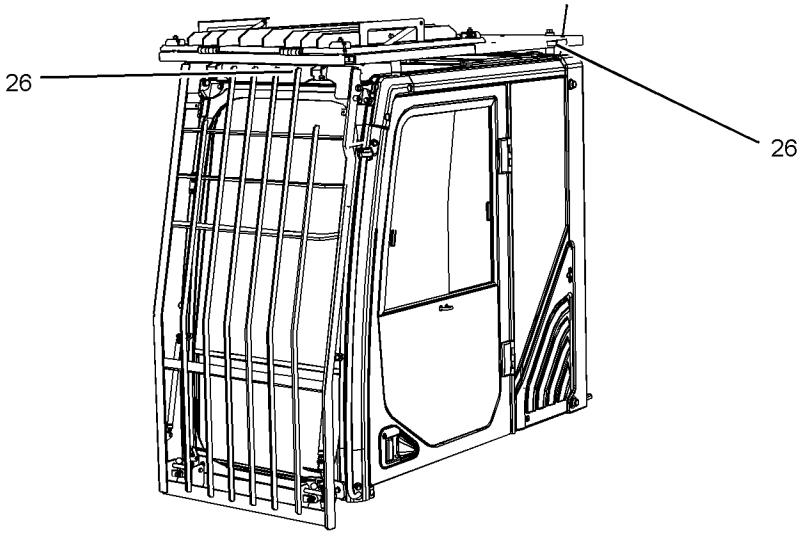


Illustration 4 g03246641

Do Not Operate (1)

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



Illustration 5 g01370904

⚠ WARNING

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

Crushing Hazard (2)

This safety message is located in the rear of the cab.

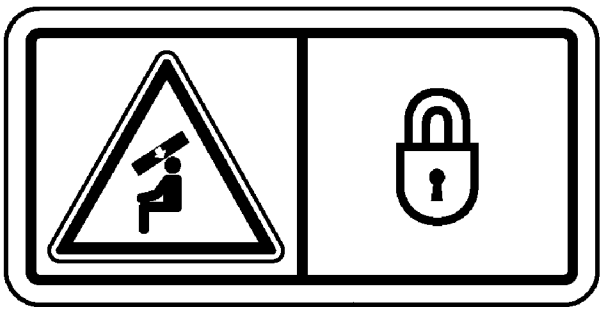


Illustration 6 g02061339

⚠ WARNING

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

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

Overload Warning Device (3)

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

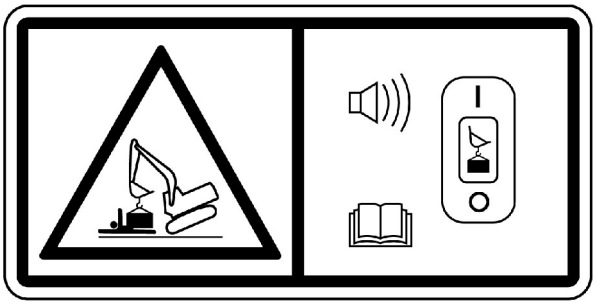


Illustration 7 g01602013

WARNING

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

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

Crushing Injury (4)

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



Illustration 8 g01374035

WARNING

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

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

Electrical Power Lines (5)

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

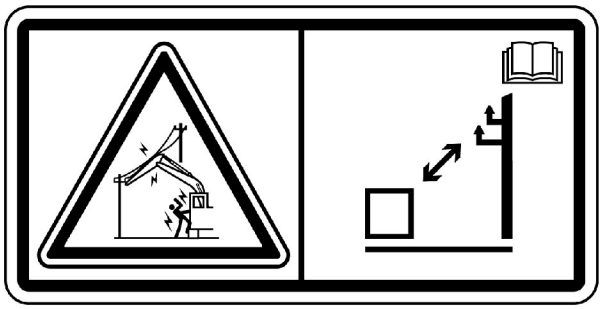


Illustration 9 g01374045

DANGER

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

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

Crushing Hazard (6)

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

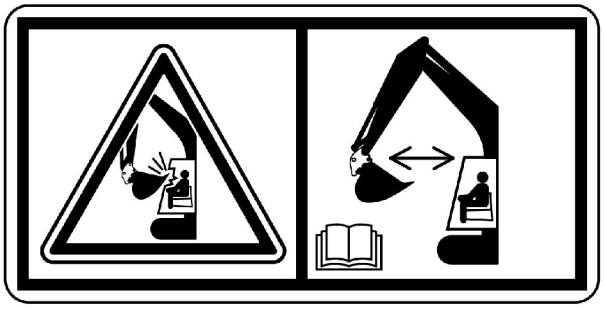


Illustration 10 g01373971

⚠ WARNING

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

Do Not Weld or Drill on ROPS (7)

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



Illustration 11 g01970802

⚠ WARNING

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

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

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

Seat Belt (8)

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

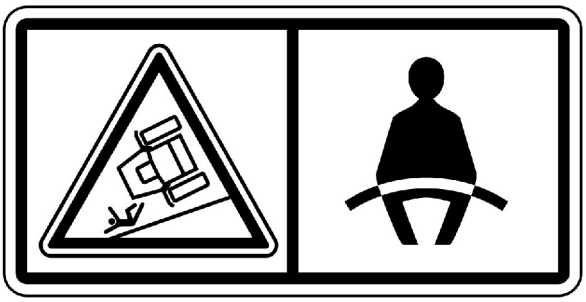


Illustration 12 g01370908

WARNING

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

Crushing Hazard (9)

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

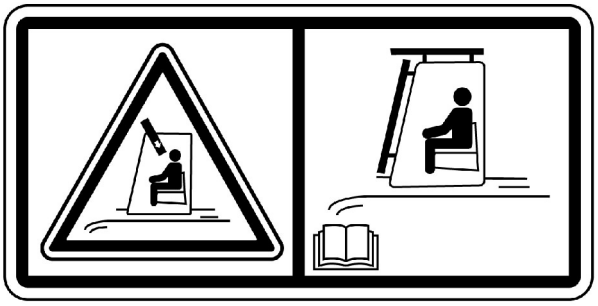


Illustration 13 g01374048

WARNING

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

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

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

Joystick Controls Alternate Patterns (10)

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

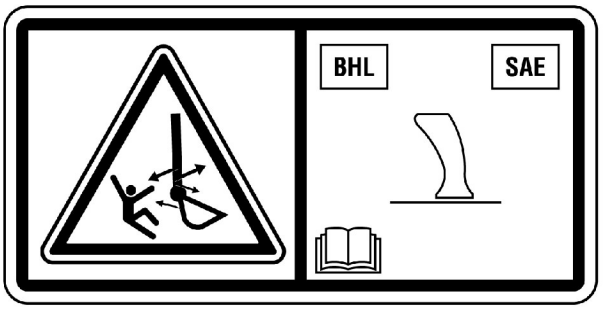


Illustration 14 g01374050

WARNING

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

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

Product Link (11)

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

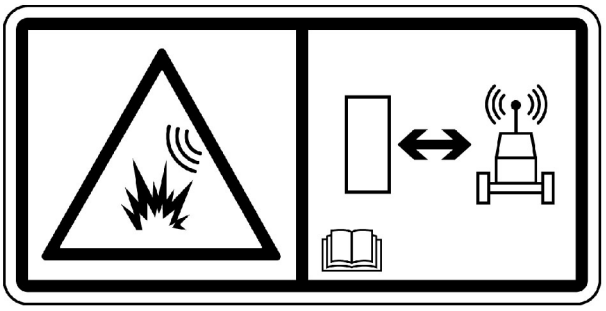


Illustration 15 g01370917

WARNING

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

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

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

Crushing Hazard (12)

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

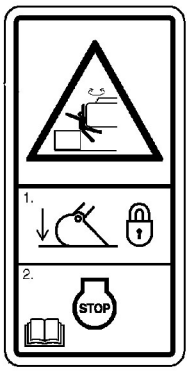


Illustration 16 g02282255

WARNING

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

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

Refer to Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration” for further information.

Crushing Hazard (13)

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

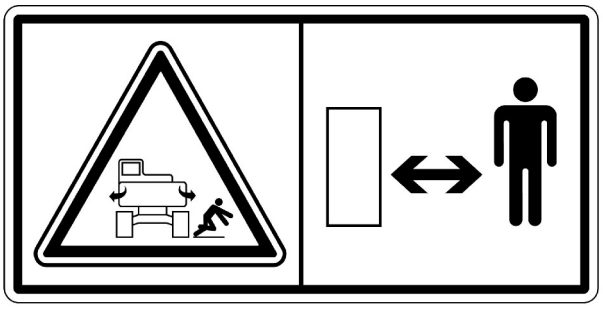


Illustration 17 g01374060

⚠ WARNING

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

Pressurized System (14)

This safety message is located next to the cooling system pressure cap.



Illustration 18 g01371640

⚠ WARNING

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

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

Aerosol Starting Aid (15)

This safety message is positioned on the cover of the intake duct of the air cleaner. The following information is not applicable to machines that are equipped with an ether starting aid.



Illustration 19 g01372254

⚠ WARNING

Explosion Hazard! Spraying uncontrolled ether into the air inlet system can cause explosions or fire that may result in personal injury or death. Read and follow the starting procedures in the Operation and Maintenance Manual.

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

Jump-Start Cables (16)

This safety message is positioned behind the front left access door near the batteries.

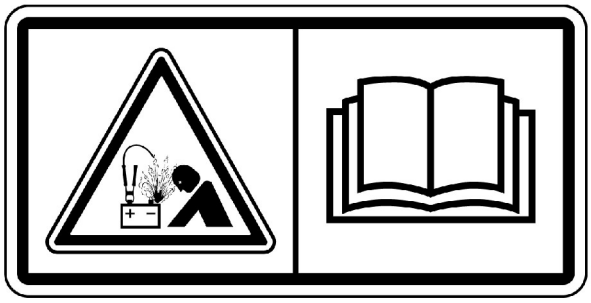


Illustration 20 g01370909

WARNING

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

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

Vapor Explosion (17)

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

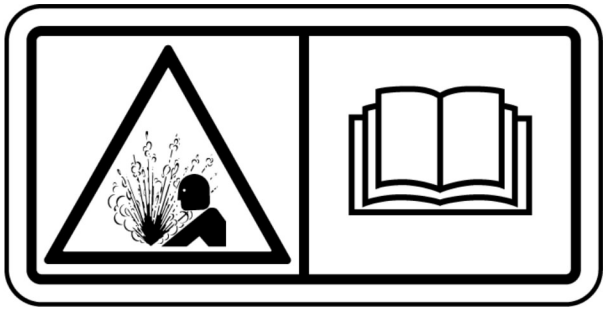


Illustration 21 g01407639

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.

High-Pressure Gas (18)

This safety message is positioned on the accumulator.

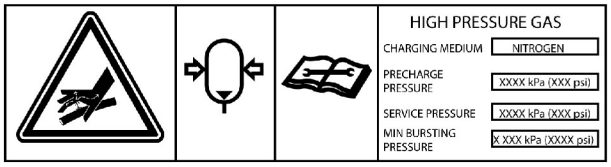


Illustration 22 g01374065

⚠ WARNING

Pressurized System!

Hydraulic accumulators contain gas and oil under high pressure. DO NOT disconnect lines or disassemble any component of a pressurized accumulator. All gas pre-charge must be removed from the accumulator as instructed by the service manual before servicing 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 (19)

This safety message is on both sides of the stick.

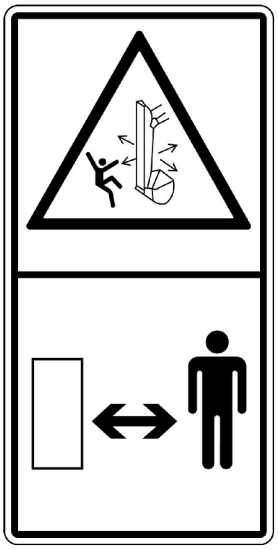


Illustration 23 g01385579

⚠ WARNING

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

High-Pressure Cylinder (20)

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

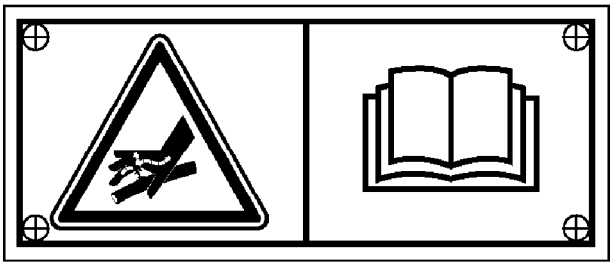


Illustration 24 g01076729

WARNING

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

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

Crushing Hazard (Counterweight) (21)

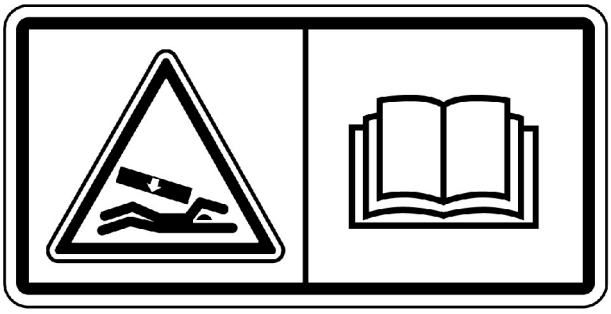


Illustration 25 g01435553

This safety message is on the right side of the machine inside the access door.

WARNING

Crushing Hazard! When the counterweight is in the fully extended position for servicing the machine, secure the extended counterweight with the counterweight lock lever.

Use the counterweight lock lever to avoid possible personnel injury or death from crushing.

Refer to Operation and Maintenance Manual, “Counterweight Remov al and Installation” for further information.

Crushing Hazard (22)

If equipped, this safety message is located near the counterweight mounting bolts.

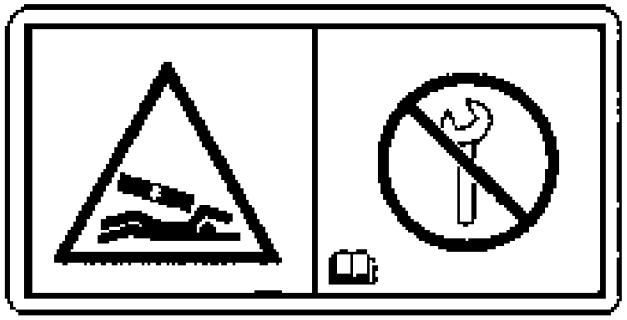


Illustration 26 g06509709

WARNING

Crushing Hazard! Personal injury or death can occur from counterweight falling during removal or installation. Do not remove any counterweight mounting bolts unless you have read and understand the instructions and warnings in the Operation and Maintenance for counterweight removal and installation.

Reference: Refer to Operation and Maintenance Manual, Counterweight Removal and Installation for further information.

Relieve Hydraulic Tank Pressure (23)

This safety message is on top of the hydraulic tank.



Illustration 27 g01371640

WARNING

HYDRAULIC TANK

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

Hot Surface (24)

This safety message is located in two locations on the engine hood. This safety message is also located under the engine hood.

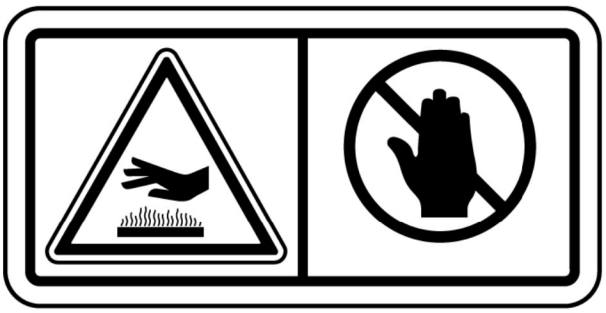


Illustration 28 g01372256

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.

Acid Burn Hazard (25)

This safety message is on the engine.



Illustration 29 g01382725

WARNING

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

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

Falling Object Guard Structure (26)

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.

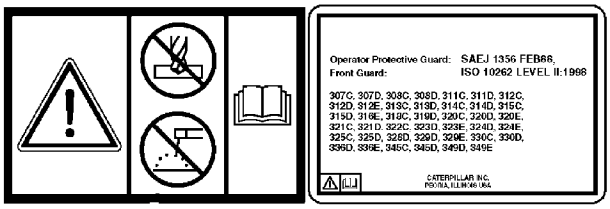


Illustration 30 g02428757

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.

Rotating Fan (27)

This safety message is located near the engine fan.

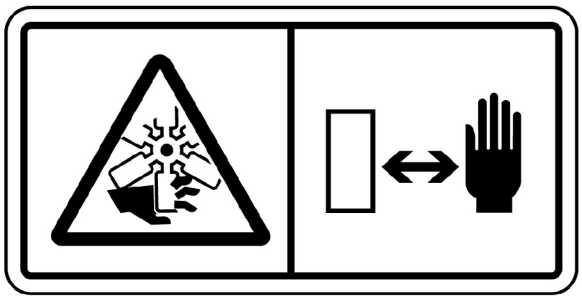


Illustration 31 g01385578

WARNING

Cutting Hazard! Keep hands clear of fan while engine is running. May cause serious injury or death.

Lifting Restriction/Counterweight Only (28)

This safety message is on top of the counterweight.

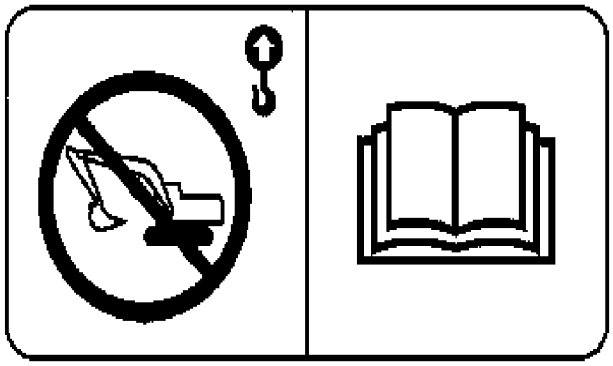


Illustration 32 g03481698

⚠ WARNING

The rear link on the counterweight should be used for the counterweight only. Do not lift the whole Machine by these counterweight links. This could cause serious injury or death. Read Operation and Maintenance Manuals.

See the Operation and Maintenance Manual, “Lifting and Tying Down the Machine" and "Counterweight Removal and Installation”for information on your product.

i07532132

Additional Messages

SMCS Code: 7000; 7405

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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.

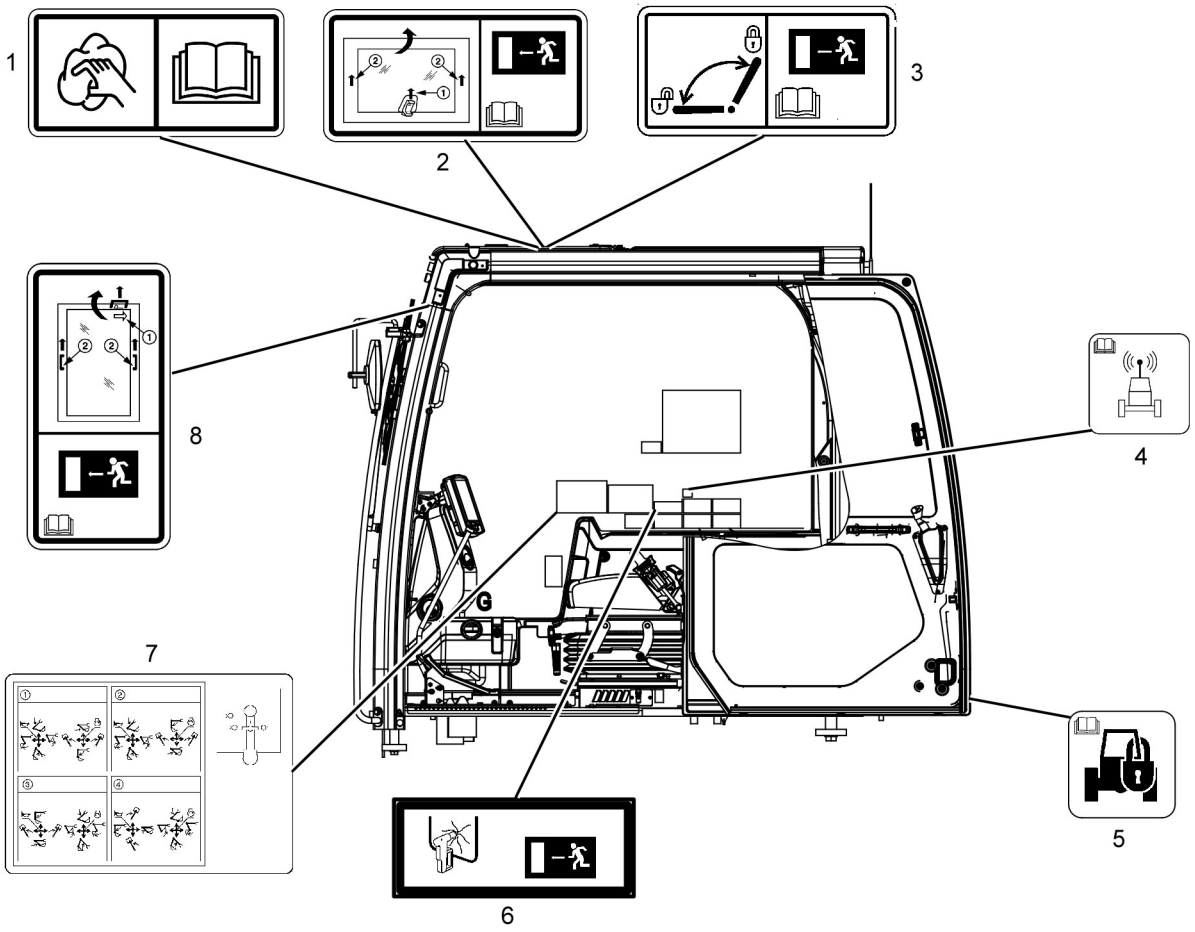


Illustration 33 g03264916

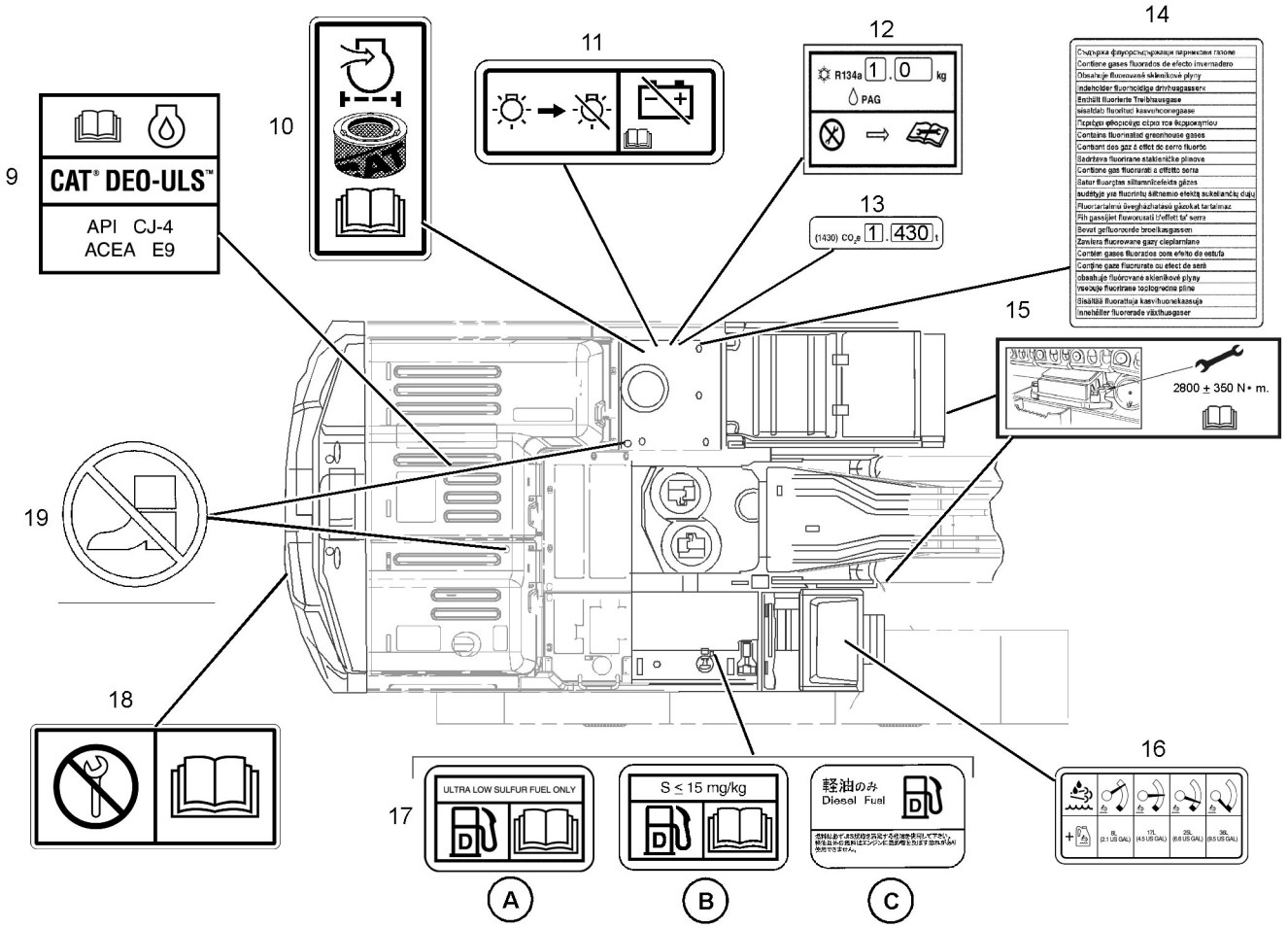


Illustration 34 g06158320

Cleaning Windows (1)

This message is on the roof hatch.

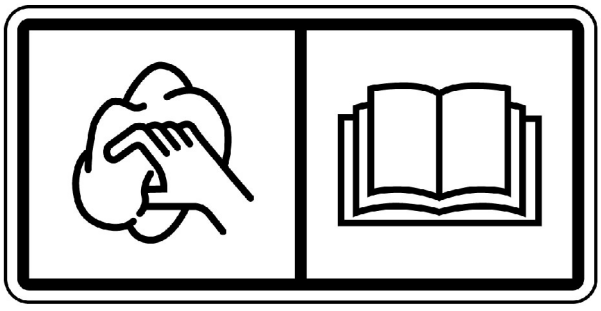


Illustration 35 g01134495

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

Alternate Exit (2)

If equipped, this message is on the roof hatch.

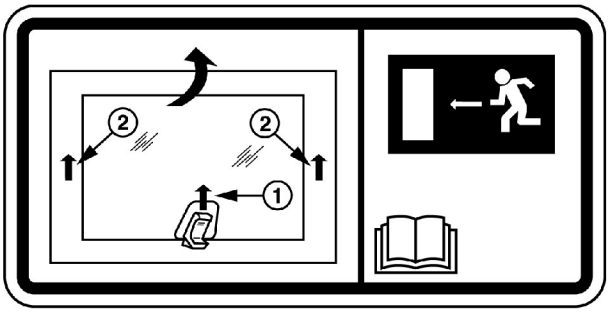


Illustration 36 g02052833

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

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

Alternate Exit Lock/Unlock (3)

If equipped, this message is on the roof hatch.

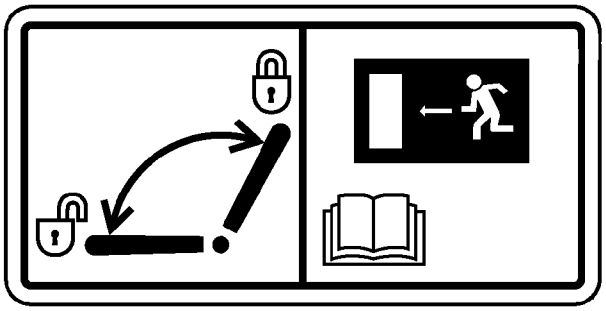


Illustration 37 g02052873

NOTICE
Unlock alternate exit window during machine operations.

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

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

Data Privacy (4)



Illustration 38 g01418953

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

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

Machine Security System (5)

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



Illustration 39 g00951606

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

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

Alternate Exit (6)

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

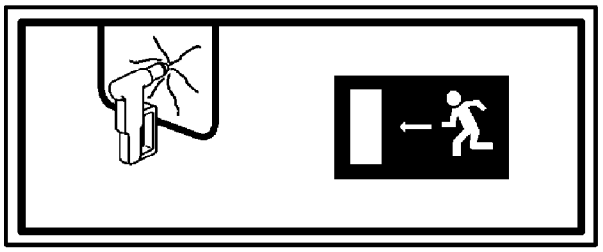


Illustration 40 g01069768

Joystick Controls Alternate Patterns (7)

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

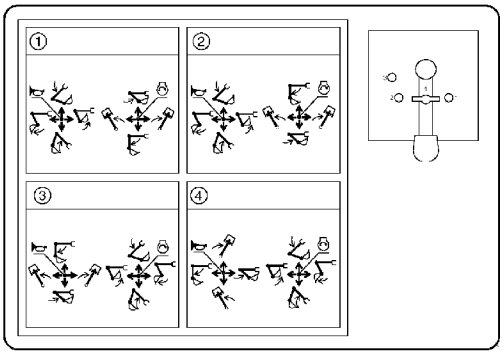


Illustration 41 g03094696

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

Break glass to exit.

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

Alternate Exit (8)

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

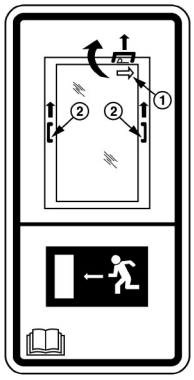


Illustration 42 g02052913

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

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

Engine Oil Requirements (9)

This message is on top of the engine.

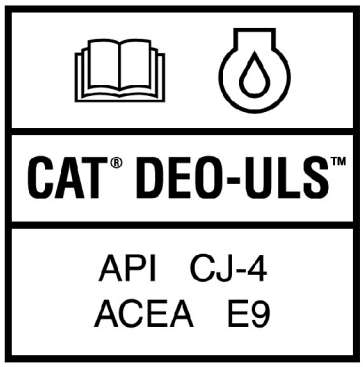


Illustration 43 g02176761

Refer to Operation and Maintenance Manual, “Lubricant Viscosities”.

Radial Seal Air Filters (10)

This message is on the air cleaner.

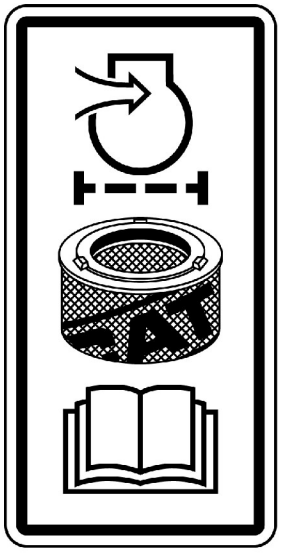


Illustration 44 g01134494

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

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

Wait To Disconnect Lamp (11)

This message is located behind the cab near the battery

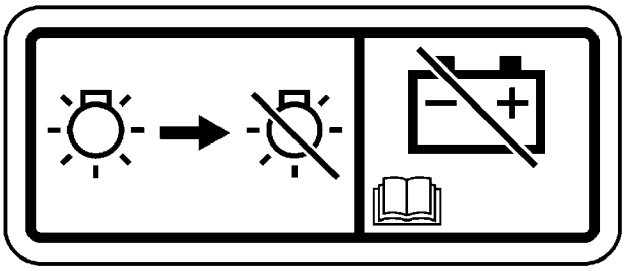


Illustration 45 g03422337

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

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

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

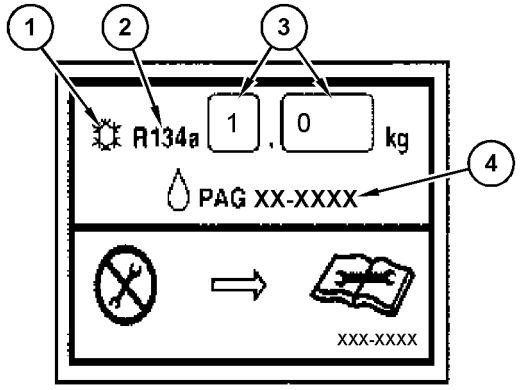


Illustration 46 g06158152

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

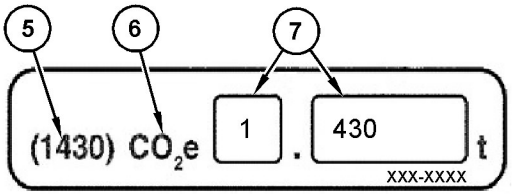


Illustration 47 g06158155

If equipped

(5) “1430” This is the Global warming potential of R134a
(6) CO2 equivalent
(7) System contains 1.430 metric tonne of CO2 equivalent



Illustration 48 g06155418

If equipped

(8) Translations (Contains fluorinated greenhouse gases)

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.

Do not service the air conditioner system before reading the service manual.

Adjustable Gauge Undercarriage Frame (15)

This message is on the front of the track frames of the machine.

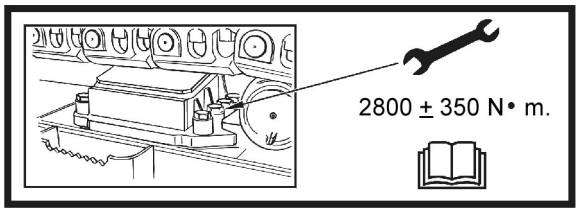


Illustration 49 g03392413

Reference: Refer to the Operation and Maintenance Manual, “Adjustable Gauge Undercarriage Frame” for the procedure to adjust the gauge of the tracks.

Refer to Operation and Maintenance Manual, “Capacities (Refill)”.

Diesel Exhaust Fluid Fill (16)

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

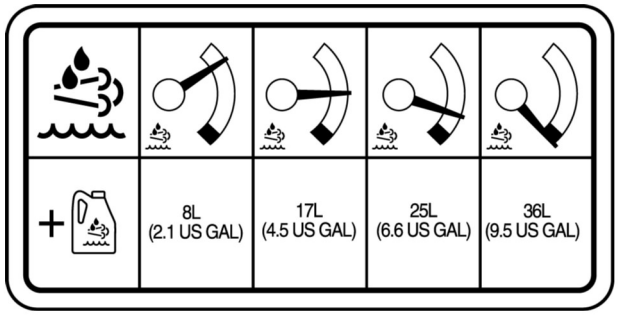


Illustration 50 g03643509

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

Diesel Fuel Requirements (17)

This message is located by the fuel tank.

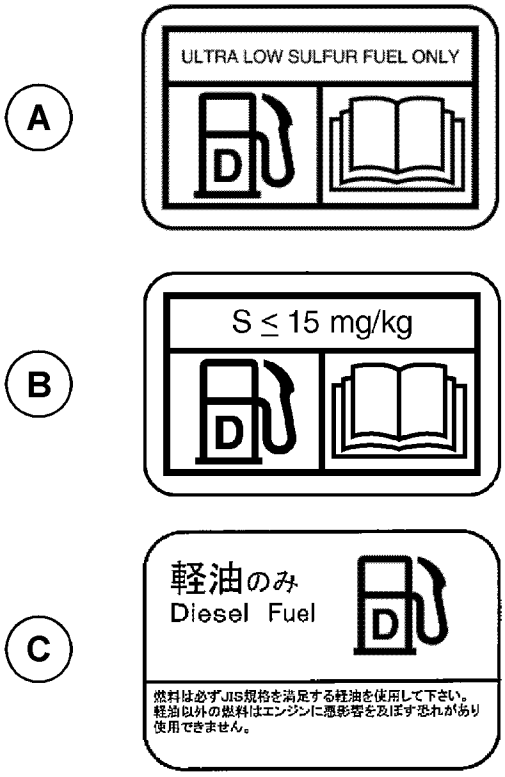


Illustration 51 g03218956

NOTICE
Ultra Low Sulfur Diesel (ULSD) fuel 0.0015 percent (≤15 ppm (mg/kg)) sulfur is required by regulation for use in engines certified to nonroad Tier 4 standards (U.S. EPA Tier 4 certified) and that are equipped with exhaust aftertreatment systems.

European ULSD 0.0010 percent (≤10ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European Stage V type-approved nonroad engines. Additionally, the Cetane number should not be less than 45, and the biodiesel content should not be greater than 20% volume/volume.

Failures that result from the use of improper fuels are not Cat factory defects. Therefore the cost of repairs would not be covered by a Cat warranty.

Cat 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. For Tier 4/Stage IIIB/Stage IV/Stage V certified engines always follow operating instructions. Fuel tank inlet labels are installed to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more details about fuels, lubricants, and Tier 4/Stage V requirements. This manual may be found on the web at Safety.Cat.com.

Counterweight (18)

This message is on the counterweight.

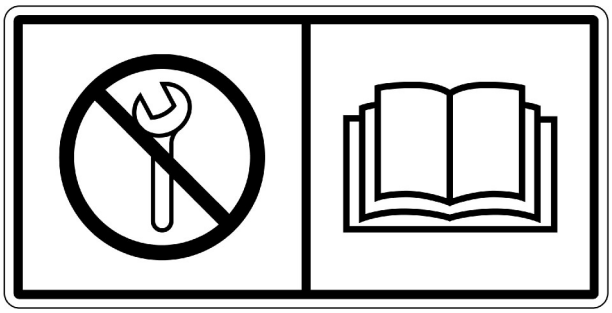


Illustration 52 g01435946

Do not tighten the counterweight mounting bolts without checking the retainer pin for the proper position.

Refer to Operation and Maintenance Manual, “Counterweight Removal and Installation” for more information.

No Step (19)

This message is on the engine hood on the top of the machine. This message is also on the left side of the machine behind the cab.

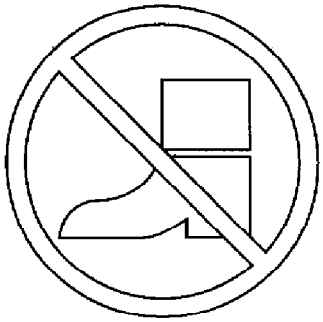


Illustration 53 g00911158

Do not step in this area.

i07746355

General Hazard Information

SMCS Code: 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

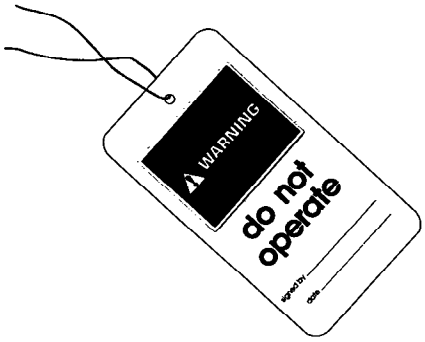


Illustration 54 g00104545

Typical example

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

⚠ WARNING

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

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

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

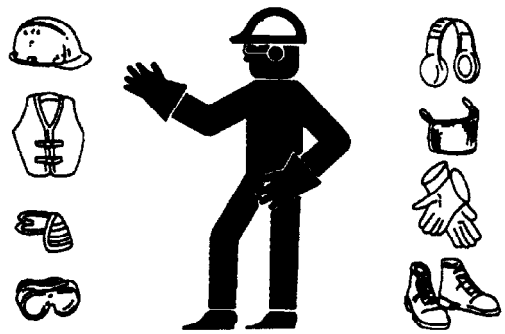


Illustration 55 g00702020

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.

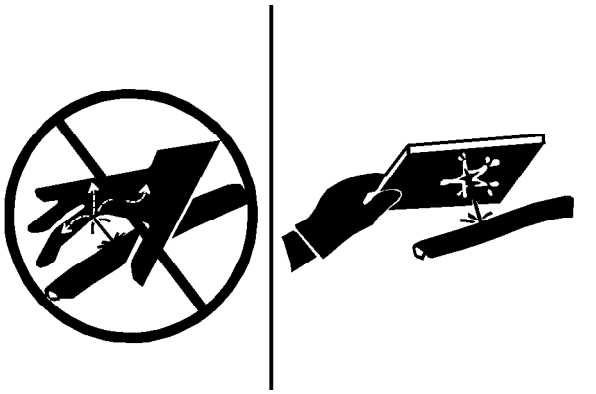


Illustration 56 g00687600

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 57 g02159053

Exhaust

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

Asbestos Information

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

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

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

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

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

Dispose of Waste Properly

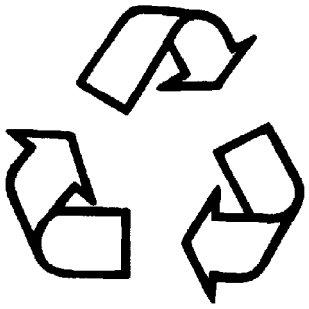


Illustration 58 g00706404

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

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

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

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

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

Stay clear of all rotating and moving parts.

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

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

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

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

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

i07399130

Burn Prevention

SMCS Code: 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

Induction System

⚠ WARNING

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

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

Coolant

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

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

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

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

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

Oils

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

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

Batteries

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

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

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

i06179517

Fire Prevention and Explosion Prevention

SMCS Code: 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up



Illustration 59 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 60 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 61 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.

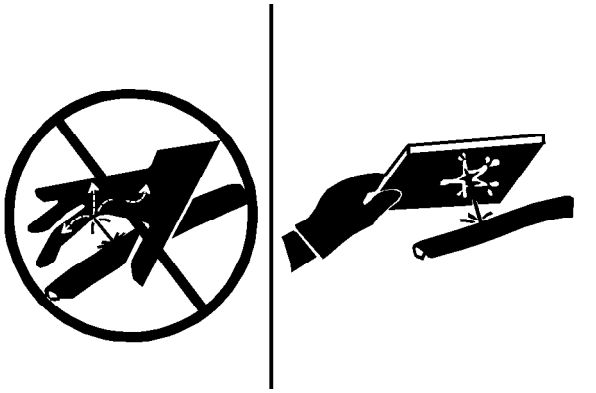


Illustration 62 g00687600

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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.

i03767099

Fire Extinguisher Location

SMCS Code: 7000; 7419

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

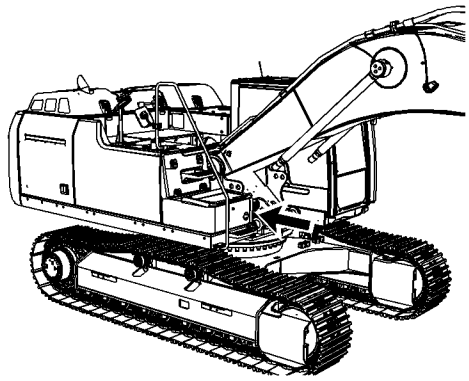


Illustration 63 g02030713

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

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

i01329108

Track Information

SMCS Code: 4170; 7000

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

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

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

i02546320

High Pressure Fuel Lines

SMCS Code: 1000; 1274; 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

⚠ 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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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.

i06590787

Restricted Visibility

SMCS Code: 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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 64 - 66 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 67 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 64 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.

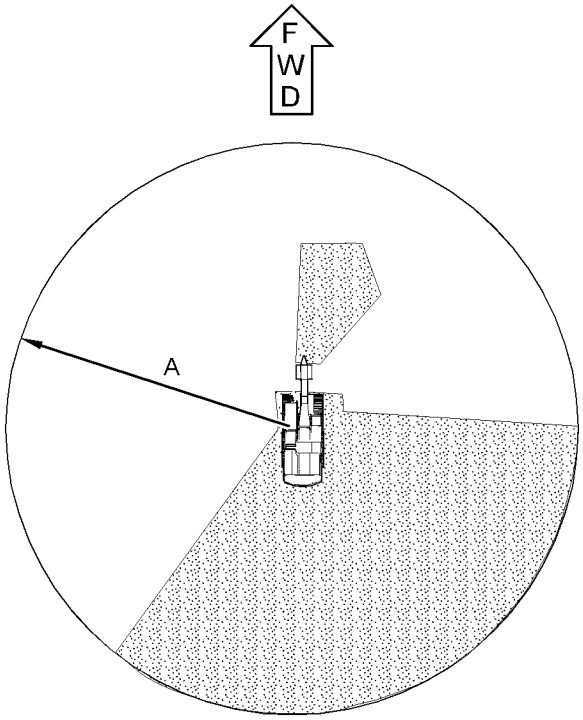


Illustration 64 g03864264

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

(A) 24 m (79 ft)

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

Illustration 65 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.

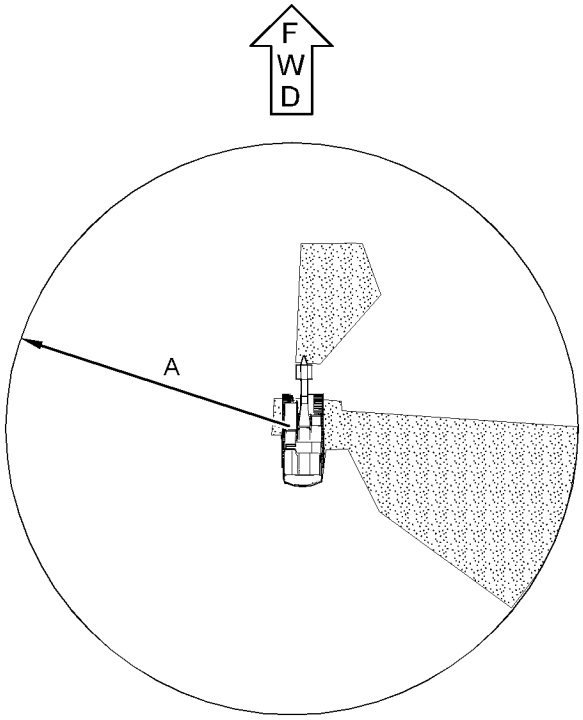


Illustration 65 g03864275

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

(A) 24 m (79 ft)

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

Illustration 66 indicates restricted visibility areas at ground level inside the shown radius from the operator with the use of available rear camera, right side camera (if equipped), left side mirrors installed.

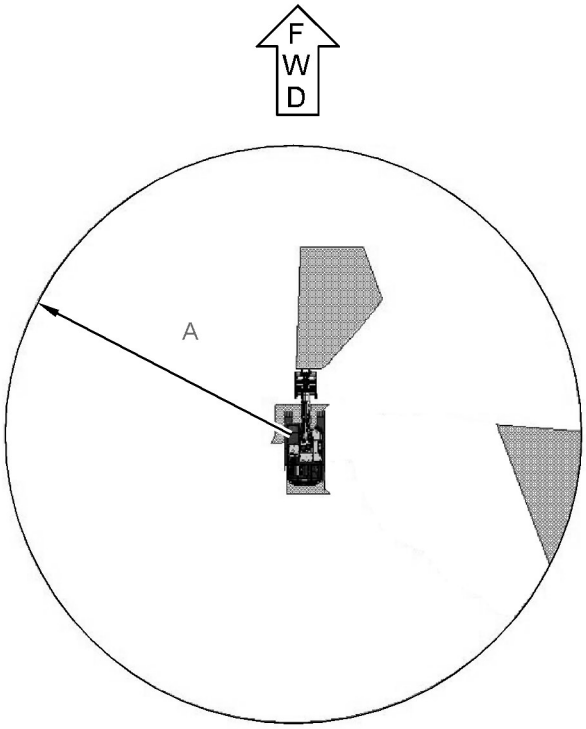


Illustration 66 g06037869

Top view of the machine, ground level visibility with available camera, left side mirror.

(A) 24 m (79 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 67 shows the machine in the travel position.

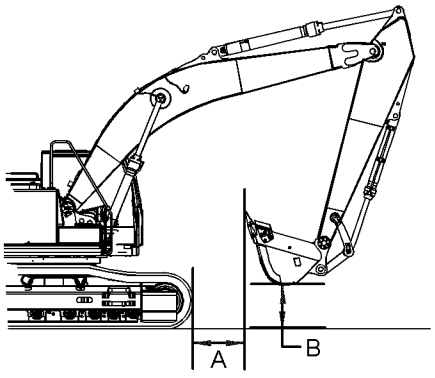


Illustration 67 g02155813

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

i03562260

Engine Starting

SMCS Code: 1000; 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

Machine Operating Temperature Range

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

Limiting Conditions and Criteria

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

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

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

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

Critical Failures

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

Table 1

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

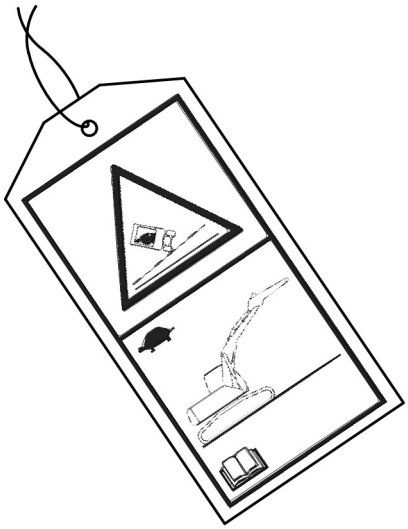


Illustration 68 g02202544

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

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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

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

i06589158

Lifting Objects

SMCS Code: 7000

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

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

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

Consult your Cat dealer for additional information.

i07749631

Demolition

SMCS Code: 6700

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

Note: Obey all local and government regulations.

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

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

- Rollover Protective Structure (ROPS, not required for demolition excavators)

- Boom Lowering Control Valve (BLCV) / Stick Lowering Control Valve (SLCV)
- Top Guard / Front Guard
- Bottom / Motor / Swivel Guard
- EN 356 class P5A front window glass
- If a roof window is used to provide visibility to the working area, then roof window shall be equipped with motorized windscreen wipers and washers.

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

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

i07393520

Parking

SMCS Code: 7000

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

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

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

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

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

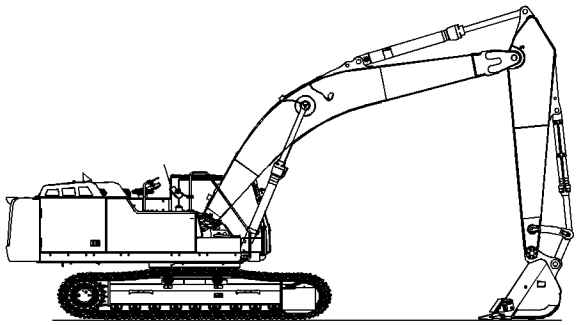


Illustration 69 g02280104

Place the machine in the servicing position.

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

Move the hydraulic lockout control to the LOCKED position.

Stop the engine.

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

Turn the battery disconnect switch to the OFF position.

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

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

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

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

i07746366

Slope Operation

SMCS Code: 7000

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

i01329161

Equipment Lowering with Engine Stopped

SMCS Code: 7000-II

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

i06759725

Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

The declared dynamic operator sound pressure level is 73 dB(A) when “ISO6396: 2008” is used to measure the value for an enclosed cab. The measurement was conducted at 70% of the maximum engine cooling fan speed and with the regeneration system for the engine exhaust emissions disabled. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

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

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

The declared exterior sound power level (L_{WA}) is 108 dB(A) when the value is measured according to the dynamic test procedure and the conditions that are specified in “ISO 6395 :2008” . The measurement was conducted at 70% of the maximum engine cooling fan speed and with the regeneration system for the engine exhaust emissions disabled. The sound level may vary at different engine cooling fan speeds.

The declared dynamic operator sound pressure level is 73 dB(A) when “ISO6396: 2008” is used to measure the value for an enclosed cab. The measurement was conducted at 70% of the maximum engine cooling fan speed and with the regeneration system for the engine exhaust emissions disabled. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

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

Vibration Data for Track Type Excavator

Information Concerning Hand/Arm Vibration Level

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

Information Concerning Whole Body Vibration Level

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

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

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

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

a. Tire pressures

b. Brake and steering systems

c. Controls, hydraulic system, and linkages

3. Keep the terrain in good condition.

a. Remove any large rocks or obstacles.

b. Fill any ditches and holes.

c. Provide machines and schedule time 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.

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

i07746362

Operator Station

SMCS Code: 7300; 7301; 7325

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

i07746359

Guards
(Operator Protection)

SMCS Code: 7000; 7150

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

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

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

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

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

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

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

Other Guards (If Equipped)

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

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

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

- Demolition applications
- Rock quarries
- Forestry products

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

Product Information Section

General Information

i07105852

Regulatory Information (Japan)

SMCS Code: 7000

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: TEW1–Up

Qualifications for Machine Operation

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

Excavation and Loading

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

Demolition

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

Mining Jobs

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

Crane Slinging for the Bucket with a Hook

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

Trailer Transportation

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

- In the event heavy items are to be transported, observe the related laws. These laws include Road Traffic Law, Road Laws, Road Transportation Vehicle Laws, and Vehicle Restriction Laws.
- Conduct prior investigation of the road width, ground clearance of road/railway bridges, weight restrictions etc. of the planned transportation route, to confirm the viability of the transportation execution.

Load

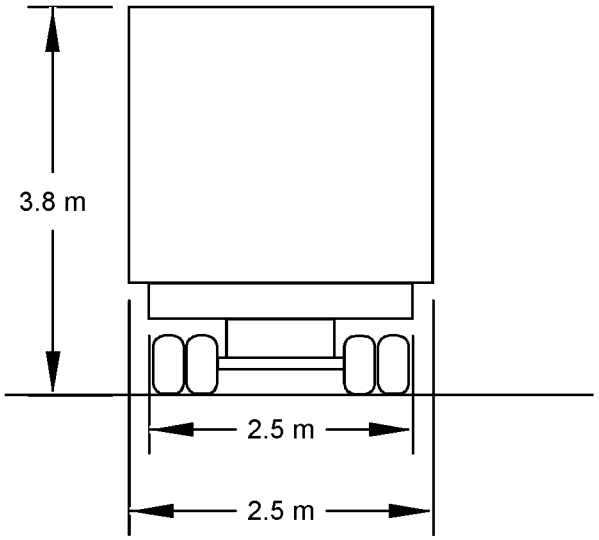


Illustration 70 g02698738

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

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

Table 3

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

(continued)

(Table 3, contd)

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

Operation of Construction Equipment and the Governing Laws and Regulations

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

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

Qualification of Operators

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

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

- One who completed an operating skill course for vehicle-type construction equipment at a registered training institution.
- One who passed the construction equipment and technologies license examination (Type 1-3) defined by the Construction Industry Law.
- One who completed an operating training course for construction equipment defined by the Vocational Training Law.
- One who took a special training (rules and skills) at a registered training institution to operate equipment weighing less than 3 tons.
- With an auto-drivers license, an operator does not need to complete an operating skill course for construction equipment to operate equipment on the roads that apply to the rules of the Road Traffic Act. However, the operator needs to complete the course to engage in snow clearing or excavating on the roads.
- The operator must be qualified under the Mine Safety Act to operate construction equipment in a mine.

Acquisition of the Qualifications

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

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

Subsidy System

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

Operation of Construction Equipment and the Governing Laws and Regulations

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

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

Request for Periodical Self-Inspection

Rules of Periodical Self-Inspection

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

Ordinance on Industrial Safety and Hygiene

Periodical self-inspections Article 167

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

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

Periodical self-inspections Article 168

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

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

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

Record of Periodical Self-Inspections Article 169

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

Specified Self-Inspection Article 169-2

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

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

Checkup before Commencing the Work Article 170

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

Other Rules

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

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

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

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

Construction Equipment and Environmental Laws

Prohibition of Emissions and Obligations to Recover Fluorocarbons

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

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

1. 1. Do not arbitrarily emit the encapsulated refrigerant installed on the product into the atmosphere.

2. 2. Recover the encapsulated refrigerant when disposing of the product.

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

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

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

Standard Certificate of Transfer

Dear Customers

Japan Construction Equipment Manufacturers Association

Standard Certificate of Transfer

Issued by the Japan Construction Equipment Manufacturers Association

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

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

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

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

1. About the standard certificate of transfer

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

2. Purpose of issuance

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

3. Issuer

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

4. Eligibility

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

5. Issuance

a. A certificate of transfer will be issued and directly given to a buyer upon the buyer's request when he/she buys eligible equipment from an issuer.

b. A certificate of transfer may not be issued for the equipment, which was sold as new merchandise more than 10 years ago.

c. A certificate of transfer is not permitted to substitute a vehicle inspection certificate.

6. Prohibition of reissuance

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

7. In case a certificate description runs out of space

a. Discretionary page/s to the certificate will be valid with a tally seal of the issuer at the joint of two pages.

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

Industrial Safety and Health Act

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

Article 164

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

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

1. In performing cargo lifting, any one of the following may be applicable.

a. Cannot be avoided due to the nature of the work or necessary in view of performing work in safe.

b. When working with attachments installed for metals of hook or shackle etc or other devices for lifting application applicable to any one of the following as implements for boom or bucket etc

- Enough strength is retained bearable for loads to be applied.
- Load lifted up is not feared to be dropped from the applicable instrument used, due to provided locking device is in use or etc.
- Load not feared of disengaging from the implement.

2. In performing work other than cargo lifting, nothing is feared to do harm to the workers.

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

1. Designate one person who issues a sign as well as setting up fixed signs related to cargo lifting work, and follow his signs.

2. Perform work on a flat ground.

3. Keep any worker away from any place where is feared to cause any danger to worker due to contact with a cargo or drop of lifted cargo.

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

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

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

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

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

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

i07185653

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.

Application/Configuration Restrictions

The operator station is ROPS certified up to a mass of 58600kg (129190 lb) per ISO 12117-2:2008.

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

Specification Data

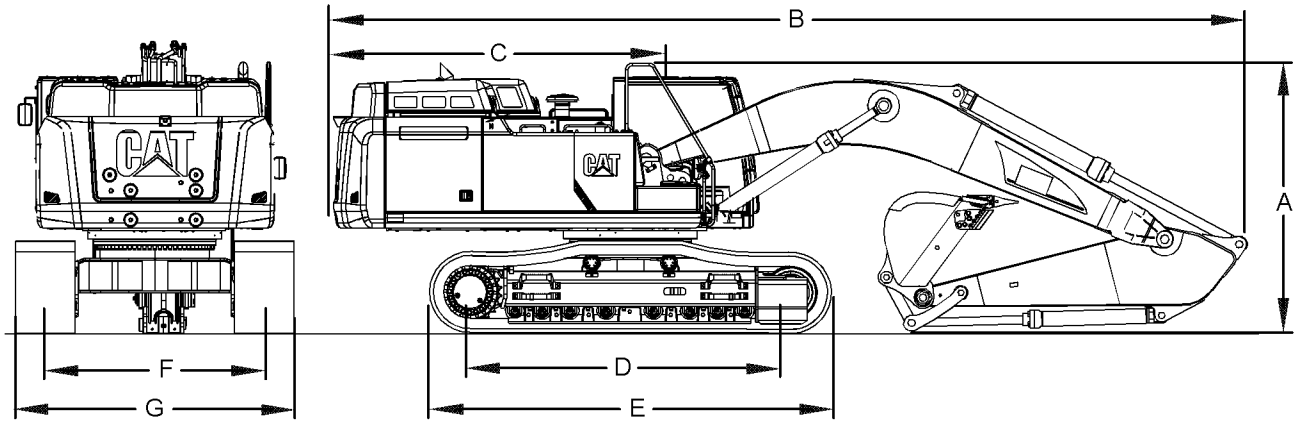


Illustration 71 g02298435

Table 4

349F L Excavator with Fixed Gauge Undercarriage(1)						
	6.9 m (22 ft 8 inch) Reach Boom			7.4 m (24 ft 3 inch) Long Reach Boom	6.55 m (21 ft 6 inch) Mass Boom	
	2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	4.3 m (14 ft 1 inch) Stick	2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
Bucket	3.1 m^3 (4.05 yd^3)				3.2 m^3 (4.19 yd^3)	
Approximate Weight	47700 kg (105200 lb)(2)	49200 kg (108500 lb)(4)	49500 kg (109100 lb)(4)	50000 kg (110200 lb)(4)	50200 kg (110700 lb)(4)	50500 kg (111300 lb)(4)
Shipping Height (A)	3660 mm (12 ft)	3730 mm (12 ft 3 inch)	3670 mm (11 ft 10 inch)	3690 mm (12 ft 1 inch)	3980 mm (13 ft 1 inch)	4020 mm (13 ft 2 inch)
Shipping Length (B)	11910 mm (39 ft 1 inch)	11920 mm (39 ft 1 inch)	11930 mm (39 ft 2 inch)	12420 mm (40 ft 9 inch)	11680 mm (38 ft 4 inch)	11590 mm (38 ft)
Swing Radius (C)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)
Length to Center of Rollers (D)	4360 mm (14 ft 4 inch)	4360 mm (14 ft 4 inch)	4360 mm (14 ft 4 inch)	4360 mm (14 ft 4 inch)	4360 mm (14 ft 4 inch)	4360 mm (14 ft 4 inch)
Length of Track (E)	5370 mm (17 ft 7 inch)	5370 mm (17 ft 7 inch)	5370 mm (17 ft 7 inch)	5370 mm (17 ft 7 inch)	5370 mm (17 ft 7 inch)	5370 mm (17 ft 7 inch)

(continued)

(Table 4, contd)

Track Gauge (F)	2740 mm (8 ft 12 inch)	2740 mm (8 ft 12 inch)	2740 mm (8 ft 12 inch)	2740 mm (8 ft 12 inch)	2740 mm (8 ft 12 inch)	2740 mm (8 ft 12 inch)
Overall Width (G)	3340 mm (10 ft 11 inch)(2)	3340 mm (10 ft 11 inch)(2) 3490 mm (11 ft 5 inch)(3) 3640 mm (11 ft 11 inch)(4)	3340 mm (10 ft 11 inch)(2) 3490 mm (11 ft 5 inch)(3) 3640 mm (11 ft 11 inch)(4)	3340 mm (10 ft 11 inch)(2) 3490 mm (11 ft 5 inch)(3) 3640 mm (11 ft 11 inch)(4)	3340 mm (10 ft 11 inch)(2) 3490 mm (11 ft 5 inch)(3) 3640 mm (11 ft 11 inch)(4)	3340 mm (10 ft 11 inch)(2) 3490 mm (11 ft 5 inch)(3) 3640 mm (11 ft 11 inch)(4)

(1) The fuel tank is 10 percent full.
(2) 600 mm (24 inch) track shoes
(3) 750 mm (28 inch) track shoes
(4) 900 mm (36 inch) track shoes

Table 5

352F Excavator with Variable Gauge Undercarriage(1)						
	6.9 m (22 ft 8 inch) Reach Boom			**7.4 m (24 ft 3 inch) Long Reach Boom**	**6.55 m (21 ft 6 inch) Mass Boom**	
	2.9 m (9 ft 6 inch) Stick	**3.35 m (11 ft) Stick**	**3.9 m (12 ft 10 inch) Stick**	**4.3 m (14 ft 1 inch) Stick**	**2.5 m (8 ft 2 inch) Stick**	**3.0 m (9 ft 10 inch) Stick**
Bucket	3.1 m^3 (4.05 yd^3)				2.8 m^3 (3.66 yd^3)	
Approximate Weight	51800 kg (114200 lb)(4)	52000 kg (114600 lb)(6)	52200 kg (115100 lb)(6)	52700 kg (116200 lb)(4)	53000 kg (116800 lb)(6)	53300 kg (117500 lb)(6)
Shipping Height (A)	3700 mm (12 ft 2 inch)	3550 mm (11 ft 8 inch)	3650 mm (12 ft)	3650 mm (12 ft)	4010 mm (13 ft 2 inch)	4020 mm (13 ft 2 inch)
Shipping Length (B)	11890 mm (39 ft)	11820 mm (38 ft 9 inch)	11890 mm (39 ft)	12370 mm (40 ft 7 inch)	11640 mm (38 ft 4 inch)	11560 mm (38 ft)
Swing Radius (C)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)	3760 mm (12 ft 4 inch)
Length to Center of Rollers (D)	4340 mm (14 ft 3 inch)	4340 mm (14 ft 3 inch)	4340 mm (14 ft 3 inch)	4340 mm (14 ft 3 inch)	4340 mm (14 ft 3 inch)	4340 mm (14 ft 3 inch)
Length of Track (E)	5380 mm (17 ft 8 inch)	5380 mm (17 ft 8 inch)	5380 mm (17 ft 8 inch)	5380 mm (17 ft 8 inch)	5380 mm (17 ft 8 inch)	5380 mm (17 ft 8 inch)
Track Gauge (F)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)	2890 mm (9 ft 6 inch)(2) 2390 mm (7 ft 10 inch)(3)
Overall Width Expanded (G)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)	3490 mm (11 ft 5 inch)(4) 3640 mm (11 ft 11 inch)(5) 3790 mm (12 ft 5 inch)(6)
Overall Width Retracted (G)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)	3000 mm (9 ft 10 inch)(4) 3140 mm (10 ft 4 inch)(5) 3290 mm (10 ft 10 inch)(6)

(1) The fuel tank is 10 percent full.

(continued)

(Table 5, contd)

(2) Expanded
(3) Retracted
(4) 600 mm (24 inch) track shoes
(5) 750 mm (28 inch) track shoes
(6) 900 mm (36 inch) track shoes

Working Ranges

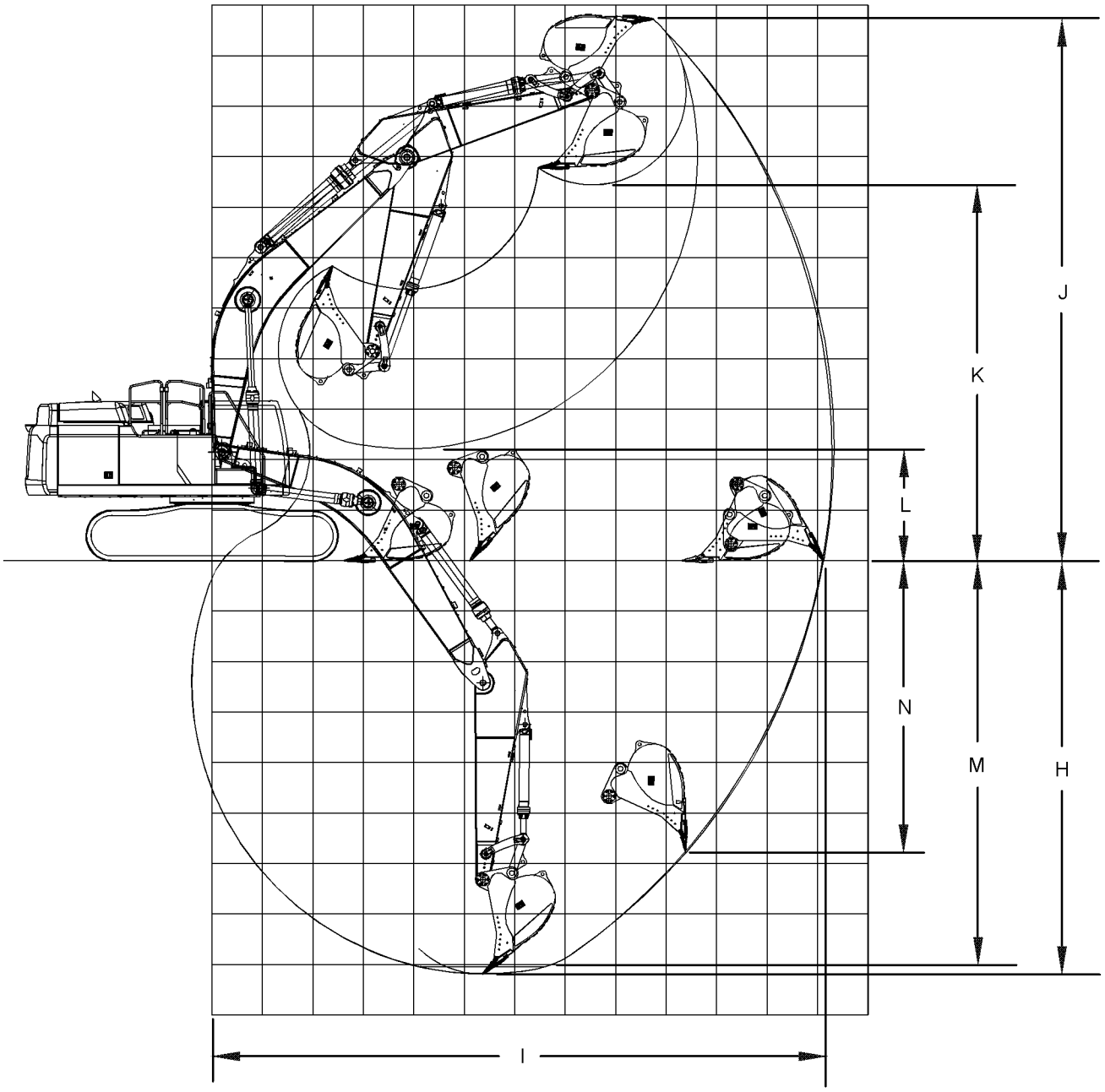


Illustration 72 g03019796

Table 6

349F L Excavator with Fixed Gauge Undercarriage		
	6.9 m (22 ft 8 inch) Reach Boom	**6.55 m (21 ft 6 inch) Mass Boom**

(continued)

(Table 6, contd)

	2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
Bucket	3.08 m^3 (4.03 yd^3)	3.1 m^3 (4.05 yd^3)		3.2 m^3 (4.19 yd^3)	
Maximum Digging Depth (H)	7180 mm (23 ft 7 inch)	7630 mm (25 ft)	8180 mm (26 ft 10 inch)	6730 mm (22 ft 1 inch)	7230 mm (23 ft 9 inch)
Maximum Reach at Ground Level (I)	11290 mm (37 ft 1 inch)	11710 mm (38 ft 5 inch)	12120 mm (39 ft 9 inch)	10740 mm (35 ft 3 inch)	11200 mm (36 ft 11 inch)
Maximum Cutting Height (J)	10640 mm (34 ft 11 inch)	10810 mm (35 ft 6 inch)	10730 mm (35 ft 2 inch)	10110 mm (33 ft 2 inch)	10300 mm (33 ft 10 inch)
Maximum Loading Height (K)	7280 mm (23 ft 11 inch)	7460 mm (24 ft 6 inch)	7450 mm (24 ft 5 inch)	6620 mm (21 ft 9 inch)	6820 mm (22 ft 5 inch)
Minimum Loading Height (L)	3230 mm (10 ft 7 inch)	2780 mm (9 ft 1 inch)	2230 mm (7 ft 4 inch)	3150 mm (10 ft 4 inch)	2650 mm (8 ft 8 inch)
Maximum Cut Depth (M)(1)	7020 mm (23 ft)	7490 mm (24 ft 7 inch)	8050 mm (26 ft 5 inch)	6560 mm (21 ft 8 inch)	7080 mm (23 ft 3 inch)
Maximum Digging Depth (Vertical wall) (N)	5350 mm (17 ft 7 inch)	5760 mm (18 ft 11 inch)	5890 mm (19 ft 4 inch)	4140 mm (13 ft 7 inch)	4570 mm (15 ft)

(1) 2440 mm (8 ft) level bottom

Table 7

352F Excavator with Variable Gauge Undercarriage					
	6.9 m (22 ft 8 inch) Reach Boom			6.55 m (21 ft 6 inch) Mass Boom	
	2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
Bucket	3.08 m^3 (4.03 yd^3)	2.15 m^3 (2.81 yd^3)		2.8 m^3 (3.66 yd^3)	
Maximum Digging Depth (H)	7040 mm (23 ft 1 inch)	7490 mm (24 ft 7 inch)	8040 mm (26 ft 5 inch)	6640 mm (21 ft 9 inch)	7140 mm (23 ft 5 inch)
Maximum Reach at Ground Level (I)	11260 mm (36 ft 11 inch)	11680 mm (38 ft 4 inch)	12090 mm (39 ft 8 inch)	10760 mm (35 ft 4 inch)	11220 mm (36 ft 10 inch)
Maximum Cutting Height (J)	10690 mm (35 ft 1 inch)	10870 mm (35 ft 8 inch)	10780 mm (35 ft 4 inch)	10240 mm (33 ft 7 inch)	11440 mm (37 ft 6 inch)
Maximum Loading Height (K)	7430 mm (24 ft 5 inch)	7610 mm (25 ft)	7590 mm (24 ft 10 inch)	6720 mm (22 ft 1 inch)	6910 mm (22 ft 8 inch)
Minimum Loading Height (L)	3370 mm (11 ft 1 inch)	2920 mm (9 ft 7 inch)	2370 mm (7 ft 9 inch)	3240 mm (10 ft 8 inch)	2740 mm (9 ft)
Maximum Cut Depth (M)(1)	6880 mm (22 ft 7 inch)	7340 mm (24 ft 1 inch)	7900 mm (25 ft 11 inch)	6740 mm (22 ft 1 inch)	6990 mm (22 ft 11 inch)
Maximum Digging Depth (Vertical wall) (N)	5350 mm (17 ft 7 inch)	5170 mm (17 ft)	5270 mm (17 ft 3 inch)	3910 mm (12 ft 10 inch)	4340 mm (14 ft 3 inch)

(1) 2440 mm (8 ft) level bottom

Long Reach

Table 8

349F L Excavator with Fixed Gauge Undercarriage	
	7.4 m (24 ft 3 inch) Reach Boom
	4.3 m (14 ft 1 inch) Stick
Bucket	3.1 m^3 (4.05 yd^3)
Maximum Digging Depth (H)	8910 mm (29 ft 3 inch)
Maximum Reach at Ground Level (I)	12940 mm (42 ft 5 inch)
Maximum Cutting Height (J)	11160 mm (36 ft 7 inch)
Maximum Loading Height (K)	7890 mm (25 ft 11 inch)
Minimum Loading Height (L)	2250 mm (7 ft 5 inch)
Maximum Cut Depth (M)(1)	8790 mm (28 ft 10 inch)
Maximum Digging Depth (Vertical wall) (N)	6480 mm (21 ft 3 inch)

(1) 2440 mm (8 ft) level bottom

Table 9

352F Excavator with Variable Gauge Undercarriage	
	7.4 m (24 ft 3 inch) Reach Boom
	4.3 m (14 ft 1 inch) Stick
Bucket	3.1 m^3 (4.05 yd^3)
Maximum Digging Depth (H)	8770 mm (28 ft 9 inch)
Maximum Reach at Ground Level (I)	12910 mm (42 ft 4 inch)
Maximum Cutting Height (J)	11310 mm (37 ft 1 inch)
Maximum Loading Height (K)	8040 mm (26 ft 5 inch)
Minimum Loading Height (L)	2400 mm (7 ft 11 inch)
Maximum Cut Depth (M)(1)	8640 mm (28 ft 4 inch)
Maximum Digging Depth (Vertical wall) (N)	6340 mm (20 ft 10 inch)

(1) 2440 mm (8 ft) level bottom

i07184185

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.

Variable Gauge

Table 10

352F Excavator without a Quick Coupler(1)									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom		6.55 m (21 ft 6 inch) Mass Boom	
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.0 m (9 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick
General Duty (GD)	TB	1370 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1755 kg (3870 lb)	100	(5)	(5)		
	UB	1450 mm (58 inch)	2.39 m^3 (3.13 yd^3)	2325 kg (5125 lb)				(5)	(5)
		1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	2420 kg (5330 lb)				(5)	(5)
		2000 mm (80 inch)	3.60 m^3 (4.71 yd^3)	2900 kg (6390 lb)				(2)	(3)
Heavy Duty (HD)	TB	1350 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1974 kg (4350 lb)		(5)	(5)		
		1500 mm (60 inch)	2.41 m^3 (3.16 yd^3)	2065 kg (4550 lb)		(5)	(5)		
		1650 mm (65 inch)	2.41 m^3 (3.15 yd^3)	2210 kg (4870 lb)		(5)	(5)		
		1800 mm (71 inch)	2.69 m^3 (3.52 yd^3)	2425 kg (5340 lb)		(5)	(4)		
		1850 mm (74 inch)	2.78 m^3 (3.64 yd^3)	2420 kg (5335 lb)		(5)	(4)		
	UB	1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2580 kg (5690 lb)				(4)	(5)
		1850 mm (73 inch)	3.19 m^3 (4.16 yd^3)	2740 kg (6040 lb)				(3)	(4)
		1950 mm (77 inch)	3.43 m^3 (4.48 yd^3)	2900 kg (6390 lb)				(3)	(4)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes
(2) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.
(3) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(4) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(5) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.

Table 11

352F Excavator without a Quick Coupler[1]									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom		6.55 m (21 ft 6 inch) Mass Boom	
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.0 m (9 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick
Severe Duty (SD)	TB	1400 mm (55 inch)	1.87 m^3 (2.44 yd^3)	2180 kg (4805 lb)	90	[4]	[4]		
		1550 mm (61 inch)	2.14 m^3 (2.80 yd^3)	2340 kg (5160 lb)		[4]	[4]		
		1700 mm (67 inch)	2.41 m^3 (3.16 yd^3)	2515 kg (5540 lb)		[4]	[4]		
		1850 mm (74 inch)	2.69 m^3 (3.52 yd^3)	2730 kg (6010 lb)		[4]	[4]		
		1900 mm (75 inch)	2.78 m^3 (3.64 yd^3)	2720 kg (5990 lb)		[4]	[3]		
	UB	1450 mm (58 inch)	2.39 m^3 (3.13 yd^3)	2540 kg (5600 lb)				[4]	[4]
		1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	2650 kg (5840 lb)				[4]	[4]
		1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2730 kg (6015 lb)				[4]	[4]
		1850 mm (73 inch)	3.21 m^3 (4.20 yd^3)	2990 kg (6590 lb)				[3]	[4]
		1950 mm (77 inch)	3.43 m^3 (4.48 yd^3)	3060 kg (6740 lb)				[2]	[3]
Extreme Duty (XD)	UB	1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	3090 kg (6815 lb)				[4]	[4]
		1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	3190 kg (7035 lb)				[3]	[4]

[1] Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes
[2] 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
[3] 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
[4] 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.

Table 12

352F Excavator with a Quick Coupler (CW55)[1]									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom		6.5 m (21 ft 4 inch) Mass Boom	
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.0 m (9 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick
Heavy Duty (HD)	TB	1650 mm (65 inch)	2.41 m^3 (3.15 yd^3)	2195 kg (4840 lb)	100	[5]	[4]		
	UB	1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2480 kg (5465 lb)				[3]	[4]

(continued)

(Table 12, contd)

		1850 mm (73 inch)	3.19 m^3 (4.16 yd^3)	2665 kg (5870 lb)				(2)	(3)
Severe Duty (SD)	UB	1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	25470 kg (5665 lb)	90			(5)	(5)
		1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2655 kg (5850 lb)				(4)	(5)
Extreme Duty (XD)	UB	1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	3090 kg (6800 lb)				(4)	(5)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes
(2) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.
(3) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(4) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(5) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.

Fixed Gauge

Table 13

349F L Excavator without a Quick Coupler(1)									
Bucket Type	**Linkage**	**Width of Bucket**	**SAE Capacity of Bucket**	**Weight of Bucket**	**Fill (%)**	**6.9 m (22 ft 8 inch) Reach Boom**		**6.55 m (21 ft 6 inch) Mass Boom**	
						2.9 m (9 ft 6 inch) Stick	**3.35 m (11 ft) Stick**	**2.5 m (8 ft 2 inch) Stick**	**3.0 m (9 ft 10 inch) Stick**
General Duty (GD)	TB	1370 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1755 kg (3870 lb)	100	(3)	(3)		
	UB	1450 mm (58 inch)	2.39 m^3 (3.13 yd^3)	2325 kg (5125 lb)				(3)	(3)
		1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	2420 kg (5330 lb)				(3)	(5)
		2000 mm (80 inch)	3.60 m^3 (4.71 yd^3)	2900 kg (6390 lb)				(2)	(2)
Heavy Duty (HD)	TB	1350 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1974 kg (4350 lb)		(3)	(3)		
		1500 mm (60 inch)	2.41 m^3 (3.16 yd^3)	2065 kg (4550 lb)		(3)	(5)		
		1650 mm (65 inch)	2.41 m^3 (3.15 yd^3)	2210 kg (4870 lb)		(3)	(5)		
		1800 mm (71 inch)	2.69 m^3 (3.52 yd^3)	2425 kg (5340 lb)		(5)	(4)		
		1850 mm (74 inch)	2.78 m^3 (3.64 yd^3)	2420 kg (5335 lb)		(5)	(4)		
	UB	1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2580 kg (5690 lb)				(5)	(4)
		1850 mm (73 inch)	3.19 m^3 (4.16 yd^3)	2740 kg (6040 lb)				(4)	(2)
		1950 mm (77 inch)	3.43 m^3 (4.48 yd^3)	2900 kg (6390 lb)				(4)	(2)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes

(continued)

(Table 13, contd)
(2) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.
(3) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.
(4) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.
(5) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.

Table 14

349F L Excavator without a Quick Coupler(1)									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom		6.55 m (21 ft 6 inch) Mass Boom	
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick
Severe Duty (SD)	TB	1400 mm (55 inch)	1.87 m³ (2.44 yd³)	2180 kg (4805 lb)	90	(4)	(4)		
		1550 mm (61 inch)	2.14 m³ (2.80 yd³)	2340 kg (5160 lb)		(4)	(4)		
		1700 mm (67 inch)	2.41 m³ (3.16 yd³)	2515 kg (5540 lb)		(4)	(5)		
		1850 mm (74 inch)	2.69 m³ (3.52 yd³)	2730 kg (6010 lb)		(5)	(3)		
		1900 mm (75 inch)	2.78 m³ (3.64 yd³)	2720 kg (5990 lb)		(5)	(3)		
	UB	1450 mm (58 inch)	2.39 m³ (3.13 yd³)	2540 kg (5600 lb)				(4)	(4)
		1550 mm (62 inch)	2.61 m³ (3.41 yd³)	2650 kg (5840 lb)				(4)	(5)
		1650 mm (65 inch)	2.77 m³ (3.62 yd³)	2730 kg (6015 lb)				(4)	(5)
		1850 mm (73 inch)	3.21 m³ (4.20 yd³)	2990 kg (6590 lb)				(3)	(2)
		1950 mm (77 inch)	3.43 m³ (4.48 yd³)	3060 kg (6740 lb)				(3)	(2)
Extreme Duty (XD)	UB	1550 mm (62 inch)	2.61 m³ (3.41 yd³)	3090 kg (6815 lb)				(4)	(3)
		1650 mm (65 inch)	2.77 m³ (3.62 yd³)	3190 kg (7035 lb)				(5)	(3)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes
(2) 1200 kg/m³ (2000 lb/yd³) is the maximum density of material.
(3) 1500 kg/m³ (2500 lb/yd³) is the maximum density of material.
(4) 2100 kg/m³ (3500 lb/yd³) is the maximum density of material.
(5) 1800 kg/m³ (3000 lb/yd³) is the maximum density of material.

Table 15

349F L Excavator with a Quick Coupler (CW55)(1)									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom		6.5 m (21 ft 4 inch) Mass Boom	
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	2.5 m (8 ft 2 inch) Stick	3.0 m (9 ft 10 inch) Stick

(continued)

(Table 15, contd)

Heavy Duty (HD)	TB	1650 mm (65 inch)	2.41 m^3 (3.15 yd^3)	2195 kg (4840 lb)	100	(4)	(3)		
	UB	1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2480 kg (5465 lb)				(3)	(2)
		1850 mm (73 inch)	3.19 m^3 (4.16 yd^3)	2665 kg (5870 lb)				(2)	(1)
Severe Duty (SD)	UB	1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	25470 kg (5665 lb)	90			(4)	(3)
		1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2655 kg (5850 lb)				(4)	(3)
Extreme Duty (XD)	UB	1550 mm (62 inch)	2.61 m^3 (3.41 yd^3)	3090 kg (6800 lb)				(3)	(2)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 600 mm (24 inch) track shoes
(2) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.
(3) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(4) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.

Fixed Gauge

Table 16

349F L Excavator without a Quick Coupler(1)									
Bucket Type	**Linkage**	**Width of Bucket**	**SAE Capacity of Bucket**	**Weight of Bucket**	**Fill (%)**	**6.9 m (22 ft 8 inch) Reach Boom**			**Long Reach Boom**
						2.9 m (9 ft 6 inch) Stick	**3.35 m (11 ft) Stick**	**3.9 m (12 ft 10 inch) Stick**	**4.3 m (14 ft 1 inch) Stick**
General Duty (GDC)	TB	750 mm (30 inch)	0.95 m^3 (1.24 yd^3)	1310 kg (2890 lb)	100	(2)	(2)	(2)	(2)
		900 mm (36 inch)	1.23 m^3 (1.60 yd^3)	1440 kg (3175 lb)		(2)	(2)	(2)	(2)
		1050 mm (42 inch)	1.51 m^3 (1.98 yd^3)	1525 kg (3361 lb)		(2)	(2)	(2)	(2)
		1200 mm (48 inch)	1.80 m^3 (2.36 yd^3)	1676 kg (3695 lb)		(2)	(2)	(2)	(2)
		1350 mm (54 inch)	2.10 m^3 (2.74 yd^3)	1795 kg (3950 lb)		(2)	(2)	(2)	(3)
		1500 mm (60 inch)	2.39 m^3 (3.13 yd^3)	1945 kg (4280 lb)		(2)	(2)	(3)	(4)
		1700 mm (68 inch)	2.78 m^3 (3.64 yd^3)	2130 kg (4690 lb)		(3)	(4)	(4)	(5)
		1850 mm (74 inch)	3.08 m^3 (4.04 yd^3)	2255 kg (4970 lb)		(4)	(4)	(5)	(5)
General Duty XL (GDXL)	TB	2045 mm (80 inch)	3.82 m^3 (5.00 yd^3)	2375 kg (5230 lb)		(5)	(5)	(6)	(6)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 750 mm (30 inch) track shoes
(2) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.
(3) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(4) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(5) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.
(6) 900 kg/m^3 (1500 lb/yd^3) is the maximum density of material.

Table 17

349F L Excavator without a Quick Coupler[1]											
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom			6.55 m (21 ft 6 inch) Mass Boom		Long reach Boom
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	3.0 m (9 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick	4.3 m (14 ft 1 inch) Stick
Heavy Duty (HD)	TB	900 mm (36 inch)	1.08 m^3 (1.41 yd^3)	1595 kg (3515 lb)	100	[2]	[2]	[2]			[2]
		1050 mm (42 inch)	1.34 m^3 (1.75 yd^3)	1685 kg (3700 lb)		[2]	[2]	[2]			[2]
		1200 mm (48 inch)	1.60 m^3 (2.09 yd^3)	1835 kg (4045 lb)		[2]	[2]	[2]			[2]
		1350 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1975 kg (4350 lb)		[2]	[2]	[2]			[2]
		1500 mm (60 inch)	2.14 m^3 (2.80 yd^3)	2125 kg (4685 lb)		[2]	[2]	[3]			[3]
		1650 mm (66 inch)	2.41 m^3 (3.15 yd^3)	2285 kg (5040 lb)		[2]	[3]	[4]			[4]
		1800 mm (71 inch)	2.69 m^3 (3.52 yd^3)	2425 kg (5340 lb)		[3]	[4]	[4]			[5]
	UB	1650 mm (65 inch)	2.77 m^3 (3.62 yd^3)	2580 kg (5690 lb)					[4]	[3]	
		1850 mm (73 inch)	3.19 m^3 (4.16 yd^3)	2740 kg (6040 lb)					[5]	[4]	
		1950 mm (77 inch)	3.43 m^3 (4.48 yd^3)	2900 kg (6390lb)					[5]	[4]	

(1) Equipped with a 9000 kg (19840 lb) counterweight and 750 mm (30 inch) track shoes
(2) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.
(3) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(4) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(5) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.

Table 18

349F L Excavator without a Quick Coupler[1]											
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom			6.55 m (21 ft 6 inch) Mass Boom		Long reach Boom
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	3.0 m (9 ft 10 inch) Stick	2.5 m (8 ft 2 inch) Stick	4.3 m (14 ft 1 inch) Stick
Severe Duty (SD)	TB	760 mm (30 inch)	0.88 m^3 (1.15 yd^3)	1445 kg (3190 lb)	90	(2)	(2)	(2)			(2)
		900 mm (36 inch)	1.08 m^3 (1.41 yd^3)	1675 kg (3695 lb)		(2)	(2)	(2)			(2)
		1050 mm (42 inch)	1.34 m^3 (1.75 yd^3)	1780 kg (3920 lb)		(2)	(2)	(2)			(2)
		1200 mm (48 inch)	1.60 m^3 (2.09 yd^3)	1950 kg (4300 lb)		(2)	(2)	(2)			(2)
		1400 mm (55 inch)	1.87 m^3 (2.44 yd^3)	2180 kg (4805 lb)		(2)	(2)	(2)			(2)
		1550 mm (61 inch)	2.14 m^3 (2.80 yd^3)	2380 kg (5250 lb)		(2)	(2)	(2)			(3)
		1700 mm (67 inch)	2.41 m^3 (3.16 yd^3)	2525 kg (5565 lb)		(2)	(3)	(3)			(4)
		1850 mm (74 inch)	2.69 m^3 (3.52 yd^3)	2725 kg (6005 lb)		(3)	(4)	(4)			
	UB	1450 mm (58 inch)	2.39 m^3 (3.13 yd^3)	2540 kg (5600 lb)					(2)	(2)	
		1850 mm (73 inch)	3.21 m^3 (4.20 yd^3)	2990 kg (6580 lb)					(4)	(3)	
Extreme Duty (XD)	TB	1250 mm (49 inch)	1.60 m^3 (2.09 yd^3)	2225 kg (4900 lb)		(2)	(2)	(2)			(2)
		1400 mm (55 inch)	1.87 m^3 (2.44 yd^3)	2365 kg (5215 lb)		(2)	(2)	(2)			(2)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 750 mm (30 inch) track shoes
(2) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.
(3) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(4) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.

Table 19

349F L Excavator with a Center Lock Quick Coupler[1]									
Bucket Type	Linkage	Width of Bucket	SAE Capacity of Bucket	Weight of Bucket	Fill (%)	6.9 m (22 ft 8 inch) Reach Boom			Long Reach Boom
						2.9 m (9 ft 6 inch) Stick	3.35 m (11 ft) Stick	3.9 m (12 ft 10 inch) Stick	4.3 m (14 ft 1 inch) Stick
General Duty (GDC)	TB	750 mm (30 inch)	0.95 m^3 (1.24 yd^3)	1310 kg (2890 lb)	100	(2)	(2)	(2)	(2)

(continued)

(Table 19, contd)

		900 mm (36 inch)	1.23 m^3 (1.60 yd^3)	1440 kg (3175 lb)		(2)	(2)	(2)	(2)
		1050 mm (42 inch)	1.51 m^3 (1.98 yd^3)	1525 kg (3361 lb)		(2)	(2)	(2)	(2)
		1200 mm (48 inch)	1.80 m^3 (2.36 yd^3)	1676 kg (3695 lb)		(2)	(2)	(2)	(3)
		1350 mm (54 inch)	2.10 m^3 (2.74 yd^3)	1795 kg (3950 lb)		(2)	(2)	(3)	(4)
		1500 mm (60 inch)	2.39 m^3 (3.13 yd^3)	1945 kg (4280 lb)		(3)	(4)	(4)	(5)
		1700 mm (68 inch)	2.78 m^3 (3.64 yd^3)	2130 kg (4690 lb)		(4)	(5)	(5)	(7)
		1850 mm (74 inch)	3.08 m^3 (4.04 yd^3)	2255 kg (4970 lb)		(5)	(5)	(6)	(5)
General Duty XL (GDXL)	TB	2045 mm (80 inch)	3.82 m^3 (5.00 yd^3)	2375 kg (5230 lb)		(6)	(6)	(7)	(7)
Heavy Duty (HD)	TB	900 mm (36 inch)	1.08 m^3 (1.41 yd^3)	1595 kg (3515 lb)		(2)	(2)	(2)	(2)
		1050 mm (42 inch)	1.34 m^3 (1.75 yd^3)	1685 kg (3715 lb)		(2)	(2)	(2)	(2)
		1200 mm (48 inch)	1.60 m^3 (2.09 yd^3)	1835 kg (4045 lb)		(2)	(2)	(2)	(2)
		1350 mm (54 inch)	1.87 m^3 (2.44 yd^3)	1975 kg (4350 lb)		(2)	(2)	(3)	(4)
		1500 mm (60 inch)	2.14 m^3 (2.80 yd^3)	2125 kg (4685 lb)		(2)	(3)	(4)	(5)
		1650 mm (66 inch)	2.41 m^3 (3.15 yd^3)	2290 kg (5040 lb)		(3)	(4)	(5)	(5)
		1800 mm (71 inch)	2.69 m^3 (3.52 yd^3)	2425 kg (5340 lb)		(4)	(5)	(5)	(6)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 750 mm (30 inch) track shoes
(2) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.
(3) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(4) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(5) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.
(6) 900 kg/m^3 (1500 lb/yd^3) is the maximum density of material.
(7) Not Recommended

Table 20

349F L Excavator with a Center Lock Quick Coupler(1)									
Bucket Type	**Linkage**	**Width of Bucket**	**SAE Capacity of Bucket**	**Weight of Bucket**	**Fill (%)**	**6.9 m (22 ft 8 inch) Reach Boom**			**Long Reach Boom**
						2.9 m (9 ft 6 inch) Stick	**3.35 m (11 ft) Stick**	**3.9 m (12 ft 10 inch) Stick**	**4.3 m (14 ft 1 inch) Stick**
Severe Duty (SD)	TB	760 mm (30 inch)	0.88 m^3 (1.15 yd^3)	1445 kg (3190 lb)	90	(2)	(2)	(2)	(2)

(continued)

(Table 20, contd)

		900 mm (36 inch)	1.08 m^3 (1.41 yd^3)	1675 kg (3700 lb)		(2)	(2)	(2)	(2)
		1050 mm (42 inch)	1.34 m^3 (1.75 yd^3)	1780 kg (3920 lb)		(2)	(2)	(2)	(2)
		1200 mm (48 inch)	1.60 m^3 (2.09 yd^3)	1950 kg (4300 lb)		(2)	(2)	(2)	(2)
		1400 mm (55 inch)	1.87 m^3 (2.44 yd^3)	2180 kg (4805 lb)		(2)	(2)	(3)	(4)
		1550 mm (61 inch)	2.14 m^3 (2.80 yd^3)	2380 kg (5250 lb)		(2)	(3)	(4)	(5)
		1700 mm (67 inch)	2.41 m^3 (3.16 yd^3)	2525 kg (5565 lb)		(3)	(4)	(5)	(5)
		1850 mm (74 inch)	2.69 m^3 (3.52 yd^3)	2725 kg (6010 lb)		(4)	(5)	(5)	
Extreme Duty (XD)	TB	1250 mm (49 inch)	1.60 m^3 (2.09 yd^3)	2225 kg (4900 lb)		(2)	(2)	(2)	(3)
		1400 mm (55 inch)	1.87 m^3 (2.44 yd^3)	2365 kg (5215 lb)		(2)	(2)	(3)	(4)

(1) Equipped with a 9000 kg (19840 lb) counterweight and 750 mm (30 inch) track shoes
(2) 2100 kg/m^3 (3500 lb/yd^3) is the maximum density of material.
(3) 1800 kg/m^3 (3000 lb/yd^3) is the maximum density of material.
(4) 1500 kg/m^3 (2500 lb/yd^3) is the maximum density of material.
(5) 1200 kg/m^3 (2000 lb/yd^3) is the maximum density of material.

Consult your Cat dealer for more information.

i07184239

Lifting Capacities

SMCS Code: 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: TEW1–Up

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.

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

- lubricants
- full fuel tank
- steel track
- cab
- 75 kg (165 lb) operator

Lifting capacities will vary with different work tools and attachments. Consult your Caterpillar dealer regarding the lifting capacities for specific work tools and attachments.

Note: 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.

Special hazards (toxic gases, ground conditions, etc.) require special precautions. The operator must determine whether special hazards exist in each application. The operator shall perform the appropriate steps to eliminate the hazard. The operator shall perform the appropriate steps to reduce the hazard.

For European applications, 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.

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.

Note: Certain European countries require a load sensing indicator and a stick and boom lowering control device if 1000 kg (2200 lb) or more is lifted during object handling applications. These countries also require a load sensing indicator and a stick and boom lowering control device if a moment is generated that is greater than or equal to 40000 N·m (29500 lb ft) during the object handling applications. Please comply with local and national requirements. To ensure compliance in these countries, (a) do not lift a load of 1000 kg (2200 lb) or more if the machine is not equipped with a load sensing indicator and a stick and boom lowering control device, and (b) do not equal or exceed a moment of 40000 N·m (29500 lb ft) in object handling applications if the machine is not equipped with a load sensing indicator and a stick and boom lowering control device.

Symbols Found in the Lifting Capacity Charts

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

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

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



Lift Capacities are provided in kilograms and pounds

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



Lift point radius



Lift point height



Lifting capacity over the front of the machine



Lifting capacity over the side of the machine

Heavy Lift ON

Fixed Gauge (Mass Boom)(600 MM DG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
													(mm) (inch)
7500 300											▪ 13050 ▪ 28900	11700 26350	7110 280
6000 240							▪ 15250 ▪ 33150	15150 32600	▪ 13800 ▪ 30200	10550 22700	▪ 12700 ▪ 27950	9400 20900	8030 320
4500 180					▪ 22650 ▪ 48500	22150 47900	▪ 17150 ▪ 37050	14350 31000	▪ 14500 ▪ 31600	10250 22050	▪ 12850 ▪ 28250	8200 18150	8600 340
3000 120					▪ 58350	43700	▪ 19200 ▪ 41500	13550 29200	▪ 15500 ▪ 33650	9800 21150	12350 27200	7600 16800	8880 350
1500 60							▪ 20650 ▪ 44650	12900 27800	15650 33650	9450 20400	12100 26700	7450 16350	8890 350
0 0					▪ 23950 ▪ 56350	19150 41100	▪ 21000 ▪ 45500	12550 27000	15400 33100	9250 19900	12500 27600	7650 16800	8640 340
-1500 -60			▪ 18000 ▪ 41100	▪ 18000 ▪ 41100	▪ 26050 ▪ 56650	19200 41250	▪ 20150 ▪ 43650	12450 26850	15300 33000	9200 19800	13750 30350	8300 18350	8100 320
-3000 -120			▪ 27750 ▪ 60500	▪ 27750 ▪ 60500	▪ 22750 ▪ 49200	19500 41900	▪ 17800 ▪ 38300	12650 27250			▪ 14000 ▪ 30800	9900 21950	7210 290
-4500 -180					▪ 16800 ▪ 35700	▪ 16800 ▪ 35700					▪ 12750 ▪ 27850	▪ 12750 ▪ 27850	5800 230

Illustration 73 g03650453

Lift Chart Above: 349F L, 6550 mm (258 inch) mass boom (heavy lift), 2500 mm (99 inch) stick, and 600 mm (24 inch) DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
7500 300									▪ 11550	10800			▪ 10000 ▪ 22050	▪ 10000 ▪ 22050	7670 300
6000 240									▪ 12900 ▪ 28200	10650 22900			▪ 9700 ▪ 21400	8500 18950	8540 340
4500 180					▪ 20800 ▪ 44600	▪ 20800 ▪ 44600	▪ 16100 ▪ 34850	14550 31300	▪ 13800 ▪ 29950	10300 22100	▪ 10750	7600	▪ 9800 ▪ 21600	7500 16650	9070 360
3000 120					▪ 25500 ▪ 54800	20650 44600	▪ 18350 ▪ 39600	13650 29400	▪ 14900 ▪ 32300	9850 21150	12050 25900	7400 15950	▪ 10250 ▪ 22500	7000 15450	9330 370
1500 60					▪ 22900 ▪ 55100	19400 41750	▪ 20050 ▪ 43400	12900 27800	15600 33550	9400 20250	11800 25400	7200 15500	▪ 11050 ▪ 24250	6800 15000	9340 370
0 0					▪ 25950 ▪ 60500	18950 40750	▪ 20300 ▪ 45050	12450 26800	15250 32850	9100 19650	11650	7100	11500 25250	6950 15350	9110 360
-1500 -60			▪ 17850 ▪ 40400	▪ 17850 ▪ 40400	▪ 26950 ▪ 58450	18900 40600	▪ 20400 ▪ 44150	12300 26450	15150 32550	9000 19400			12450 27450	7500 16550	8600 340
-3000 -120			▪ 29450 ▪ 66650	▪ 29450 ▪ 66650	▪ 24100 ▪ 52200	19150 41100	▪ 18600 ▪ 40150	12350 26650	▪ 14200 ▪ 30250	9100 19650			▪ 13400 ▪ 29450	8750 19350	7760 310
-4500 -180					▪ 19150 ▪ 41000	▪ 19150 ▪ 41000	▪ 14500 ▪ 30500	12800 27600					▪ 12800 ▪ 28100	11550 25900	6480 260

Illustration 74 g03650460

Lift Chart Above: 349F L, 6550 mm (258 inch) mass boom (heavy lift), 3000 mm (118 inch) stick, and 600 mm (24 inch) DG track shoes

Fixed Gauge (Mass Boom)(900 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
													(mm) (inch)
+8													
7500 300											* 13050 * 28900	11950 26950	7110 280
6000 240							* 15250 * 33150	* 15250 * 33150	* 13800 * 30200	10800 23250	* 12700 * 27950	9650 21400	8030 320
4500 180					* 22650 * 48500	* 22650 * 48500	* 17150 * 37050	14700 31700	* 14500 * 31600	10500 22600	* 12850 * 28250	8450 18650	6600 340
3000 120					* 58350	44750	* 19200 * 41500	13850 29900	* 15500 * 33650	10100 21700	12700 27950	7850 17250	5880 350
1500 60							* 20650 * 44650	13250 28500	16050 34550	9700 20950	12450 27450	7650 16800	5890 350
0 0					* 23950 * 56350	19650 42200	* 21000 * 45500	12900 27750	15800 34000	9500 20450	12900 28350	7850 17250	5640 340
-1500 -60			* 18000 * 41100	* 18000 * 41100	* 26050 * 56650	19700 42350	* 20150 * 43650	12800 27600	15750 33900	9450 20350	14150 * 31150	8550 18850	5100 320
-3000 -120			* 27750 * 60500	* 27750 * 60500	* 22750 * 49200	20000 43000	* 17300 * 38300	13000 28000			* 14000 * 30800	10150 22550	7210 290
-4500 -180					* 16800 * 35700	* 16800 * 35700					* 12750 * 27850	* 12750 * 27850	5800 230

Illustration 75 g03650464

Lift Chart Above: 349F L, 6550 mm (258 inch) mass boom (heavy lift), 2500 mm (99 inch) stick, and 900 mm (36 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
7500 300									* 11550	11050			* 10000 * 22050	* 10000 * 22050	7670 300
6000 240									* 12900 * 28200	10900 23450			* 9700 * 21400	8750 19450	8540 340
4500 180					* 20800 * 44600	* 20800 * 44600	* 16100 * 34850	14850 32050	* 13800 * 29950	10550 22650	* 10750	7850	* 9800 * 21600	7750 17100	9070 360
3000 120					* 25500 * 54800	21150 45700	* 18350 * 39600	13950 30100	* 14900 * 32300	10100 21700	12400 26600	7650 16400	* 10250 * 22500	7200 15850	9330 370
1500 60					* 22900 * 55100	19900 42850	* 20050 * 43400	13250 28500	* 15850 * 34350	9650 20800	12150 26150	7400 15950	* 11050 * 24250	7000 15450	9340 370
0 0					* 25950 * 60500	19450 41850	* 20800 * 45050	12800 27550	15700 33800	9400 20200	12000	7300	11800 26000	7150 15800	9110 360
-1500 -60			* 17850 * 40400	* 17850 * 40400	* 26950 * 58450	19400 41700	* 20400 * 44150	12650 27200	15550 33500	9250 19950			12800 28250	7750 17050	8600 340
-3000 -120			* 29450 * 66650	* 29450 * 66650	* 24100 * 52200	19650 42200	* 18600 * 40150	12700 27400	* 14200 * 30250	9350 20250			* 13400 * 29450	8950 19900	7760 310
-4500 -180					* 19150 * 41000	* 19150 * 41000	* 14500 * 30500	13100 28350					* 12800 * 28100	11850 26600	6480 260

Illustration 76 g03650467

Lift Chart Above: 349F L, 6550 mm (258 inch) mass boom (heavy lift), 3000 mm (118 inch) stick, and 900 mm (36 inch) TG track shoes

Fixed Gauge (Reach Boom)(900 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
9000													* 9050	* 9050	7300
360													* 20050	* 20050	290
7500									* 11950	11600			* 8500	* 8500	8480
300									* 26250	24900			* 18750	* 18750	330
6000									* 12500	11350	* 10750	8450	* 8350	8000	9270
240									* 27300	24450	* 20250	18100	* 18350	17800	370
4500					* 20750	* 20750	* 16000	15300	* 13600	10950	* 12250	8300	* 8450	7250	9770
180					* 44500	* 44500	* 34600	33050	* 29550	23650	* 26700	17800	* 18550	16000	390
3000					* 25750	21750	* 18400	14450	* 14850	10500	12800	8050	* 8800	6850	10010
120					* 55300	46950	* 39700	31150	* 32250	22650	27550	17300	* 19200	15050	400
1500					* 18600	* 18600	* 20250	13750	* 15950	10100	12550	7800	* 9400	6700	10020
60					* 44500	44200	* 43800	29600	* 34600	21750	27000	16800	* 20700	14700	400
0					* 20950	20100	* 21150	13300	16150	9800	12350	7650	* 10400	6800	9800
0					* 48650	43200	* 45800	28650	34700	21100	26600	16450	* 22900	15000	390
-1500			* 14900	* 14900	* 27700	20050	* 20950	13100	15950	9650	12300	7600	11700	7250	9330
-60			* 33650	* 33650	* 60150	43100	* 45400	28250	34350	20800	26500	16350	25800	15950	370
-3000			* 23850	* 23850	* 25350	20200	* 19650	13150	* 15450	9700			* 12800	8150	8570
-120			* 53850	* 53850	* 55000	43450	* 42450	28350	* 33250	20900			* 28150	18050	340
-4500			* 27400	* 27400	* 21400	20600	* 16700	13400					* 12600	10100	7430
-180			* 59150	* 59150	* 46100	44350	* 35800	28900					* 27650	22500	290

Illustration 77 g03650368

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 900 mm (36 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
9000 360													▪ 7900 ▪ 17500	▪ 7900 ▪ 17500	7860 310
7500 300													▪ 7550 ▪ 16600	▪ 7550 ▪ 16600	8970 350
6000 240									▪ 11650 ▪ 25350	11500 24700	▪ 11050 ▪ 22950	8550 18300	▪ 7450 ▪ 16400	▪ 7450 ▪ 16400	9720 380
4500 180							▪ 14800 ▪ 32050	▪ 14800 ▪ 32050	▪ 12800 ▪ 27750	11050 23800	▪ 11550 ▪ 25250	8300 17850	▪ 7600 ▪ 16650	6750 14950	10190 400
3000 120					▪ 23750 ▪ 51000	22200 47950	▪ 17300 ▪ 37400	14600 31450	▪ 14150 ▪ 30650	10550 22750	▪ 12300 ▪ 26750	8050 17300	▪ 7900 ▪ 17400	6400 14050	10420 410
1500 60					▪ 25800 ▪ 59100	20650 44550	▪ 19450 ▪ 42050	13750 29650	▪ 15400 ▪ 33350	10100 21700	12500 26900	7750 16700	▪ 8500 ▪ 18700	6250 13700	10430 410
0 0					▪ 23800 ▪ 55050	19950 42950	▪ 20700 ▪ 44850	13200 28450	16050 34550	9700 20950	12250 26400	7550 16250	▪ 9400 ▪ 20700	6300 13900	10220 410
-1500 -60			▪ 15300 ▪ 34450	▪ 15300 ▪ 34450	▪ 28150 ▪ 61050	19750 42450	▪ 20950 ▪ 45350	12950 27850	15850 34050	9500 20500	12150 26150	7450 16000	10850 23900	6650 14700	9770 390
-3000 -120	▪ 38550	▪ 38550	▪ 22300 ▪ 50350	▪ 22300 ▪ 50350	▪ 26350 ▪ 57100	19850 42600	▪ 20050 ▪ 43400	12900 27800	15800 33950	9450 20400	12150	7450	12100 26750	7400 16400	9050 360
-4500 -180			▪ 30900 ▪ 66650	▪ 30900 ▪ 66650	▪ 23050 ▪ 49700	20150 43350	▪ 17800 ▪ 38300	13100 28200	▪ 13750 ▪ 29250	9650 20800			▪ 12450 ▪ 27450	8900 19850	7980 320
-6000 -240					▪ 17400 ▪ 36750	▪ 17400 ▪ 36750	▪ 13100 ▪ 27200	▪ 13100 ▪ 27200					▪ 11950 ▪ 26150	▪ 11950 ▪ 26150	6380 250

Illustration 78 g03650424

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 3900 mm (154 inch) stick, and 900 mm (36 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
9000 360													▪ 9050 ▪ 20050	▪ 9050 ▪ 20050	7300 290
7500 300									▪ 11950 ▪ 26250	11500 24650			▪ 8500 ▪ 18750	▪ 8500 ▪ 18750	8480 330
6000 240									▪ 12500 ▪ 27300	11250 24200	▪ 10750 ▪ 20250	8350 17900	▪ 8350 ▪ 18350	7950 17600	9270 370
4500 180					▪ 20750 ▪ 44500	▪ 20750 ▪ 44500	▪ 16000 ▪ 34600	15150 32700	▪ 13600 ▪ 29550	10850 23400	▪ 12250 ▪ 26700	8200 17600	▪ 8450 ▪ 18550	7150 15800	9770 390
3000 120					▪ 25750 ▪ 55300	21500 46450	▪ 18400 ▪ 39700	14300 30850	▪ 14850 ▪ 32250	10400 22400	12700 27300	7950 17100	▪ 8300 ▪ 19300	6750 14850	10010 400
1500 60					▪ 18600 ▪ 44500	▪ 18600 43700	▪ 20250 ▪ 43800	13550 29250	▪ 15950 ▪ 34600	10000 21500	12450 26750	7700 16600	▪ 9400 ▪ 20700	6600 14550	10020 400
0 0					▪ 20950 ▪ 48650	19850 42700	▪ 21150 ▪ 45800	13150 28300	16000 34400	9700 20850	12250 26350	7550 16250	▪ 10400 ▪ 22900	6700 14800	9800 390
-1500 -60			▪ 14900 ▪ 33650	▪ 14900 ▪ 33650	▪ 27700 ▪ 60150	19800 42600	▪ 20950 ▪ 45400	12950 27900	15850 34050	9550 20550	12200 26250	7500 16150	11600 25600	7150 15750	9330 370
-3000 -120			▪ 23850 ▪ 53850	▪ 23850 ▪ 53850	▪ 25350 ▪ 55000	20000 42950	▪ 19650 ▪ 42450	13000 28000	▪ 15450 ▪ 33250	9550 20650			▪ 12800 ▪ 28150	8050 17850	8570 340
-4500 -180			▪ 27400 ▪ 59150	▪ 27400 ▪ 59150	▪ 21400 ▪ 46100	20400 43850	▪ 16700 ▪ 35800	13250 28600					▪ 12600 ▪ 27650	9950 22250	7430 290

Illustration 79 g03650468

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 900 mm (36 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
kg lb															(mm) (inch)
+ℓ															
9000													* 7900	* 7900	7860
360									* 18700	* 18700			* 17500	* 17500	310
7500													* 7550	* 7550	8970
300													* 16600	* 16600	350
6000									* 11650	11350	* 11050	8450	* 7450	7400	9720
240									* 25350	24450	* 22950	18100	* 16400	16350	380
4500							* 14800	* 14800	* 12800	10950	* 11550	8200	* 7600	6700	10190
180							* 32050	* 32050	* 27750	23550	* 25250	17650	* 16650	14750	400
3000					* 23750	22000	* 17300	14450	* 14150	10450	* 12300	7950	* 7900	6300	10420
120					* 51000	47450	* 37400	31150	* 30650	22500	* 26750	17100	* 17400	13900	410
1500					* 25800	20450	* 19450	13600	* 15400	9950	12400	7650	* 8500	6150	10430
60					* 56100	44050	* 42050	29350	* 33350	21450	26650	16500	* 18700	13550	410
0					* 23800	19700	* 20700	13050	15900	9600	12150	7450	* 9400	6250	10220
0					* 55050	42450	* 44850	28150	34250	20700	26150	16050	* 20700	13700	410
-1500			* 15300	* 15300	* 28150	19500	* 20950	12800	15700	9400	12050	7350	10750	6600	9770
-60			* 34450	* 34450	* 61050	41950	* 45350	27550	33750	20250	25900	15800	23650	14500	390
-3000			* 22300	* 22300	* 26350	19600	* 20050	12750	15650	9350	12050	7350	12000	7300	9050
-120	* 38550	* 38550	* 50350	* 50350	* 57100	42100	* 43400	27450	33650	20150			26500	16200	360
-4500			* 30900	* 30900	* 23050	19900	* 17800	12950	* 13750	9500			* 12450	8800	7980
-180			* 66650	* 66650	* 49700	42850	* 38300	27850	* 29250	20550			* 27450	19600	320
-6000					* 17400	* 17400	* 13100	* 13100					* 11950	* 11950	6380
-240					* 36750	* 36750	* 27200	* 27200					* 26150	* 26150	250

Illustration 80 g03650470

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 3900 mm (154 inch) stick, and 900 mm (36 inch) TG track shoes

Fixed Gauge (Long Reach Boom)(900 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360		10500 420				
																	(mm) (inch)
+8																	
9000 360															* 7150 * 15800	* 7150 * 15800	8900 350
7500 300											* 9700 * 20800	8600 18350			* 6900 * 15250	* 6900 * 15250	9890 390
6000 240											* 10100 * 22000	8400 18000	* 7350	6400	* 6900 * 15200	6300 14000	10570 420
4500 180							* 14200 * 30600	* 14200 * 30600	* 12050 * 26150	10300 23250	* 10750 * 23400	8100 17400	* 9850 * 19700	6250 13400	* 7100 * 15550	5750 12700	11010 440
3000 120					* 23250 * 49850	21400 46250	* 16700 * 36000	14100 30450	* 13450 * 29150	10200 22000	* 11550 * 25100	7750 16700	9850 21150	6050 13000	* 7400 * 16250	5400 11950	11220 450
1500 60					* 18950 * 44950	* 18950 42450	* 18300 * 40600	13150 28400	* 14750 * 31900	9650 20300	12150 26150	7400 15950	9650 20700	5900 12600	* 7950 * 17450	5300 11600	11230 450
0 0					* 18100 * 41800	* 18100 40750	* 20050 * 43400	12550 27050	15550 33450	9250 19900	11850 25500	7150 15400	9450 20350	5700 12300	* 8750 * 19250	5300 11700	11040 440
-1500 -60			* 12200 * 27500	* 12200 * 27500	* 21750 * 49700	18700 40200	* 20350 * 44100	12250 26350	15250 32800	9000 19350	11650 25100	7000 15050	9350	5650	9250 20350	5550 12250	10620 420
-3000 -120	* 14150 * 31550	* 14150 * 31550	* 17800 * 40050	* 17800 * 40050	* 26000 * 56350	18750 40300	* 19750 * 42750	12150 26150	15150 32600	8900 19150	11600 25000	6950 14950			10100 22300	6050 13400	9960 400
-4500 -180			* 24450 * 55300	* 24450 * 55300	* 23400 * 50500	19050 40950	* 18100 * 39100	12300 26450	* 14350 * 30850	8950 19350	* 11200	7050			* 11200 * 24650	7050 15650	9010 360
-6000 -240			* 24950	* 24950	* 19150 * 41000	* 19150 * 41000	* 15050 * 32000	12650 27250	* 11450	9300					* 11100 * 24400	9100 20450	7630 300

Illustration 81 g03650476

Lift Chart Above: 349F L, 7400 mm (291 inch) long reach boom (heavy lift), 4300 mm (169 inch) stick, and 900 mm (36 inch) TG track shoes

Variable Gauge (Long Reach Boom) (900 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360		10500 420				
																	(mm) (inch)
+ℓ																	
9000											* 7150	* 7150			* 7100	* 7100	9020
360															* 15700	* 15700	350
7500											* 9700	9350			* 6900	* 6900	9970
300											* 21300	20050			* 15200	* 15200	390
6000											* 10150	9150	* 7650	7050	* 6900	6900	10630
240											* 22100	19700			* 15200	* 15200	420
4500							* 14450	* 14450	* 12200	11750	* 10850	8850	* 10000	6900	* 7100	6300	11040
180							* 31150	* 31150	* 26400	25350	* 23550	19050	* 20200	14750	* 15600	13950	440
3000					* 23700	23550	* 16950	15450	* 13600	11150	* 11650	8500	10200	6700	* 7450	6000	11230
120					* 50850	50800	* 36550	33300	* 29450	24050	* 25300	18300	21900	14350	* 16350	13200	450
1500					* 18500	* 18500	* 19000	14500	* 14850	10600	* 12400	8200	10000	6500	* 8000	5850	11220
60					* 43650	* 43650	* 41000	31300	* 32150	22900	* 26900	17600	21500	13950	* 17600	12900	450
0			* 7500	* 7500	* 18350	* 18350	* 20150	13900	* 15700	10200	12300	7900	9850	6350	* 8850	5950	11000
0			* 17000	* 17000	* 42250	* 42250	* 43550	29950	* 33950	22000	26500	17050	21150	13650	* 19450	13050	440
-1500			* 12750	* 12750	* 22250	21000	* 20350	13600	15850	9950	12150	7750	9750	6300	9700	6250	10570
-60			* 28700	* 28700	* 50850	45050	* 44050	29300	34050	21450	26100	16700			21350	13700	420
-3000	* 14650	* 14650	* 18400	* 18400	* 25800	21050	* 19650	13550	* 15550	9900	12100	7700			10650	6850	9880
-120	* 32700	* 32700	* 41450	* 41450	* 55850	45250	* 42500	29200	* 33550	21300	26050	16650			23500	15100	390
-4500			* 25250	* 25250	* 23050	21350	* 17900	13700	* 14150	10000					* 11200	8000	8890
-180			* 57050	* 57050	* 49750	45900	* 38550	29550	* 30400	21550					* 24650	17750	350
-6000					* 18600	* 18600	* 14600	14100							* 11050	10450	7460
-240					* 39750	* 39750	* 30950	30400							* 24300	23500	290

Illustration 82 g03650432

Lift Chart Above: 352F , 7400 mm (291 inch) long reach boom (heavy lift), 4300 mm (169 inch) stick, and 900 mm (36 inch) TG track shoes

Variable Gauge (Reach Boom)(900 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
kg lb															(mm) (inch)
+ℓ															
9000 360													* 8950 * 19850	* 8950 * 19850	7450 290
7500 300									* 12000 * 26250	* 12000 * 26250			* 8450 * 18700	* 8450 * 18700	8580 340
6000 240									* 12600 * 27450	12250 26350	* 11200 * 21550	9150 19600	* 8350 * 18350	* 8350 * 18350	9340 370
4500 180					* 21300 * 45600	* 21300 * 45600	* 16250 * 35100	* 16250 * 35100	* 13750 * 29800	11850 25500	* 12300 * 26800	8950 19250	* 8450 * 18400	7800 17250	9800 390
3000 120					* 26150 * 56200	23700 51100	* 18600 * 40200	15650 33700	* 15000 * 32500	11350 24500	* 12950 * 28100	8700 18750	* 8850 * 19450	7400 16300	10020 400
1500 60					* 18500 * 44050	* 18500 * 44050	* 20400 * 44100	14950 32200	* 16050 * 34800	10950 23600	12900 27750	8500 18250	* 9500 * 20850	7300 16050	10010 400
0 0					* 21500 * 49850	* 21500 47600	* 21200 * 45900	14500 31250	16550 35650	10700 23000	12700 27350	8350 17950	* 10550 * 23200	7450 16400	9760 390
-1500 -60			* 15750 * 35600	* 15750 * 35600	* 27550 * 59750	22100 47500	* 20900 * 45250	14350 30900	16400 35350	10550 22700	12650 27250	8250 17850	12150 26850	8000 17600	9270 370
-3000 -120			* 24850 * 56150	* 24850 * 56150	* 25050 * 54300	22300 47950	* 19450 * 42000	14400 31050	* 15250 * 32800	10600 22850			* 12800 * 28150	9050 20050	8470 340
-4500 -180			* 26650 * 57400	* 26650 * 57400	* 20850 * 44900	* 20850 * 44900	* 16300 * 34800	14700 31700					* 12500 * 27500	11300 25300	7290 290

Illustration 83 g03650443

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 900 mm (36 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
+ℓ															
9000													* 7850	* 7850	7990
360													* 17350	* 17350	310
7500											* 7850	* 7850	* 7500	* 7500	9060
300													* 16550	* 16550	360
6000									* 11750	* 11750	* 11050	9200	* 7450	* 7450	9780
240									* 25550	* 25550	* 23600	19800	* 16400	* 16400	390
4500							* 15050	* 15050	* 12900	11900	* 11650	9000	* 7600	7300	10220
180							* 32550	* 32550	* 28050	25650	* 25350	19300	* 16700	16150	410
3000					* 24250	24150	* 17550	15750	* 14300	11400	* 12350	8700	* 7950	6950	10430
120					* 52050	* 52050	* 37900	34000	* 30950	24550	* 26900	18750	* 17500	15250	410
1500					* 25000	22650	* 19650	14950	* 15500	10950	12850	8450	* 8600	6800	10420
60					* 59350	48750	* 42450	32250	* 33600	23550	27650	18150	* 18850	14950	410
0			* 9650	* 9650	* 24050	22000	* 20800	14450	* 16300	10600	12600	8200	* 9550	6950	10180
0			* 21850	* 21850	* 55600	47250	* 45000	31050	* 35250	22800	27150	17700	* 21000	15250	400
-1500			* 15950	* 15950	* 28050	21800	* 20900	14200	16250	10400	12500	8100	* 11050	7350	9710
-60			* 35900	* 35900	* 60300	46850	* 45250	30500	35000	22400	26900	17500	* 24450	16200	390
-3000			* 23100	* 23100	* 26100	21900	* 19900	14150	* 15650	10350			* 12350	8200	8960
-120			* 52150	* 52150	* 56550	47100	* 43050	30500	* 33800	22350			* 27250	18150	360
-4500			* 30200	* 30200	* 22600	22250	* 17500	14350	* 13400	10550			* 12450	10000	7840
-180			* 65100	* 65100	* 48700	47900	* 37550	30950	* 28400	22800			* 27450	22250	310
-6000					* 16600	* 16600	* 12350	* 12350					* 11800	* 11800	6170
-240													* 26850	* 26850	240

Illustration 84 g03650448

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom (heavy lift), 3900 mm (154 inch) stick, and 900 mm (36 inch) TG track shoes

i07185642

Lifting Capacities

SMCS Code: 7000

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: KBP1–Up

S/N: TEW1–Up

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.

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

- lubricants
- full fuel tank
- Steel track
- cab
- 75 kg (165 lb) operator

Lifting capacities will vary with different work tools and attachments. Consult your Caterpillar dealer regarding the lifting capacities for specific work tools and attachments.

Note: 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.

Special hazards (toxic gases, ground conditions, etc.) require special precautions. The operator must determine whether special hazards exist in each application. The operator shall perform the appropriate steps to eliminate the hazard. The operator shall perform the appropriate steps to reduce the hazard.

For European applications, 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.

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.

Note: Certain European countries require a load sensing indicator and a stick and boom lowering control device if 1000 kg (2200 lb) or more is lifted during object handling applications. These countries also require a load sensing indicator and a stick and boom lowering control device if a moment is generated that is greater than or equal to 40000 N·m (29500 lb ft) during the object handling applications. Please comply with local and national requirements. To ensure compliance in these countries, (a) do not lift a load of 1000 kg (2200 lb) or more if the machine is not equipped with a load sensing indicator and a stick and boom lowering control device, and (b) do not equal or exceed a moment of 40000 N·m (29500 lb ft) in object handling applications if the machine is not equipped with a load sensing indicator and a stick and boom lowering control device.

Symbols Found in the Lifting Capacity Charts

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

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

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



Lift Capacities are provided in kilograms and pounds

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



Lift point radius



Lift point height



Lifting capacity over the front of the machine



Lifting capacity over the side of the machine

Heavy Lift ON

Fixed Gauge (Mass Boom)(600 MM DG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
													(mm) (inch)
7500											* 11950	11800	7110
300											* 26450	* 26450	280
6000							* 13800	* 13800	* 12450	10700	* 11600	9500	8030
240							* 30000	* 30000	* 27250	22900	* 25600	21150	320
4500					* 20500	* 20500	* 15500	14500	* 13100	10350	* 11750	8300	8600
180					* 43950	* 43950	* 33500	31300	* 28500	22250	* 25850	18400	340
3000							* 17350	13700	* 13950	9950	* 12250	7700	8880
120					* 52800	44150	* 37450	29500	* 30300	21400	* 26950	17000	350
1500							* 18600	13050	* 14650	9550	12250	7500	8890
60							* 40250	28100	* 31750	20600	27000	16550	350
0					* 22650	19350	* 18900	12700	* 14850	9350	* 12550	7700	8640
0					* 53250	41600	* 40950	27350	* 32150	20100	* 27700	17000	340
-1500			* 17000	* 17000	* 23450	19450	* 18150	12600	* 14150	9300	* 12700	8400	8100
-60			* 38800	* 38800	* 51000	41750	* 39250	27200	* 30500	20050	* 27950	18600	320
-3000			* 24850	* 24850	* 20400	19700	* 15950	12800			* 12550	10000	7210
-120			* 54200	* 54200	* 44200	42400	* 34350	27550			* 27550	22200	290
-4500					* 15000	* 15000					* 11350	* 11350	5800
-180					* 31850	* 31850					* 24800	* 24800	230

Illustration 85 g03644951

Lift Chart Above: 349F L, 6550 mm (257 inch) mass boom, 2500 mm (100 inch) stick, and 600 mm (24 inch)DG track shoes

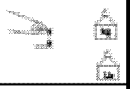
(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
													(mm) (inch)
7500 300											* 13050 * 28900	11800 26600	7110 280
6000 240							* 15250 * 33150	* 15250 32950	* 13800 * 30200	10700 22900	* 12700 * 27950	9500 21150	8030 320
4500 180					* 22650 * 48500	22400 48400	* 17150 * 37050	14500 31300	* 14500 * 31600	10350 22250	* 12850 * 28250	8300 18400	8600 340
3000 120					* 58350	44150	* 19200 * 41500	13700 29500	* 15500 * 33650	9950 21400	12450 27500	7700 17000	8880 350
1500 60							* 20650 * 44650	13050 28100	15800 34000	9550 20600	12250 27000	7500 16550	8890 350
0 0					* 23950 * 56350	19350 41600	* 21000 * 45500	12700 27350	15550 33450	9350 20100	12650 27900	7700 17000	8640 340
-1500 -60			* 18000 * 41100	* 18000 * 41100	* 26050 * 56650	19450 41750	* 20150 * 43650	12600 27200	15500 33350	9300 20050	13900 30650	8400 18600	8100 320
-3000 -120			* 27750 * 60500	* 27750 * 60500	* 22750 * 49200	19700 42400	* 17800 * 38300	12800 27550			* 14000 * 30800	10000 22200	7210 290
-4500 -180					* 16800 * 35700	* 16800 * 35700					* 12750 * 27850	* 12750 * 27850	5800 230

Illustration 86 g03645017

Lift Chart Above: 349F L, 6550 mm (257 inch) mass boom (heavy lift) , 2500 mm (100 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
7500 300									* 10550 	* 10550 			* 9100 * 20150	* 9100 * 20150	7670 300
6000 240									* 11650 * 25450	10750 23150			* 8850 * 19550	8600 19150	8540 340
4500 180					* 18800 * 40350	* 18800 * 40350	* 14550 * 31500	* 14550 * 31500	* 12400 * 27000	10400 22350	* 9800 	7700 	* 8950 * 19700	7600 16850	9070 360
3000 120					* 23050 * 49500	20900 45100	* 16550 * 35700	13800 29700	* 13400 * 29100	9950 21400	* 11650 * 25350	7500 16150	* 9350 * 20500	7100 15600	9330 370
1500 60					* 21600 * 52000	19600 42250	* 18100 * 39100	13050 28100	* 14250 * 30900	9500 20500	11950 25700	7300 15700	* 10050 * 22100	6900 15200	9340 370
0 0					* 24500 * 55350	19150 41200	* 18700 * 40550	12600 27150	* 14650 * 31750	9250 19900	11800 	7150 	* 11300 * 24850	7050 15550	9110 360
-1500 -60			* 16850 * 38100	* 16850 * 38100	* 24250 * 52600	19150 41100	* 18350 * 39650	12450 26750	* 14350 * 30950	9100 19650			* 11950 * 26300	7600 16750	8600 340
-3000 -120			* 27800 * 61250	* 27800 * 61250	* 21650 * 46900	19350 41600	* 16700 * 36000	12500 27000	* 12700 * 27050	9200 19900			* 12000 * 26350	8850 19600	7760 310
-4500 -180					* 17150 * 36650	* 17150 * 36650	* 12950 * 27200	12950 * 27200					* 11400 * 25000	* 11400 * 25000	6480 260

Illustration 87 g03645044

Lift Chart Above: 349F L, 6550 mm (257 inch) mass boom, 3000 mm (118 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
7500 300									* 11550	10900			* 10000 * 22050	* 10000 * 22050	7670 300
6000 240									* 12900 * 28200	10750 23150			* 9700 * 21400	8600 19150	8540 340
4500 180					* 20300 * 44600	* 20300 * 44600	* 16100 * 34850	14650 31650	* 13800 * 29950	10400 22350	* 10750	7700	* 9800 * 21600	7600 16850	9070 360
3000 120					* 25500 * 54800	20900 45100	* 18350 * 39600	13800 29700	* 14900 * 32300	9950 21400	12200 26150	7500 16150	* 10250 * 22500	7100 15600	9330 370
1500 60					* 22900 * 55100	19600 42250	* 20050 * 43400	13050 28100	15750 33900	9500 20500	11950 25700	7300 15700	* 11050 * 24250	6900 15200	9340 370
0 0					* 25950 * 60500	19150 41200	* 20800 * 45050	12600 27150	15450 33200	9250 19900	11800	7150	11600 25550	7050 15550	9110 360
-1500 -60			* 17850 * 40400	* 17850 * 40400	* 26950 * 58450	19150 41100	* 20400 * 44150	12450 26750	15300 32950	9100 19650			12600 27750	7600 16750	8600 340
-3000 -120			* 29450 * 66650	* 29450 * 66650	* 24100 * 52200	19350 41600	* 18600 * 40150	12500 27000	* 14200 * 30250	9200 19900			* 13400 * 29450	8850 19600	7760 310
-4500 -180					* 19150 * 41000	* 19150 * 41000	* 14500 * 30500	12950 27950					* 12800 * 28100	11650 26200	6480 260

Illustration 88 g03645054

Lift Chart Above: 349F L, 6550 mm (257 inch) mass boom (heavy lift) , 3000 mm (118 inch) stick, and 600 mm (24 inch)DG track shoes

Fixed Gauge (Reach Boom)(600 MM DG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 9850 * 21950	* 9850 * 21950	6720 260
7500 300									* 11550 * 25450	11200 24000			* 9200 * 20350	* 9200 * 20350	7990 320
6000 240							* 13400 * 29050	* 13400 * 29050	* 11950 * 26050	11000 23700			* 9050 * 19900	8450 18750	8830 350
4500 180					* 20350 * 43600	* 20350 * 43600	* 15300 * 33050	14800 31900	* 12850 * 27900	10650 22900	* 11500 * 25100	8050 17250	* 9150 * 20150	7550 16700	9340 370
3000 120					* 18150 * 47250	* 18150 44900	* 17350 * 37400	13950 30150	* 13900 * 30100	10200 22000	* 11950 * 26000	7850 16850	* 9550 * 21000	7100 15650	9600 380
1500 60					* 12900 * 31700	* 12900 * 31700	* 18750 * 40600	13300 28750	* 14750 * 31950	9850 21200	12250 26350	7650 16450	* 10300 * 22600	6950 15300	9610 380
0 0					* 18400 * 42900	* 18400 42250	* 19250 * 41700	12950 27950	* 15150 * 32750	9600 20650	12100 26050	7500 16150	11450 25200	7100 15650	9380 370
-1500 -60			* 14200 * 32200	* 14200 * 32200	* 24350 * 52900	19700 42350	* 18750 * 40650	12850 27700	* 14800 * 32000	9500 20450			* 11950 * 26300	7600 16300	8880 350
-3000 -120			* 25000 * 56550	* 25000 * 56550	* 21850 * 47300	19950 42850	* 17150 * 37100	12950 27950	* 13400 * 28750	9550 20650			* 11950 * 26300	8700 19300	8080 320
-4500 -180					* 17700 * 38000	* 17700 * 38000	* 13850 * 29500	13300 28700					* 11450 * 25150	11150 24950	6860 270

Illustration 89 g03645056

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom, 2900 mm (114 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
kg lb															(mm) (inch)
9000													* 10750	* 10750	6720
360													* 23950	* 23950	260
7500									* 12800	11200			* 10050	10050	7990
300									* 27950	24000			* 22250	* 22250	320
6000							* 14800	* 14800	* 13200	11000			* 9850	8450	8830
240							* 32050	* 32050	* 28800	23700			* 21750	18750	350
4500					* 22450	* 22450	* 16900	14800	* 14200	10650	12700	8050	* 10000	7550	9340
180					* 48050	* 48050	* 36500	31900	* 30850	22900	27250	17250	* 22000	16700	370
3000					* 19200	* 19200	* 19150	13950	* 15400	10200	12450	7850	* 10450	7100	9600
120					* 50050	44900	* 41350	30150	* 33350	22000	26800	16850	* 22950	15650	380
1500					* 13650	* 13650	* 20800	13300	16050	9850	12250	7650	11150	6950	9610
60					* 33600	* 33600	* 44950	28750	34550	21200	26350	16450	24500	15300	380
0					* 19450	* 19450	* 21350	12950	15750	9600	12100	7500	11450	7100	9380
0					* 45450	42250	* 46200	27950	33950	20650	26050	16150	25200	15650	370
-1500			* 15050	* 15050	* 26950	19700	* 20800	12850	15650	9500			12300	7600	8880
-60			* 34150	* 34150	* 58600	42350	* 45050	27700	33700	20450			27150	16800	350
-3000			* 26450	* 26450	* 24250	19950	* 19050	12950	* 14950	9550			* 13300	8700	8080
-120			* 59850	* 59850	* 52550	42850	* 41200	27950	* 32000	20650			* 29300	19300	320
-4500					* 19700	* 19700	* 15450	13300					* 12800	11150	6860
-180					* 42350	* 42350	* 32900	28700					* 28100	24950	270

Illustration 90 g03645057

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 2900 mm (114 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 8250 * 18300	* 8250 * 18300	7300 290
7500 300									* 10800 * 23750	* 10800 * 23750			* 7750 * 17100	* 7750 * 17100	8480 330
6000 240									* 11300 * 24650	11100 23900	* 9800 * 18500	8250 17650	* 7600 * 16750	* 7600 * 16750	9270 370
4500 180					* 18850 * 40350	* 18850 * 40350	* 14500 * 31300	* 14500 * 31300	* 12300 * 26650	10700 23050	* 11050 * 24050	8050 17350	* 7700 * 16950	7050 15600	9770 390
3000 120					* 23300 * 50000	21250 45850	* 16650 * 35900	14100 30400	* 13400 * 29100	10250 22100	* 11600 * 25200	7850 16850	* 8000 * 17650	6650 14650	10010 400
1500 60					* 17550 * 42050	* 17550 * 42050	* 18300 * 39550	13400 28850	* 14400 * 31200	9850 21200	* 12100 * 26200	7600 16350	* 8600 * 18900	6500 14300	10020 400
0 0					* 19800 * 45950	19600 42100	* 19100 * 41300	12950 27900	* 14950 * 32400	9550 20550	12050 25950	7450 16000	* 9500 * 20950	6600 14550	9800 390
-1500 -60			* 14050 * 31750	* 14050 * 31750	* 25000 * 54250	19550 41950	* 18900 * 40950	12750 27500	* 14900 * 32200	9400 20250	12000 * 25750	7350 15900	* 11000 * 24300	7050 15500	9330 370
-3000 -120			* 22500 * 50850	* 22500 * 50850	* 22850 * 49500	19700 42350	* 17700 * 38200	12800 27600	* 13900 * 29900	9400 20300			* 11450 * 25250	7950 17550	8570 340
-4500 -180			* 24600 * 53000	* 24600 * 53000	* 19250 * 41400	* 19250 * 41400	* 15000 * 32100	13050 28150					* 11250 * 24750	9800 21900	7430 290

Illustration 91 g03645122

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom, 3350 mm (132 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 9050 * 20050	* 9050 * 20050	7300 290
7500 300									* 11950 * 26250	11350 24350			* 8500 * 18750	* 8500 * 18750	8480 330
6000 240									* 12500 * 27300	11100 23900	* 10750 * 20250	8250 17650	* 8350 * 18350	7800 17350	9270 370
4500 180					* 20750 * 44500	* 20750 * 44500	* 16000 * 34600	14950 32300	* 13600 * 29550	10700 23050	* 12250 * 26700	8050 17350	* 8450 * 18550	7050 15600	9770 390
3000 120					* 25750 * 55300	21250 45850	* 18400 * 39700	14100 30400	* 14850 * 32250	10250 22100	12500 26850	7850 16850	* 8800 * 19300	6650 14650	10010 400
1500 60					* 18600 * 44500	* 18600 43100	* 20250 * 43800	13400 28850	* 15950 34550	9850 21200	12250 26350	7600 16350	* 9400 * 20700	6500 14300	10020 400
0 0					* 20950 * 48650	19600 42100	* 21150 * 45800	12950 27900	15750 33850	9550 20550	12050 25950	7450 16000	* 10400 * 22900	6600 14550	9800 390
-1500 -60			* 14900 * 33650	* 14900 * 33650	* 27700 * 60150	19550 41950	* 20950 * 45400	12750 27500	15550 33500	9400 20250	12000 25800	7350 15900	11400 25150	7050 15500	9330 370
-3000 -120			* 23850 * 53850	* 23850 * 53850	* 25350 * 55000	19700 42350	* 19650 * 42450	12800 27600	* 15450 * 33250	9400 20300			* 12800 * 28150	7950 17550	8570 340
-4500 -180			* 27400 * 59150	* 27400 * 59150	* 21400 * 46100	20100 43250	* 16700 * 35800	13050 28150					* 12600 * 27650	9800 21900	7430 290

Illustration 92 g03645128

Lift Chart Above: 349F L, 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 600 mm (24 inch)DG track shoes

Variable Gauge (Mass Boom)(600 MM DG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
													(mm) (inch)
7500											* 11900	* 11900	7220
300											* 26300	* 26300	280
6000							* 13950	* 13950	* 12500	11750	* 11600	10300	8110
240							* 30300	* 30300	* 27300	25200	* 25600	22950	320
4500					* 20950	* 20950	* 15700	* 15700	* 13200	11400	* 11800	9100	8640
180					* 44900	* 44900	* 33900	* 33900	* 28650	24500	* 25950	20150	340
3000							* 17500	15100	* 14050	10950	* 12250	8550	8890
120							* 37800	32600	* 30500	23650	* 26950	18800	350
1500							* 18700	14500	* 14700	10600	* 12400	8400	8870
60					* 37600	* 37600	* 40450	31200	* 31900	22850	* 27300	18450	350
0					* 23800	21750	* 18900	14150	* 14800	10400	* 12600	8650	8600
0					* 54550	46750	* 40900	30500	* 32100	22400	* 27750	19050	340
-1500			* 18550	* 18550	* 23200	21850	* 18000	14100	* 14000	10350	* 12700	9500	8030
-60			* 42150	* 42150	* 50450	46950	* 38950	30400	* 30150	22350	* 27950	21000	320
-3000			* 24350	* 24350	* 20000	* 20000	* 15650	14300			* 12500	11400	7090
-120			* 53050	* 53050	* 43300	* 43300	* 33600	30850			* 27450	25350	280

Illustration 93 g03645145

Lift Chart Above: 352F , 6550 mm (258 inch) mass boom, 2500 mm (101 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300				
kg lb													(mm) (inch)
7500 300											* 13000 * 28750	12650 28450	7220 280
6000 240							* 15400 * 33450	* 15400 * 33450	* 13850 * 30250	11750 25200	* 12700 * 27950	10300 22950	8110 320
4500 180					* 23150 * 49600	* 23150 * 49600	* 17350 * 37500	15950 34400	* 14600 * 31800	11400 24500	* 12900 * 28350	9100 20150	8640 340
3000 120							* 19400 * 41900	15100 32600	* 15600 * 33850	10950 23650	12950 28500	8550 18800	8890 350
1500 60					* 39850	* 39850	* 20750 * 44850	14500 31200	* 16350 35300	10600 22850	12800 28150	8400 18450	8870 350
0 0					* 25200 * 59000	21750 46750	* 20950 * 45400	14150 30500	16150 34800	10400 22400	13300 29250	8650 19050	8600 340
-1500 -60			* 19650 * 44650	* 19650 * 44650	* 25800 * 56050	21850 46950	* 20000 * 43300	14100 30400	* 15600 * 33600	10350 22350	* 14150 * 31150	9500 21000	8030 320
-3000 -120			* 27200 * 59200	* 27200 * 59200	* 22300 * 48250	22200 47650	* 17450 * 37500	14300 30850			* 13950 * 30650	11400 25350	7090 280

Illustration 94 g03645147

Lift Chart Above: 352F , 6550 mm (258 inch) mass boom (heavy lift), 2500 mm (101 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
kg lb															(mm) (inch)
9000													* 9800	* 9800	6500
7500 300									* 11250 * 21500	* 11250 * 21500			* 9050 * 20050	* 9050 * 20050	7780 310
6000 240							* 28150	* 28150	* 11700 * 25550	* 11700 25400			* 8850 * 19500	* 8850 * 19500	8610 340
4500 180					* 19250 * 41300	* 19250 * 41300	* 14750 * 31900	* 14750 * 31900	* 12500 * 27200	11450 24600	* 10350	8550	* 9000 * 19750	8350 18500	9110 360
3000 120					* 23400 * 50300	23150 49950	* 16750 * 36150	15200 32750	* 13500 * 29300	10950 23650	* 11700 * 25400	8350 17900	* 9400 * 20650	7850 17300	9340 370
1500 60					* 21450 * 51400	* 21450 47250	* 18200 * 39350	14450 31200	* 14350 * 31050	10550 22750	* 12000 * 26000	8100 17450	* 10150 * 22350	7700 16950	9330 370
0 0					* 25200 * 55200	21550 46350	* 18750 * 40550	14050 30250	* 14650 * 31750	10300 22150	* 11900	8000	* 11450 * 25200	7900 17450	9070 360
-1500 -60			* 17850 * 40400	* 17850 * 40400	* 24050 * 52200	21550 46300	* 18200 * 39450	13900 29950	* 14250 * 30750	10200 21950			* 11950 * 26350	8600 18950	8530 340
-3000 -120			* 27650 * 60050	* 27650 * 60050	* 21300 * 46150	* 21300 * 46150	* 16450 * 35450	14050 30250	* 12400	10300			* 11950 * 26300	10050 22300	7660 300
-4500 -180					* 16500 * 35200	* 16500 * 35200	* 12300 * 25700	* 12300 * 25700					* 11300 * 24700	* 11300 * 24700	6310 250

Illustration 95 g03645160

Lift Chart Above: 352F , 6550 mm (258 inch) mass boom, 3000 mm (118 inch) stick, and 600 mm (24 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000													* 10700	* 10700	6500
7500 300									* 12300 * 23500	12000 * 23500			* 9950 * 21950	* 9950 * 21950	7780 310
6000 240							* 31150	* 31150	* 13000 * 28350	11850 25400			* 9700 * 21400	9400 20850	8610 340
4500 180					* 21300 * 45650	* 21300 * 45650	* 16350 * 35350	16100 34700	* 13900 * 30200	11450 24600	* 11300	8550	* 9850 * 21650	8350 18500	9110 360
3000 120					* 25950 * 55700	23150 49950	* 18550 * 40050	15200 32750	* 15000 * 32550	10950 23650	12650 27200	8350 17900	* 10300 * 22650	7850 17300	9340 370
1500 60					* 22750 * 54450	21950 47250	* 20200 * 43650	14450 31200	* 15950 * 34500	10550 22750	12450 26750	8100 17450	* 11150 * 24500	7700 16950	9330 370
0 0					* 26700 * 61250	21550 46350	* 20800 * 45050	14050 30250	16050 34550	10300 22150	12300	8000	12150 26800	7900 17450	9070 360
-1500 -60			* 18950 * 42850	* 18950 * 42850	* 26700 * 58000	21550 46300	* 20250 * 43900	13900 29950	* 15850 * 34250	10200 21950			13250 29300	8600 18950	8530 340
-3000 -120			* 30800 * 66950	* 30800 * 66950	* 23750 * 51350	21800 46850	* 18300 * 39500	14050 30250	* 13850	10300			* 13250 * 29450	10050 22300	7660 300
-4500 -180					* 18450 * 39450	* 18450 * 39450	* 13800 * 28850	* 13800 * 28850					* 12700 * 27750	* 12700 * 27750	6310 250

Illustration 96 g03645164

Lift Chart Above: 352F , 6550 mm (258 inch) mass boom (heavy lift), 3000 mm (118 inch) stick, and 600 mm (24 inch)DG track shoes

Variable Gauge (Reach Boom)(750 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													▪ 10300 ▪ 22800	▪ 10300 ▪ 22800	6760 260
7500 300									▪ 11550 ▪ 25450	▪ 11550 ▪ 25450			▪ 9750 ▪ 21500	▪ 9750 ▪ 21500	8000 320
6000 240							▪ 13600 ▪ 29400	▪ 13600 ▪ 29400	▪ 12050 ▪ 26200	▪ 12050 ▪ 26200			▪ 9650 ▪ 21250	9450 20950	8800 350
4500 180					▪ 20350 ▪ 44600	▪ 20350 ▪ 44600	▪ 15500 ▪ 33500	▪ 15500 ▪ 33500	▪ 12950 ▪ 28100	11800 25400	▪ 11550 ▪ 25200	8950 19250	▪ 9900 ▪ 21800	8500 18800	9300 370
3000 120					▪ 18050 ▪ 46600	▪ 18050 ▪ 46600	▪ 17500 ▪ 37800	15550 33550	▪ 14000 ▪ 30300	11350 24500	▪ 12000 ▪ 26100	8750 18800	▪ 10500 ▪ 23050	8050 17700	9530 380
1500 60					▪ 14400 ▪ 34950	▪ 14400 ▪ 34950	▪ 18850 ▪ 40800	14950 32200	▪ 14800 ▪ 32100	11000 23700	▪ 12350 ▪ 26800	8550 18400	▪ 11450 ▪ 25150	7900 17400	9510 380
0 0					▪ 20400 ▪ 47450	▪ 20400 ▪ 47450	▪ 19250 ▪ 41700	14600 31450	▪ 15150 ▪ 32750	10750 23200	▪ 12350 ▪ 26700	8400 18150	▪ 11950 ▪ 26300	8100 17850	9260 370
-1500 -60			▪ 16400 ▪ 37000	▪ 16400 ▪ 37000	▪ 24150 ▪ 52450	22400 48100	▪ 18650 ▪ 40400	14500 31250	▪ 14750 ▪ 31850	10700 23000			▪ 12150 ▪ 26750	8750 19300	8730 350
-3000 -120			▪ 26700 ▪ 58200	▪ 26700 ▪ 58200	▪ 21500 ▪ 46600	▪ 21500 ▪ 46600	▪ 16950 ▪ 36550	14650 31550	▪ 13200 ▪ 28200	10800 23300			▪ 12200 ▪ 26900	10150 22450	7880 310
-4500 -180					▪ 17100 ▪ 36700	▪ 17100 ▪ 36700	▪ 13350 ▪ 28300	▪ 13350 ▪ 28300					▪ 11750 ▪ 25700	▪ 11750 ▪ 25700	6580 260

Illustration 97 g03645177

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom, 2900 mm (114 inch) stick, and 750 mm (30 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 11200 * 24900	* 11200 * 24900	6760 260
7500 300									* 12800 * 28100	12400 26600			* 10650 * 23500	* 10650 * 23500	8000 320
6000 240							* 14950 * 32400	* 14950 * 32400	* 13300 * 28950	12200 26250			* 10550 * 23250	9450 20950	8800 350
4500 180					* 23000 * 49200	* 23000 * 49200	* 17150 * 37000	16400 35350	* 14350 * 31100	11800 25400	* 12800 * 27850	8950 19250	* 10850 * 23800	8500 18800	9300 370
3000 120					* 19150 * 49350	* 19150 * 49350	* 19350 * 41800	15550 33550	* 15500 * 33600	11350 24500	13100 28200	8750 18800	* 11450 * 25150	8050 17700	9530 380
1500 60					* 15250 * 37000	* 15250 * 37000	* 20900 * 45150	14950 32200	* 16400 * 35550	11000 23700	12900 27750	8550 18400	11900 26200	7900 17400	9510 380
0 0					* 21650 * 50250	* 21650 47950	* 21350 * 46200	14600 31450	16600 35700	10750 23200	12750 27450	8400 18150	12250 27000	8100 17850	9260 370
-1500 -60			* 17350 * 39250	* 17350 * 39250	* 26750 * 58150	22400 48100	* 20700 * 44800	14500 31250	* 16350 * 35350	10700 23000			13300 29350	8750 19300	8730 350
-3000 -120			* 28850 * 64750	* 28850 * 64750	* 23850 * 51750	22650 48650	* 18800 * 40650	14650 31550	* 14650 * 31350	10800 23300			* 13600 * 29950	10150 22450	7880 310
-4500 -180					* 19100 * 40950	* 19100 * 40950	* 14900 * 31600	* 14900 * 31600					* 13100 * 28750	* 13100 * 28750	6580 260

Illustration 98 g03645179

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom, 2900 mm (114 inch) stick, and 750 mm (30 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 8200 * 18150	* 8200 * 18150	7450 290
7500 300									* 10850 * 23750	* 10850 * 23750			* 7750 * 17050	* 7750 * 17050	8580 340
6000 240									* 11400 * 24800	* 11400 * 24800	* 10250 * 19700	9150 19650	* 7600 * 16750	* 7600 * 16750	9340 370
4500 180					* 19300 * 41300	* 19300 * 41300	* 14700 * 31750	* 14700 * 31750	* 12400 * 26900	11850 25550	* 11100 * 24150	9000 19300	* 7700 * 17000	* 7700 * 17000	9800 390
3000 120					* 23650 * 50800	* 23650 * 50800	* 16800 * 36300	15650 33800	* 13500 * 29300	11400 24550	* 11650 * 25300	8750 18800	* 8050 * 17700	7450 16350	10020 400
1500 60					* 17500 * 41650	* 17500 * 41650	* 18400 * 39800	14950 32250	* 14450 * 31350	11000 23650	* 12100 * 26300	8500 18300	* 8650 * 19000	7300 16100	10010 400
0 0					* 20350 * 47100	* 20350 * 47100	* 19100 * 41350	14550 31350	* 14950 * 32400	10700 23050	* 12300 * 26600	8350 18000	* 9600 * 21150	7500 16450	9760 390
-1500 -60			* 14900 * 33550	* 14900 * 33550	* 24800 * 53900	22150 47650	* 18800 * 40750	14400 31000	* 14800 * 32050	10550 22800	* 11900 * 25550	8300 17900	* 11200 * 24700	8000 17650	9270 370
-3000 -120			* 23500 * 53050	* 23500 * 53050	* 22550 * 48850	22350 48050	* 17450 * 37750	14450 31150	* 13700 * 29450	10600 22900			* 11450 * 25250	9100 20100	8470 340
-4500 -180			* 23850 * 51350	* 23850 * 51350	* 18700 * 40250	* 18700 * 40250	* 14600 * 31200	* 14600 * 31200					* 11200 * 24550	* 11200 * 24550	7290 290

Illustration 99 g03645191

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom, 3350 mm (132 inch) stick, and 750 mm (30 inch)DG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
kg lb															(mm) (inch)
9000 360													* 8950 * 19900	* 8950 * 19900	7450 290
7500 300									* 11950 * 26250	* 11950 * 26250			* 8450 * 18700	* 8450 * 18700	8580 340
6000 240									* 12600 * 27450	12300 26400	* 11200 * 21550	9150 19650	* 8350 * 18350	* 8350 * 18350	9340 370
4500 180					* 21250 * 45550	* 21250 * 45550	* 16250 * 35050	* 16250 * 35050	* 13700 * 29800	11850 25550	* 12300 * 26800	9000 19300	* 8450 * 18600	7850 17300	9800 390
3000 120					* 26150 * 56150	23750 51200	* 18600 * 40150	15650 33800	* 15000 * 32450	11400 24550	* 12900 * 28100	8750 18800	* 8850 * 19400	7450 16350	10020 400
1500 60					* 18500 * 44100	* 18500 * 44100	* 20400 * 44100	14950 32250	* 16050 * 34750	11000 23650	12850 27650	8500 18300	* 9500 * 20850	7300 16100	10010 400
0 0					* 21550 * 49900	* 21550 47700	* 21150 * 45850	14550 31350	16500 35550	10700 23050	12700 27300	8350 18000	* 10500 * 23150	7500 16450	9760 390
-1500 -60			* 15800 * 35600	* 15800 * 35600	* 27500 * 59750	22150 47650	* 20850 * 45200	14400 31000	16400 35250	10550 22800	12600 27200	8300 17900	12150 26750	8000 17650	9270 370
-3000 -120			* 24850 * 56150	* 24850 * 56150	* 25050 * 54250	22350 48050	* 19400 * 41950	14450 31150	* 15250 * 32800	10600 22900			* 12750 * 28150	9100 20100	8470 340
-4500 -180			* 26600 * 57350	* 26600 * 57350	* 20850 * 44850	* 20850 * 44850	* 16250 * 34750	14750 31800					* 12500 * 27450	11350 25350	7290 290

Illustration 100 g03645192

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 750 mm (30 inch)DG track shoes

Variable Gauge (Reach Boom)(600 MM TG Shoe)

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 10300 * 22800	* 10300 * 22800	6760 260
7500 300									* 11550 * 25450	* 11550 * 25450			* 9750 * 21500	* 9750 * 21500	8000 320
6000 240							* 13600 * 29400	* 13600 * 29400	* 12050 * 26200	* 12050 25900			* 9650 * 21250	9300 20700	8800 350
4500 180					* 20850 * 44600	* 20850 * 44600	* 15500 * 33500	* 15500 * 33500	* 12950 * 28100	11650 25100	* 11550 * 25200	8850 19000	* 9900 * 21800	8400 18550	9300 370
3000 120					* 18050 * 46600	* 18050 * 46600	* 17500 * 37800	15350 33150	* 14000 * 30300	11200 24200	* 12000 * 26100	8650 18550	* 10500 * 23050	7900 17450	9530 380
1500 60					* 14400 * 34950	* 14400 * 34950	* 18850 * 40800	14750 31750	* 14800 * 32100	10850 23400	* 12350 * 26800	8450 18150	* 11450 * 25150	7800 17150	9510 380
0 0					* 20400 * 47450	* 20400 47300	* 19250 * 41700	14400 31050	* 15150 * 32750	10600 22850	* 12350 * 26700	8300 17900	* 11950 * 26300	8000 17600	9260 370
-1500 -60			* 16400 * 37000	* 16400 * 37000	* 24150 * 52450	22100 47450	* 18650 * 40400	14300 30850	* 14750 * 31850	10550 22700			* 12150 * 26750	8650 19050	8730 350
-3000 -120			* 26700 * 58200	* 26700 * 58200	* 21500 * 46600	* 21500 * 46600	* 16950 * 36550	14450 31100	* 13200 * 28200	10650 22950			* 12200 * 26900	10000 22150	7880 310
-4500 -180					* 17100 * 36700	* 17100 * 36700	* 13350 * 28300	* 13350 * 28300					* 11750 * 25700	* 11750 * 25700	6580 260

Illustration 101 g03645217

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom, 2900 mm (114 inch) stick, and 600 mm (24 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000 360													* 11200 * 24900	* 11200 * 24900	6760 260
7500 300									* 12800 * 28100	12250 26300			* 10650 * 23500	* 10650 * 23500	8000 320
6000 240							* 14950 * 32400	* 14950 * 32400	* 13300 * 28950	12050 25900			* 10550 * 23250	9300 20700	8800 350
4500 180					* 23000 * 49200	* 23000 * 49200	* 17150 * 37000	16200 34950	* 14350 * 31100	11650 25100	* 12800 * 27850	8850 19000	* 10850 * 23800	8400 18550	9300 370
3000 120					* 19150 * 49350	* 19150 * 49350	* 19350 * 41800	15350 33150	* 15500 * 33600	11200 24200	12900 27800	8650 18550	* 11450 * 25150	7900 17450	9530 380
1500 60					* 15250 * 37000	* 15250 * 37000	* 20900 * 45150	14750 31750	* 16400 * 35550	10850 23400	12700 27350	8450 18150	11700 25800	7800 17150	9510 380
0 0					* 21650 * 50250	* 21650 47300	* 21350 * 46200	14400 31050	16350 35200	10600 22850	12550 27050	8300 17900	12100 26650	8000 17600	9260 370
-1500 -60			* 17350 * 39250	* 17350 * 39250	* 26750 * 58150	22100 47450	* 20700 * 44800	14300 30850	16250 35000	10550 22700			13100 28950	8650 19050	8730 350
-3000 -120			* 28850 * 64750	* 28850 * 64750	* 23850 * 51750	22350 48050	* 18800 * 40650	14450 31100	* 14650 * 31350	10650 22950			* 13600 * 29950	10000 22150	7880 310
-4500 -180					* 19100 * 40950	* 19100 * 40950	* 14900 * 31600	14800 * 31600					* 13100 * 28750	13050 * 28750	6580 260

Illustration 102 g03645220

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom (heavy lift), 2900 mm (114 inch) stick, and 600 mm (24 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000													* 8200	* 8200	7450
360													* 18150	* 18150	290
7500									* 10850	* 10850			* 7750	* 7750	8580
300									* 23750	* 23750			* 17050	* 17050	340
6000									* 11400	* 11400	* 10250	9050	* 7600	* 7600	9340
240									* 24800	* 24800	* 19700	19400	* 16750	* 16750	370
4500					* 19300	* 19300	* 14700	* 14700	* 12400	11700	* 11100	8850	* 7700	* 7700	9800
180					* 41300	* 41300	* 31750	* 31750	* 26900	25250	* 24150	19050	* 17000	* 17000	390
3000					* 23650	23450	* 16800	15450	* 13500	11250	* 11650	8600	* 8050	7350	10020
120					* 50800	50550	* 36300	33350	* 29300	24250	* 25300	18550	* 17700	16150	400
1500					* 17500	* 17500	* 18400	14750	* 14450	10850	* 12100	8400	* 8650	7200	10010
60					* 41650	* 41650	* 39800	31850	* 31350	23350	* 26300	18050	* 19000	15850	400
0					* 20350	* 20350	* 19100	14350	* 14950	10550	* 12300	8250	* 9600	7350	9760
0					* 47100	47100	* 41350	30900	* 32400	22750	* 26600	17750	* 21150	16250	390
-1500			* 14900	* 14900	* 24800	21900	* 18800	14200	* 14800	10400	* 11900	8200	* 11200	7900	9270
-60			* 33550	* 33550	* 53900	47000	* 40750	30600	* 32050	22450	* 25550	17650	* 24700	17400	370
-3000			* 23500	* 23500	* 22550	22050	* 17450	14250	* 13700	10450			* 11450	8950	8470
-120			* 53050	* 53050	* 48350	47450	* 37750	30700	* 29450	22600			* 25250	19300	340
-4500			* 23850	* 23850	* 18700	* 18700	* 14600	14550					* 11200	* 11200	7290
-180			* 51350	* 51350	* 40250	* 40250	* 31200	* 31200					* 24550	* 24550	290

Illustration 103 g03645227

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom, 3350 mm (132 inch) stick, and 600 mm (24 inch) TG track shoes

(mm) (inch)	1500 60		3000 120		4500 180		6000 240		7500 300		9000 360				
															(mm) (inch)
9000													* 8950	* 8950	7450
360													* 19900	* 19900	290
7500									* 11950	* 11950			* 8450	* 8450	8580
300									* 26250	* 26250			* 18700	* 18700	340
6000									* 12600	12150	* 11200	9050	* 8350	* 8350	9340
240									* 27450	26100	* 21550	19400	* 18350	* 18350	370
4500					* 21250	* 21250	* 16250	* 16250	* 13700	11700	* 12300	8850	* 8450	7750	9800
180					* 45550	* 45550	* 35050	* 35050	* 29800	25250	* 26800	19050	* 18600	17050	390
3000					* 26150	23450	* 18600	15450	* 15000	11250	* 12900	8600	* 8850	7350	10020
120					* 56150	50550	* 40150	33350	* 32450	24250	27800	18550	* 19400	16150	400
1500					* 18500	* 18500	* 20400	14750	* 16050	10850	12700	8400	* 9500	7200	10010
60					* 44100	* 44100	* 44100	31850	* 34750	23350	27300	18050	* 20850	15850	400
0					* 21550	* 21550	* 21150	14350	16300	10550	12500	8250	* 10500	7350	9760
0					* 49900	47100	* 45850	30900	35050	22750	26900	17750	* 23150	16250	390
-1500			* 15800	* 15800	* 27500	21900	* 20850	14200	16150	10400	12450	8200	11950	7900	9270
-60			* 35600	* 35600	* 59750	47000	* 45200	30600	34750	22450	26800	17650	26400	17400	370
-3000			* 24850	* 24850	* 25050	22050	* 19400	14250	* 15250	10450			* 12750	8950	8470
-120			* 56150	* 56150	* 54250	47450	* 41950	30700	* 32800	22600			* 28150	19800	340
-4500			* 26600	* 26600	* 20850	* 20850	* 16250	14550					* 12500	11200	7290
-180			* 57350	* 57350	* 44850	* 44850	* 34750	31350					* 27450	25000	290

Illustration 104 g03645230

Lift Chart Above: 352F , 6900 mm (271 inch) reach boom (heavy lift), 3350 mm (132 inch) stick, and 600 mm (24 inch) TG track shoes

Identification Information

i07281533

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

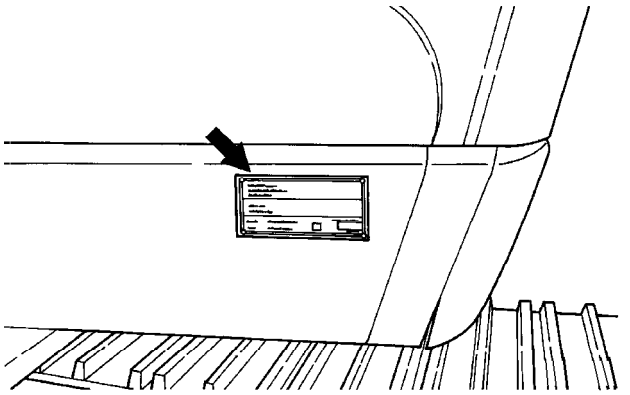


Illustration 105 g00675011

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

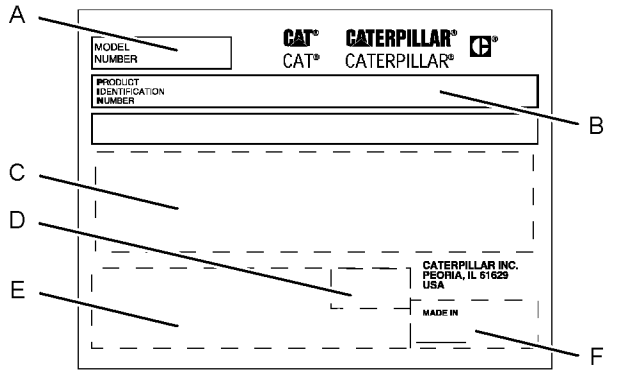


Illustration 106 g02436556

Model number (A)_____

Machine PIN (B)_____

Service Information Plate (C)_____

Year of Manufacture (If Required) (D)_____

CE Plate (If Required) (E)

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

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

CE Plate

Note: The CE plate is on machines that are going into the European Union.

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

If the machine is equipped with the plate for the European Union, this plate will be attached to the PIN plate. Several pieces of information are stamped onto the “CE” plate.

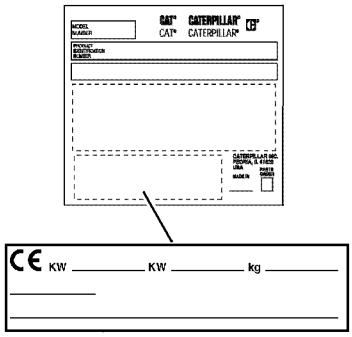


Illustration 107 g01883459

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

- Primary Engine Power (kW)_____
- Additional Engine Power (kW)_____
- Typical Machine Weight (kg)_____
- Year of Construction_____
- Machine Type_____

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

Machine Specification Film

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

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

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



Illustration 108 g06178867

Typical example

Electromagnetic Emissions

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

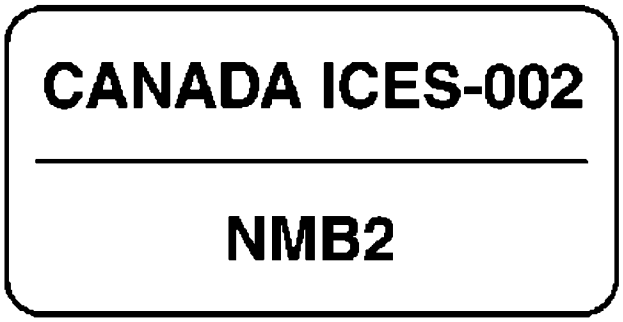


Illustration 109 g06063443

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

Engine Serial Number

This label is on the engine.

Engine Serial Number _____

Sound Certification

This film is on the left side of the machine.

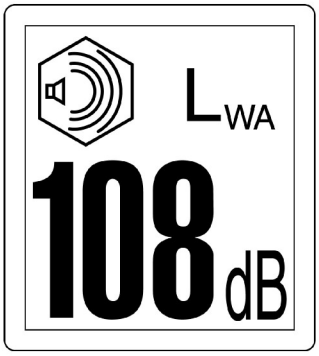


Illustration 110 g02409196

If equipped, the sound certification film is used to verify the environmental sound certification of the machine. The value that is listed on the film indicates the guaranteed sound power level. The guaranteed sound power level is measured at the time of manufacture. The guaranteed sound power level is measured according to the conditions that are specified in “2000/14/EC”.

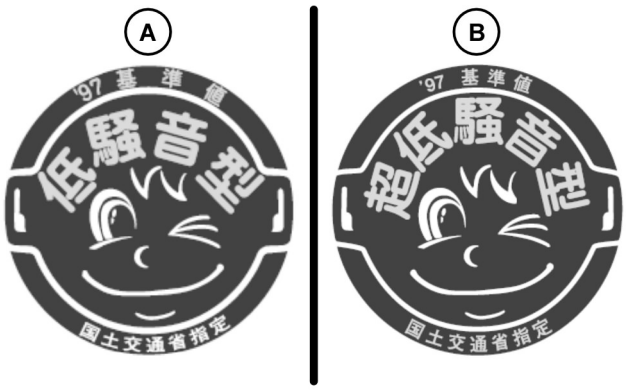


Illustration 111 g03105800

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

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

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

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

i05757951

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: TEW1–Up

Note: This information is pertinent in Japan.



Illustration 112 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.

i08085827

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

S/N: BZ21–Up

S/N: KEA1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: KBP1–Up

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

S/N: NDC1–Up

S/N: KBP1–Up

Table 21

An EC or EU Declaration of Conformity document was provided with the machine if the machine 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 of the Technical File to the Authorities of European Union Member States on request:

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

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

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Hydraulic Excavator
	Model/Type:	352F
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfills all the relevant provisions of the following Directives

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

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

Done at: **Signature**

Date: **Name/Position**

Note: The above information was correct as of **October 2014**, but may be subject to change. Refer to the individual declaration of conformity issued with the machine for exact details.

Declaration of Conformity

SMCS Code: 1000; 7000

S/N: KBP1–Up

Table 22

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 OF MACHINERY

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

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

Standards & Regulations Manager, Caterpillar France 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:	Rubber Tracked Loader
	Model/Type:	239D,249D,259D,279D,289D,299D,299D2,299D XHP,299D2 XHP Compact Track Loader
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfills all the relevant provisions of the following Directives

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

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

Done at: **Signature**

Date: **Name/Position**

Note: The above information was correct as of January 2016, 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

i05767689

Daily Inspection

SMCS Code: 1000; 6319; 6700; 7000

⚠ WARNING

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

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

Steam can cause personal injury.

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

Remove the cooling system pressure cap slowly to relieve pressure.

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

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

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

First 100 Hours

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

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

Severe Applications

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

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

Operation and Maintenance Manual, “ Blade Linkage - Lubricate”

Daily Basis

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

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

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

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

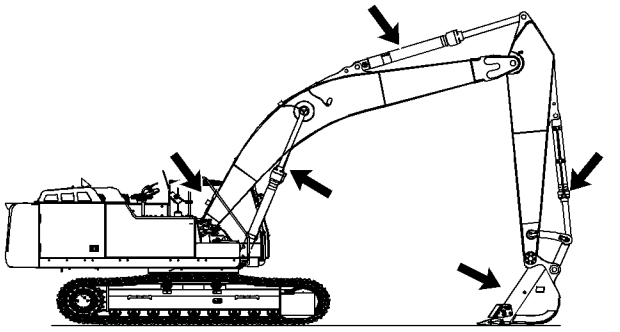


Illustration 113 g02515516

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

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

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

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

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

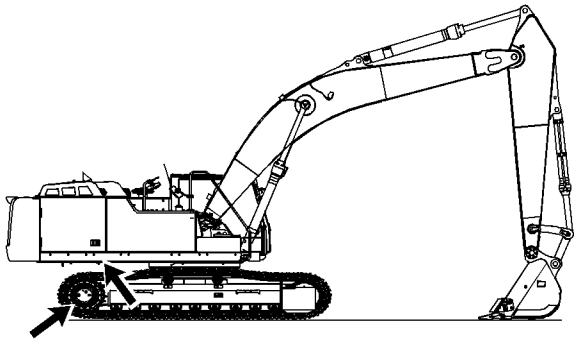


Illustration 114 g02280134

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

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

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

Inspect the swing drive for leaks.

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

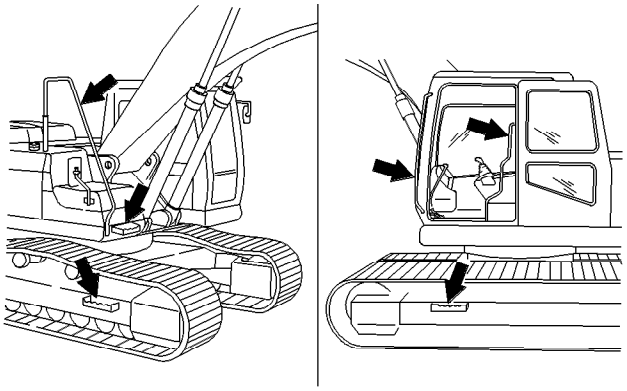


Illustration 115 g00101987

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

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

Adjust the mirrors in order to achieve the best visibility.

i07786730

Mounting and Dismounting

SMCS Code: 6700; 7000

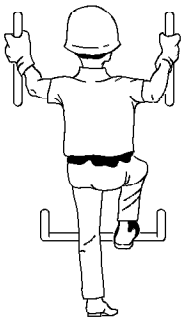


Illustration 116 g00037860

Typical example

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

Face the machine whenever you get on or 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 2867:2011 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”.

Machine Operation

i06244619

Alternate Exit

SMCS Code: 7310

Front Window (If Equipped)

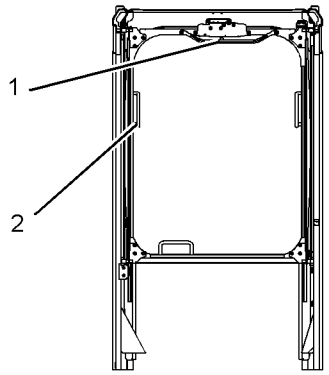


Illustration 117 g02050493

(1) Lever
(2) Handle

The front window serves as an alternate exit.

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

Right Side Window

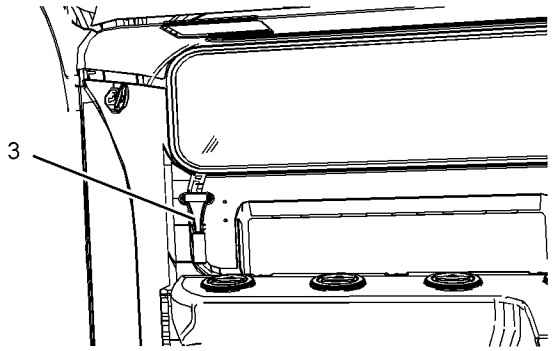


Illustration 118 g02050942

(3) Hammer (If Equipped)

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

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

Roof Hatch (If Equipped)

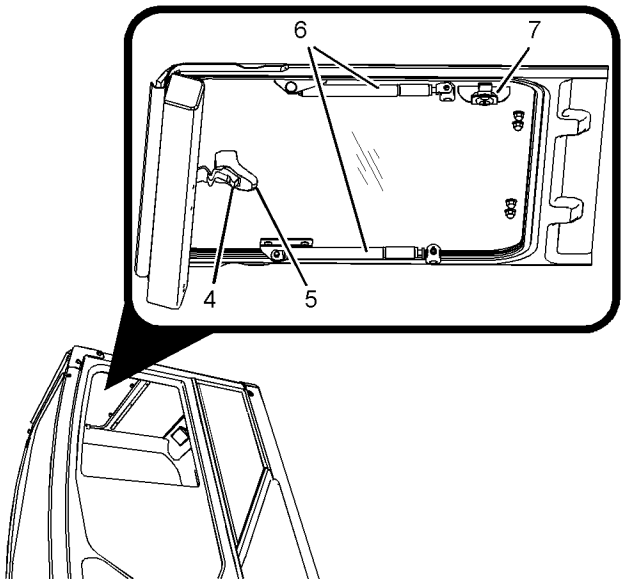


Illustration 119 g02851621

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

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

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

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

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

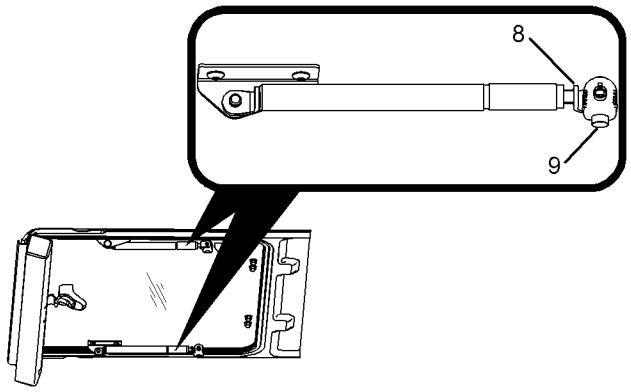


Illustration 120 g02901996

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

Exit through the roof hatch.

Removing the Roof Hatch from the Outside

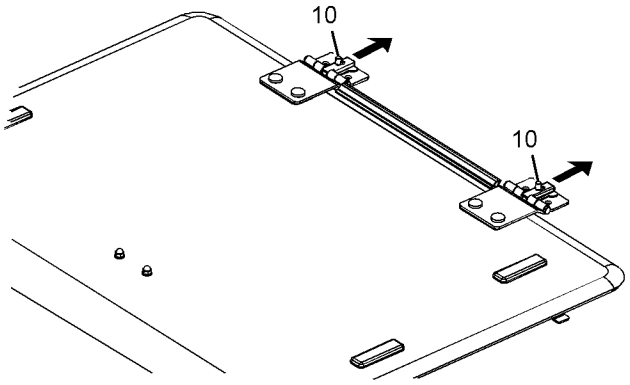


Illustration 121 g02851583

(10) Hinge pin release

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

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

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

Roof Hatch (If Equipped)

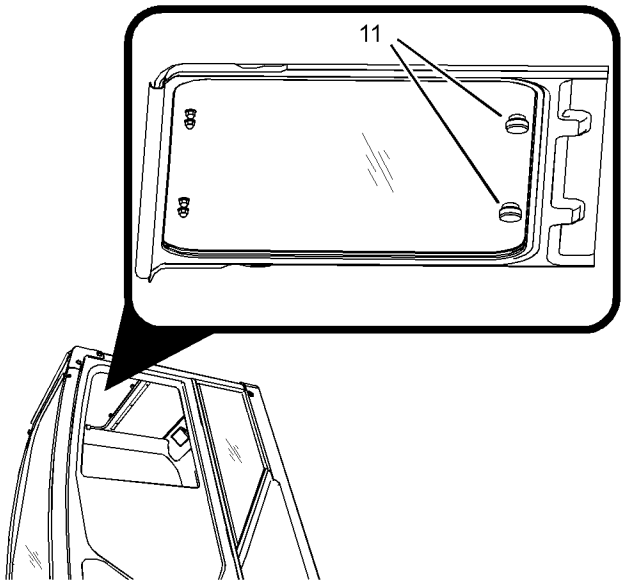


Illustration 122 g02851579

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

Slide the visor cover back.

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

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

FOGS (If Equipped)

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

Top FOGS

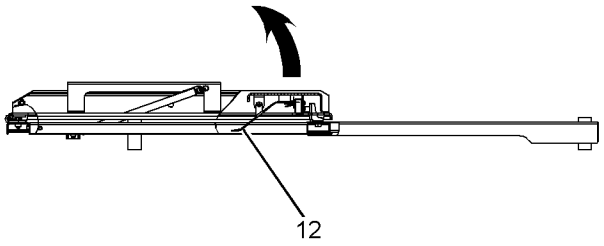


Illustration 123 g02902217

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

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

Front FOGS

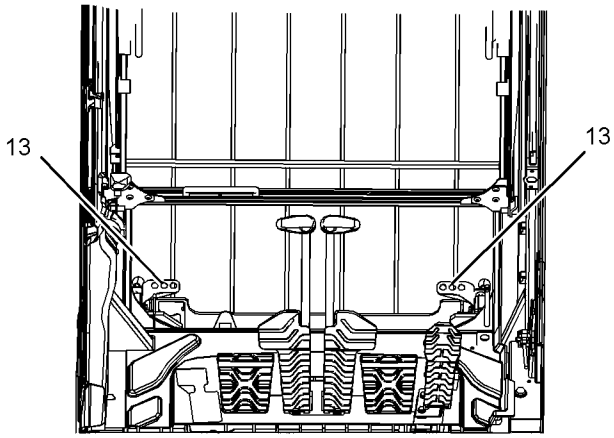


Illustration 124 g02902219

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

i07186721

Seat

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

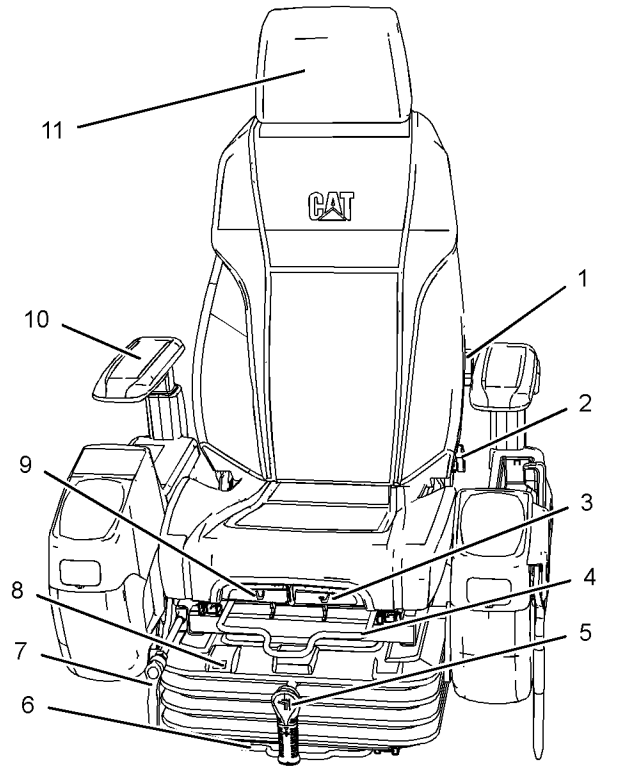


Illustration 125 g01636841

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

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

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

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

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

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

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

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

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

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

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

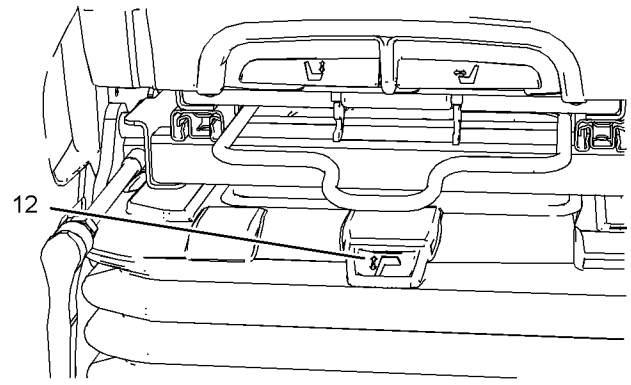


Illustration 126 g01637296

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

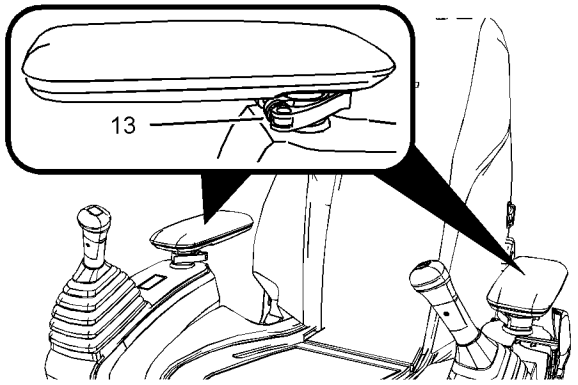


Illustration 127 g02697124

(13) Armrest height adjustment

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

Heated Seat and Ventilated Seat (If Equipped)

⚠ WARNING

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

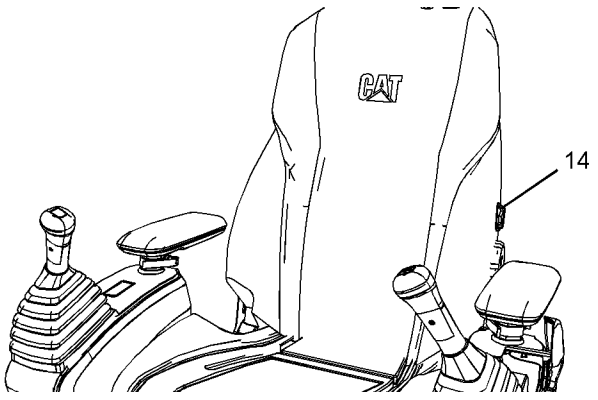


Illustration 128 g02697116

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

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

i04200349

Seat Belt

SMCS Code: 7327

Note: This machine was equipped with a seat belt when the machine was shipped from Caterpillar. At the time of installation, the seat belt and the instructions for installation of the seat belt meet the SAE J386 and ISO 6683 standards. Consult your Cat dealer for all replacement parts.

Always check the condition of the seat belt and the condition of the mounting hardware before you operate the machine.

Seat Belt Adjustment for Non-Retractable Seat Belts

Adjust both ends of the seat belt. The seat belt should be snug but comfortable.

Lengthening the Seat Belt

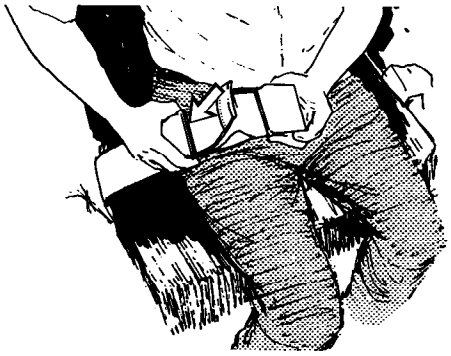


Illustration 129 g00100709

1. Unfasten the seat belt.

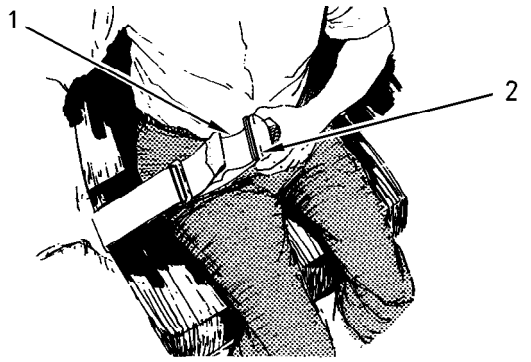


Illustration 130 g00932817

2. To remove the slack in outer loop (1), rotate buckle (2). This will free the lock bar. This permits the seat belt to move through the buckle.

3. Remove the slack from the outer belt loop by pulling on the buckle.

4. Loosen the other half of the seat belt in the same manner. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Shortening the Seat Belt

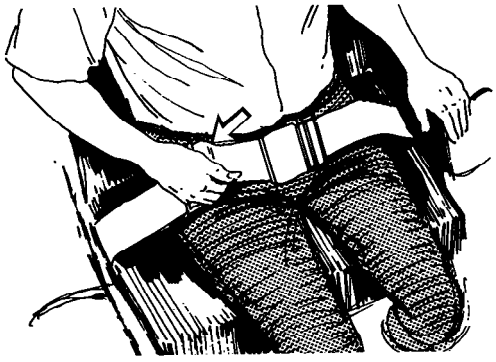


Illustration 131 g00100713

1. Fasten the seat belt. Pull out on the outer belt loop in order to tighten the seat belt.

2. Adjust the other half of the seat belt in the same manner.

3. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Fastening The Seat Belt

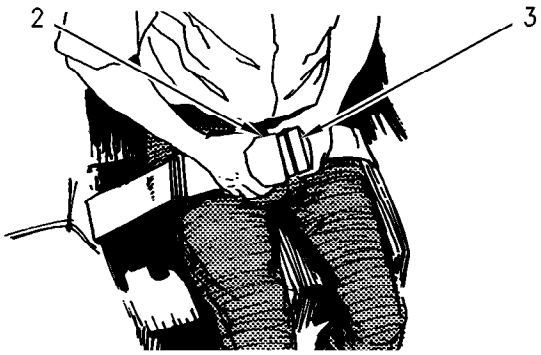


Illustration 132 g00932818

Fasten the seat belt catch (3) into the buckle (2). Make sure that the seat belt is placed low across the lap of the operator.

Releasing The Seat Belt



Illustration 133 g00100717

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

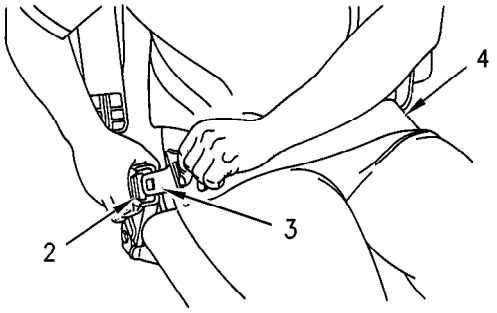


Illustration 134 g00867598

Pull seat belt (4) out of the retractor in a continuous motion.

Fasten seat belt catch (3) into buckle (2). Make sure that the seat belt is placed low across the lap of the operator.

The retractor will adjust the belt length and the retractor will lock in place. The comfort ride sleeve will allow the operator to have limited movement.

Releasing The Seat Belt

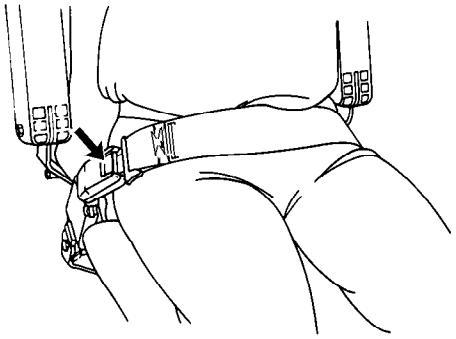


Illustration 135 g00039113

Push the release button on the buckle in order to release the seat belt. The seat belt will automatically retract into the retractor.

Extension of the Seat Belt

⚠ WARNING

When using retractable seat belts, do not use seat belt extensions, or personal injury or death can result.

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

Longer, non-retractable seat belts and extensions for the non-retractable seat belts are available.

Caterpillar requires only non-retractable seat belts to be used with a seat belt extension.

Consult your Cat dealer for longer seat belts and for information on extending the seat belts.

i06231518

Diesel Particulate Filter Regeneration

SMCS Code: 108F

Regeneration

Regeneration is to increase the exhaust temperature for a given time. The Caterpillar Regeneration System (CRS) is used to remove soot from the DPF, and warm up the Selective Catalyst Reduction (SCR) system. The DPF traps both soot and ash. The ash is removed through a manual cleaning process. Refer to Operation and Maintenance Manual, “Diesel Particulate Filter - Clean” for more information on the service of the DPF.

Regeneration Indicators



Regeneration Active – When illuminated, this indicator shows that the system is active. This indicator shows that elevated emission temperatures are possible. This indicator will turn off when regeneration is complete.



DPF – This indicator will illuminate in order to show that a regeneration is required. This indicator will illuminate when “Time to Regen” is less than a pre-determined amount of time.



Regeneration Disabled – This indicator will illuminate in order to show that a regeneration has been disabled.

Regeneration Switch



Force Regeneration – Press in the top switch for 2 seconds in order to begin regeneration.



Disable Regeneration – Press in the bottom switch for 2 seconds in order to disable regeneration.

Note: If equipped with a rocker style switch, the MIDDLE position of the regeneration switch is the default position for automatic regeneration.

Note: If the engine start switch key is cycled or the “Force Regeneration” switch is pressed for longer than 2 seconds the system will no longer be disabled. When the “Force Regeneration” switch is pressed and “Time to Regen” is less than 8 hours, regeneration will begin if the machine is at low idle and is parked.

Note: If the engine start switch key is cycled while the regeneration system is disabled via the “Disable Regeneration” switch, press and hold the “Disable Regeneration” switch for 2 seconds to reinitiate.

Modes of Regeneration

Automatic: The Electronic Control Module (ECM) uses multiple inputs from the engine and the machine to determine the best time to perform an automatic regeneration. Automatic regenerations can take place throughout the operating cycle of the engine. The regeneration active indicator will be illuminated when a regeneration is being performed. Interruptions of the regeneration are acceptable. If a regeneration is in progress and needs to be stopped, it is permissible to press the “Disable Regeneration” switch.

Note: Automatic adjustments of engine speed may be noticed during regenerations. If a regeneration is taking place and the engine is taken to low idle, the engine speed may remain elevated in order to maintain the regeneration.

Note: If the machine returns to work while an automatic regeneration is active, the regeneration may be stopped. The ECM will continue to monitor inputs to determine the best time to restart the regeneration.

Manual: A manual regeneration is initiated by pressing the “Force Regeneration” switch. A manual regeneration will only be allowed if the “Time to Regen” is less than 8 hours. If the “Force Regeneration” switch is pressed before “Time to Regen” is less than 8 hours, then “Regen not Required” will be displayed. The machine must be stationary, the parking brake must be applied, and the engine must be at low idle in order to perform a manual regeneration.

Disabled: When the regeneration system is in disabled mode, automatic regenerations will not be performed. The DPF indicator will illuminate if a manual regeneration is required. The “Time to Regen” displayed on the performance screen will indicate the time until the next regeneration will be required. However, the DPF indicator may illuminate with time remaining on the display. When the DPF indicator illuminates, the operator must perform a manual regeneration.

Regeneration Triggers

A regeneration may be required for the following reasons:

Soot: The DPF will collect soot produced by the engine. An automatic regeneration will become active to reduce soot level.

Start-Up Regeneration: A start-up regeneration is initiated by the ECM after a cold engine start. This regeneration is performed to heat the system to a required temperature for Diesel Exhaust Fluid (DEF) dosing to begin.

SCR Maintenance: A regeneration is performed to maintain the SCR system.

ARD Maintenance: A regeneration is performed to maintain the CRS system.

Regeneration System Warning Indicators



Illustration 136 g02117258

The DPF Indicator will illuminate when a regeneration is required. A regeneration should be performed as soon as possible.

Note: In some situations, the DPF indicator may stay illuminated after a regeneration ends. The illuminated DPF indicator indicates that a complete regeneration has **not** been performed. A complete regeneration is when the soot has been depleted or all of the criteria for one of the other regeneration types have been met. If the DPF indicator stays illuminated, perform a regeneration without interruption. The DPF indicator will shut off when a regeneration is complete.

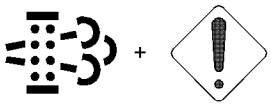


Illustration 137 g02117259

If the soot load is above a threshold or “Time to Regen” is 0 hours, then a regeneration is required. The DPF indicator and an action indicator will be illuminated. Engine power will be slightly derated. If the machine continues to operate without a regeneration, derate will eventually reach 100%. Stop the machine and apply the parking brake. With the engine at low idle, initiate a manual regeneration.

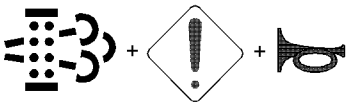


Illustration 138 g02117261

Once the amount of soot collected in the DPF has reached a threshold or “Time to Regen” has been at 0 hours for a pre-determined time, the DPF indicator and an action indicator will be illuminated and an audible alarm will sound.

10 minutes after the illumination of the DPF indicator, action indicator, and audible alarm, the engine will shut down. The engine can be restarted by cycling the engine start switch key. The engine will return to its previous derate state before shutdown.

Once the amount of soot collected reaches a threshold level or 6.4 hours of run time has passed since the action indictor was illuminated without a successful regeneration, the engine will have a 100% derate.

Once the amount of soot collected reaches a critical threshold level, the regeneration will be locked out. At this time, a regeneration can only be done through Cat Electronic Technician (ET), by an authorized Cat dealer. The engine may be restarted, but will only run for 30 seconds before shutting down again.

Delayed Engine Shutdown

The Delayed Engine Shutdown allows the engine to run for a time after the engine start switch is turned to the OFF position to cool the engine and system components. The key may be removed from the engine key switch.

Note: There may be regulations that define the requirements for the operator and/or support personnel to be present when the engine is running.

⚠ 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.

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

Note: Leaving the machine unattended when the engine is running may result in property damage in the event of a malfunction.

Turn the engine start switch to the OFF position.

Delayed Engine Shutdown – The delayed engine shutdown indicator will illuminate or the following text will be displayed, ENGINE COOLDOWN ACTIVE.

Delayed engine shutdown will run whenever the exhaust temperature is above a threshold at engine shutdown. Delayed engine shutdown will continue to run until the engine and system components are cooled.

Note: Only if components are extremely hot, Delayed Engine Shutdown will be initiated.

Note: To override delayed engine shutdown and stop the engine, turn the engine start switch to the STOP position. Overriding delayed engine shutdown may reduce engine and machine system component life. A warning message and/or audible alarm will be initiated and a fault code will be logged for improper engine shutdown.

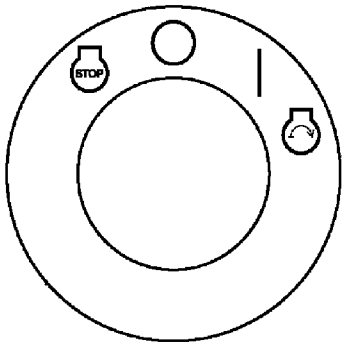


Illustration 139 g02362719

Note: At any time during a delayed engine shutdown, the engine start switch may be turned to the ON position. The machine may be placed back into service.

Note: With the operator key in the OFF position, the purge system will activate after a delayed engine shutdown.

DEF Purge – DEF Purge allows to extract the residual DEF from the DEF injectors, lines, and pump. The DEF purge will activate during a Delayed Engine Shutdown is running or after the key to the Engine is turned OFFin the shutdown position. The start key may be removed.

Note: There may be regulations that define the requirements for the operator and/or support personnel to be present when the engine is running.

⚠ 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.

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

Note: Leaving the machine unattended when the engine is running may result in property damage in the event of a malfunction.

i06301373

Selective Catalytic Reduction Warning System

SMCS Code: 1091-WXX; 7400

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

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

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

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

Definitions

Observe the following definitions.

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

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

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

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

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

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

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

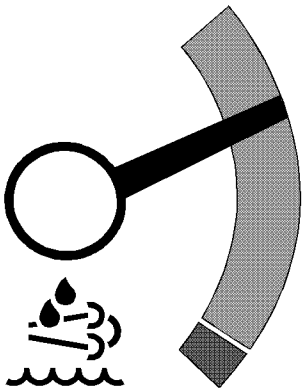


Illustration 140 g03684888

DEF Level Normal

Inducement Strategy for DEF Level

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

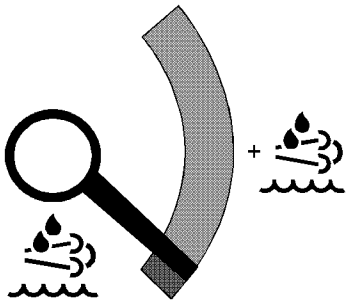


Illustration 141 g03681105

DEF Level Low

If the DEF level falls below 20%, “DEF Level Low” message will be displayed on the monitor. To avoid further inducements, turn the key to the OFF position and add DEF to the DEF tank.

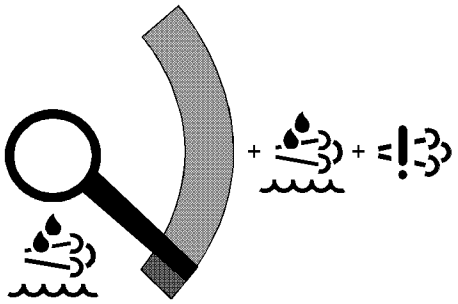


Illustration 142 g03681073

DEF Level Low and Emission Fault

If the DEF level falls below 13.5%, a level 1 inducement event will occur. a “DEF Level Low” message and an “Emission Fault” message will appear on the monitor.

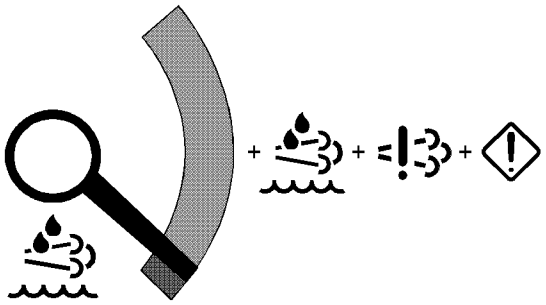


Illustration 143 g03681077

DEF Level Low, Emission Fault, and Flashing Action Lamp

If the DEF level is below 7.5%, a level 2 inducement event will occur. a “DEF Level Low” message and an “Emission Fault” message will appear on the monitor. The action lamp on the monitor will flash. If the ECM is configured to “Reduced Performance” and the DEF level has reached 1%, the machine will be limited to 75% torque.

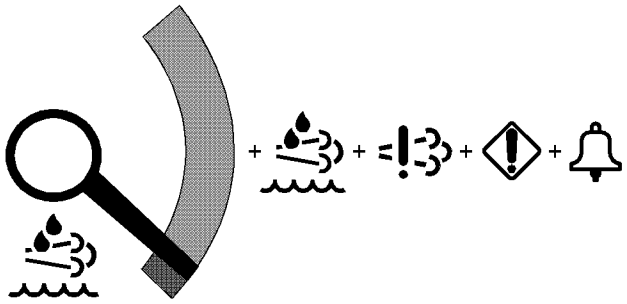


Illustration 144 g03681078

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

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

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

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

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



Illustration 145 g03623190

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



Illustration 146 g03623191

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

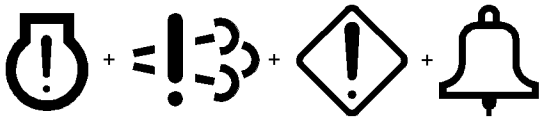


Illustration 147 g03623193

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

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

Inducement Emergency Override for Cat Engines Equipped with Selective Catalytic Reduction Systems (If Equipped)

Note: The inducement emergency override will only be allowed on a select number of machines that may be used in emergency situations. Contact your Cat dealer to find out if your machine is allowed to have this feature.

Inducement emergency override can only be enabled using Caterpillar supplied passwords. The feature is disabled by default. The feature will be enabled at the factory if allowed. If the customer wants the feature enabled after delivery of engine, they will need to contact their Cat dealer. Inducement emergency override is regulated by the Environmental Protection Agency (EPA) and only allowed in the United States. The European Union and Japan do not allow the feature to be used. For detailed information on activating, deactivating, or resetting override, contact your Cat dealer. Before you attempt the procedures documented in this manual, make sure that you have read and understand the information in this document.

The United States EPA requires the limiting of engine speed and/or power (derate) in certain conditions, to help ensure proper functioning of the engines emission control system. The EPA allows the temporary disabling of these limits (restoration of full engine speed and power capability) during a qualified emergency situation. The EPA defines a qualified emergency situation as a significant direct or indirect risk to human life. Below are examples of direct versus indirect risks.

Direct – An emission control condition that inhibits performance of an engine being used to rescue a person from life-threatening situation.

Indirect – An emission control condition that inhibits performance of an engine being used to provide electrical power to a data center that routes 911 emergency response communications.

The emissions-related derate can be disabled for up to 120 hours of engine operation. The temporary disabling of emissions-related derate is referred to as “Inducement Emergency Override” and must be reported to the United States EPA. The override can only be enabled or disabled by an authorized Cat dealer using Caterpillar supplied passwords. Once enabled, the override can be activated thru the electronic display menu in the cab (if equipped). Upon activation, the check engine and action lamps will be illuminated until and the override is reset. A code indicating that the inducement emergency override is active will also be active until the override is reset. The override can only be reset by the engine manufacturer, Caterpillar. A Cat dealer can reset the override using Caterpillar supplied passwords. Improper use of the override, failure to deactivate the override when the emergency has ended, and failure to report use of the override is prohibited under federal regulations and subject to penalties imposed by the United States EPA. The civil penalty per day operated in violation can be severe.

NOTICE
When the inducement emergency override is active, damage to aftertreatment and engine components can occur. Never use the override longer than necessary and always fix the root cause of the inducement as soon as possible. There will always be a diagnostic code indicating root cause of the inducement. Refer to the troubleshooting guide for how to fix inducement related failures.

Override Activation Method

There are two options for setting the override, using Cat Electronic Technician (ET) or thru the electronic display menu in the cab (if equipped). If the override has already been enabled by an authorized Cat dealer, then the operator can turn on the override without further input from Caterpillar. Upon activation, the check engine and action lamps will illuminate to alert the operator that the override is active. The override must be paused by the operator if the emergency ends before the 120 hours of override operation has expired. While paused, the equipment will be subject to derates. Once paused, the override can be activated again if the 120 hour time period has not expired and if an emergency situation still exists. Per federal regulations, the operator must fill out the Override Usage Report below and provide the report to Caterpillar within 60 days of activating the override.

Setting the Override through Cat Electronic Technician (ET)

- Go to “Configuration Parameters”
- Select “Aftertreatment Configuration”
- Select “Operator Inducement Emergency Override Activation” to activate the override
- The “Value” field should be switched to “Activated” (to pause the override change the “Value” field to “Not Activated”)

Setting the Override through Electronic Display Menu

Machine applications will be able to activate or deactivate the override thru the electronic display menu in the cab. The override will only be available when engine is already in inducement (derated). Operators must be trained properly to understand where override is located and that there could be severe penalties as mentioned above for misusing the override. There will be a warning on display stating: “EMERGENCY USE ONLY. SEE OWNERS MANUAL. PENALTIES APPLY FOR MISUSE” .

Resetting the Override

The override needs to be reset through Cat Electronic Technician (ET) whenever the override has expired. The override cannot be used again until the override is reset. The override should also be reset whenever the emergency has ended, regardless if the override has expired or not (i.e. accumulated 120 hours). The check engine and action lamps will continue to be illuminated until the override is reset. The code indicating that the inducement emergency override is active will also continue to be active until the override is reset. The override may be reset at any point after the initial activation. The override can only be reset by the engine manufacturer, Caterpillar, or an authorized Cat dealer using Caterpillar supplied passwords.

Override Usage Report

To comply with federal regulations, the operator must report usage of the override to Caterpillar Inc. within 60 days of activating the override. Failure to meet this reporting requirement may subject the operator to penalties under 40 CFR 1068.101. Caterpillar Inc. will in turn report override usage annually to the United States EPA. Although submitted to Caterpillar Inc., the override usage reports are deemed to be submissions to the United States EPA. Federal regulations prohibit submitting false information. The following information must be included in the report:

- Contact name, mail and e-mail addresses, and telephone number for the responsible company or entity
- A description of the emergency situation, the location of the engine during the emergency, and the contact information for an official who can verify the emergency situation (such as a county sheriff, fire marshal, or hospital administrator)
- The reason for the activation of the override during the emergency situation, such as the lack of DEF, or the failure of an emission-related sensor when the engine was needed to respond to an emergency situation
- The engine serial number (or equivalent)
- A description of the extent and duration of the engine operation while the override was active, including a statement describing whether the override was manually deactivated (paused) after the emergency situation ended

The Override Usage Report may be sent via e-mail or regular mail to one of the following addresses:

Email :

Emissions_Compliance@cat.com

Regular Mail :

Caterpillar Inc.
P.O. Box 600
Mossville, IL 61552-0600
Attention: Emissions Compliance Manager

i07229185

Operator Controls

SMCS Code: 7300; 7301; 7451

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

Cat Grade Control (If Equipped)

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

For information on how to use Cat Grade Control, refer to Operation and Maintenance Manual, SEBU8358, “Cat Grade Control Depth and Slope for E Series Excavators” and Operation and Maintenance Manual, M0077726, “Cat Grade Control for 2D and 3D Excavators”.

Operator Controls

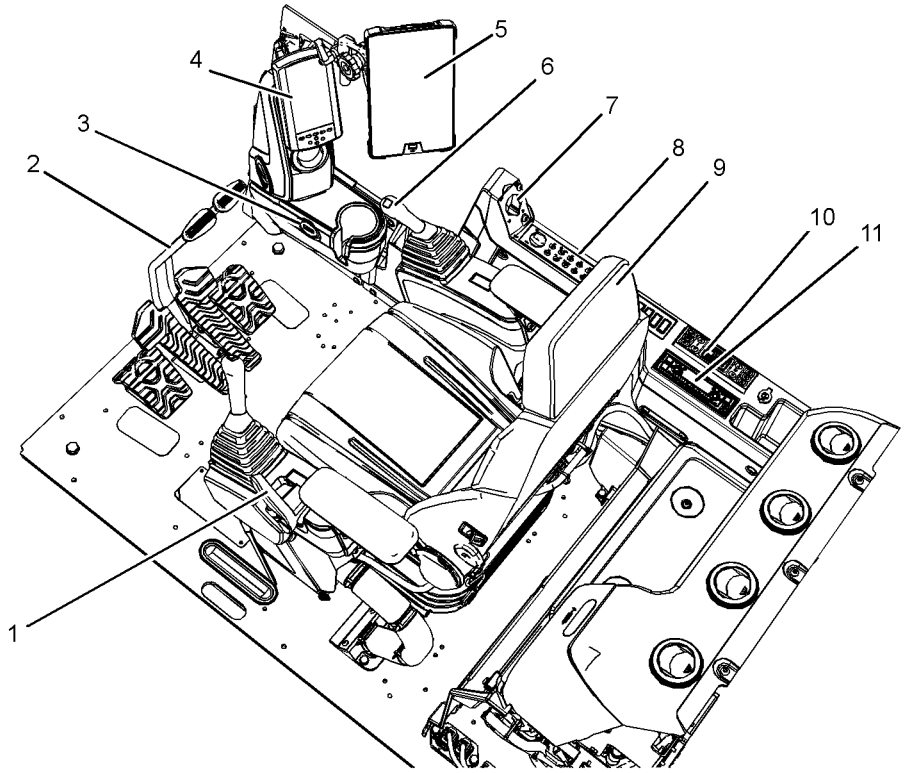


Illustration 148 g06169881

(1) Hydraulic lockout control
(2) Travel controls
(3) Service hour meter
(4) Monitor
(5) Cat Grade Control monitor
(6) Joystick controls
(7) Engine start switch
(8) Right side control panel
(9) Operator seat
(10) Air conditioning and heating control
(11) Radio

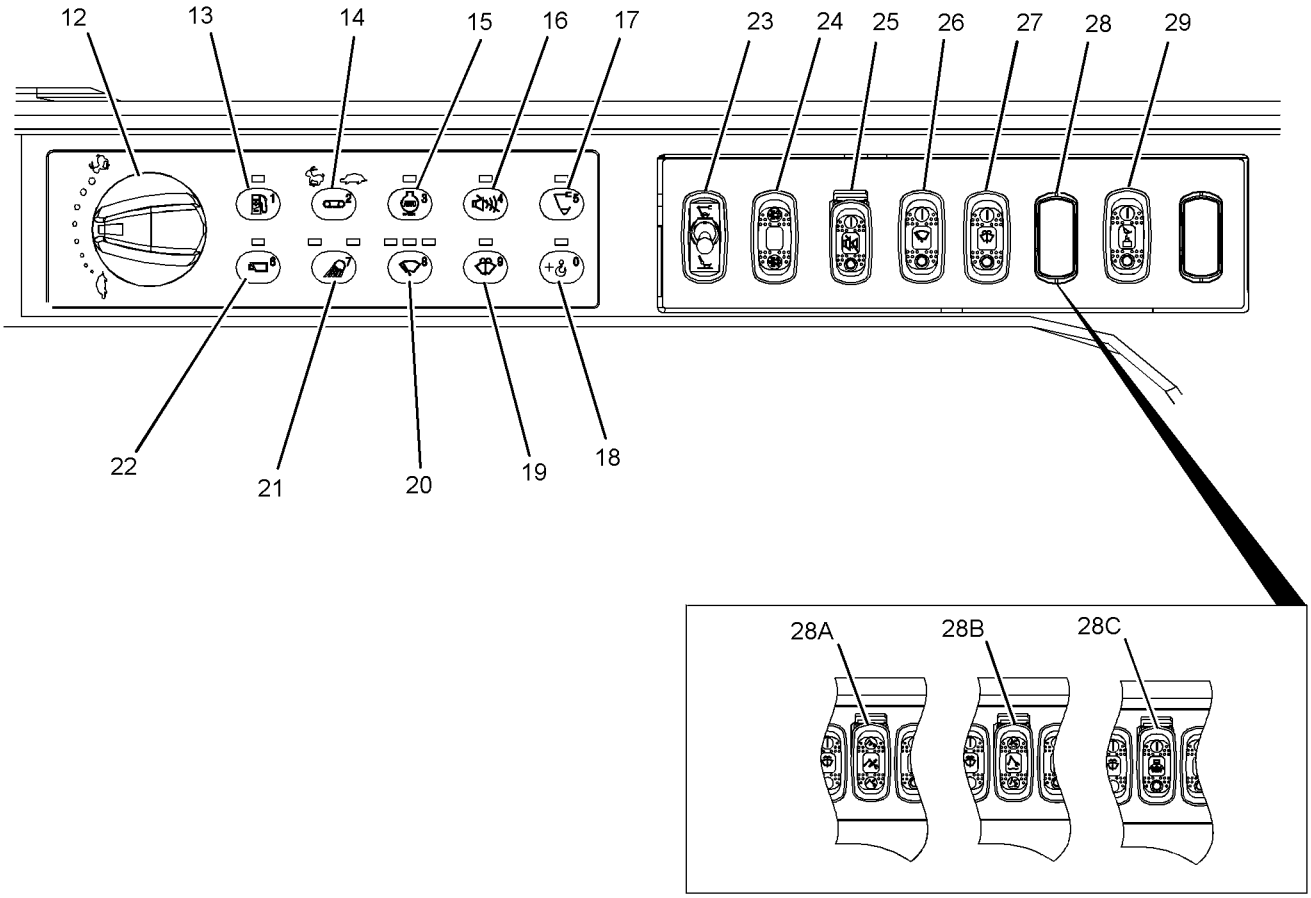


Illustration 149 g06169898

Right side control panel

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

Note: Not all switches present in the cab will be functional. If an attachment was not ordered, a switch may still be present but not functional.

Hydraulic Lockout Control (1)

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

Locked – Move the travel levers/pedals and move the joysticks to the HOLD (center) position. Move the lever for the hydraulic lockout control backward to the LOCKED position. All the factory installed hydraulic controls will become inoperable.

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

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

Travel Control (2)

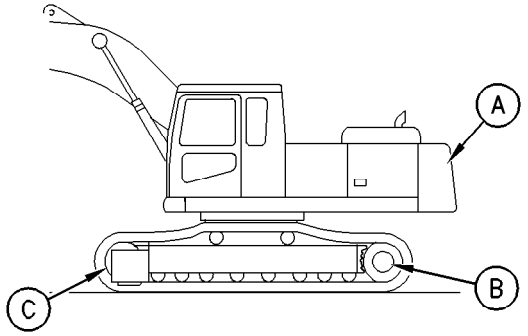


Illustration 150 g00753277

Position for normal travel

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

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

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

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

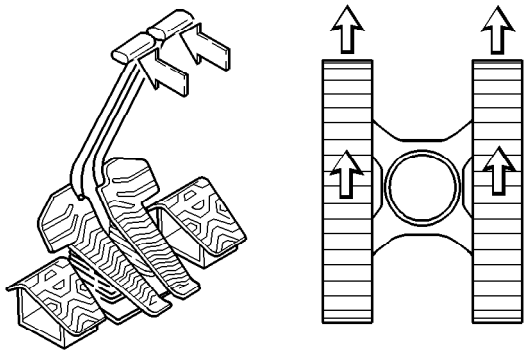


Illustration 151 g00731542

FORWARD travel

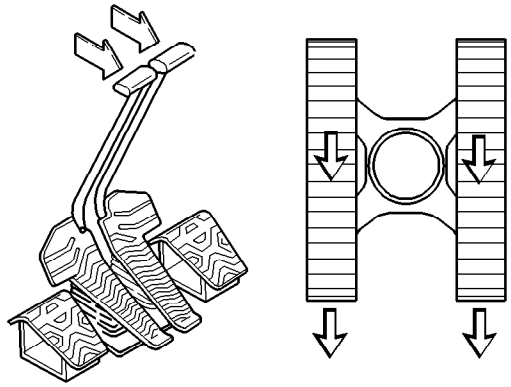


Illustration 152 g00731543

REVERSE travel

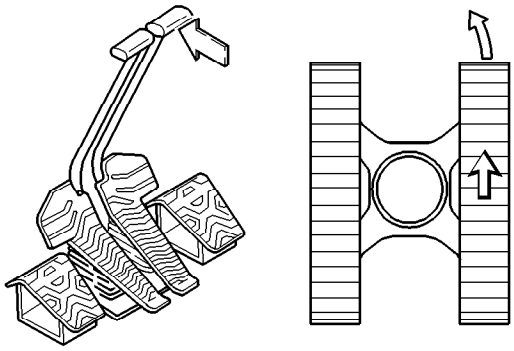


Illustration 153 g00731472

Pivot left turn (FORWARD)

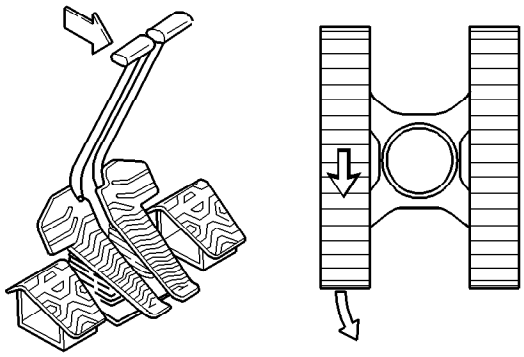


Illustration 154 g00731478

Pivot Left Turn (REVERSE)

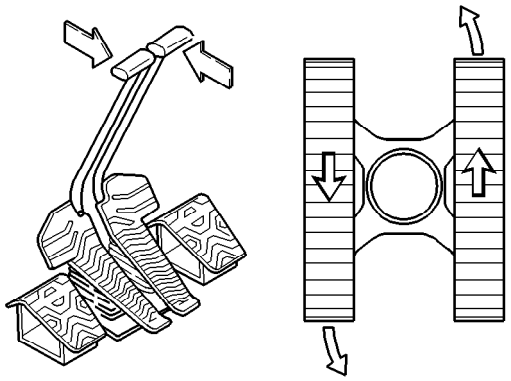


Illustration 155 g00731476
Counterrotate turn (LEFT)

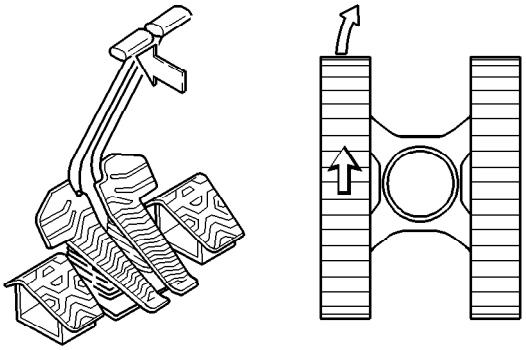


Illustration 156 g00731471
Pivot right turn (FORWARD)

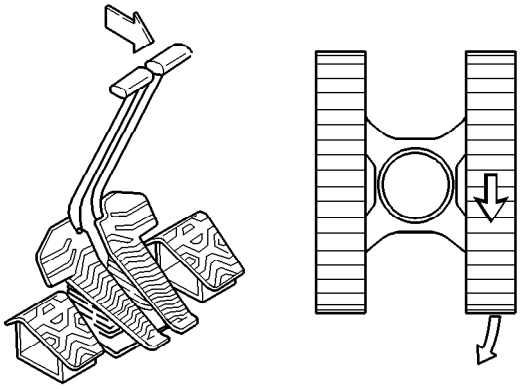


Illustration 157 g00731479
Pivot right turn (REVERSE)

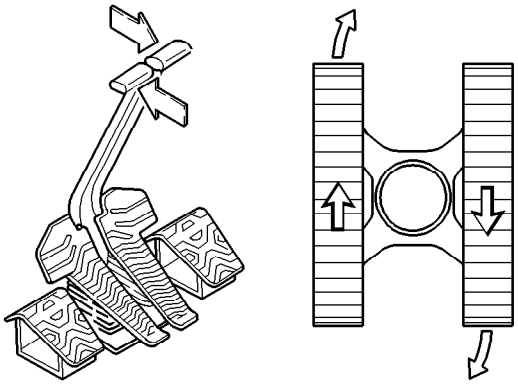


Illustration 158 g00731477
Counterrotate turn (RIGHT)

Service Hour Meter (3)

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

Monitor (4)

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

Cat Grade Control Monitor (5) (if equipped)

The monitor is used to display Cat Grade Control operating information. For more information on the operation of the monitor, refer to Operation and Maintenance Manual, M0077726, “Cat Grade Control for 2D and 3D Excavators”.

Joystick Controls (6)

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

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

Engine Start Switch (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.

Positions of the engine key switch are indicated by a film that surrounds the engine key switch.

Your machine may be equipped with a Type 1 film or your machine may be equipped with a Type 2 film. Both the Type 1 film and the Type 2 film are show below.

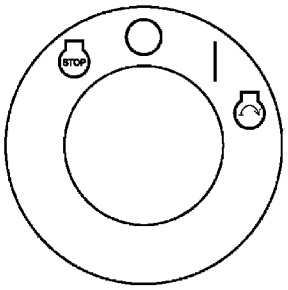


Illustration 159 g03740258
Type 1 engine key switch positions

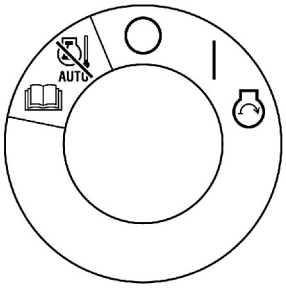


Illustration 160 g03740273
Type 2 engine key switch positions

STOP (TYPE 1) – Turn the engine key switch to the STOP position and hold the engine key switch in that position for 1 second to override delayed engine shutdown (DES). The engine will be shutdown immediately.

Note: Shutting down the engine using this method is considered a hard shutdown which disables the DES.

Note: A warning message and/or audible alarm will be initiated and a fault code will be logged for improper engine shutdown if exhaust temperature is above a limit.

Note: Overriding delayed engine shutdown may reduce engine and machine system component life. **Use for emergency situations only.**

DELAYED ENGINE SHUTDOWN OVERRIDE (TYPE 2) – Turn the engine key switch to the DELAYED ENGINE SHUTDOWN OVERRIDE position and hold the engine key switch in that position for 1 second to override delayed engine shutdown (DES). The engine will be shutdown immediately.

Note: Shutting down the engine using this method is considered a hard shutdown which disables the DES.

Note: A warning message and/or audible alarm will be initiated and a fault code will be logged for improper engine shutdown if exhaust temperature is above a limit.

Note: Overriding delayed engine shutdown may reduce engine and machine system component life. **Use for emergency situations only.**

For more information, refer to Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”.

OFF (TYPE 1 AND TYPE 2) – Inserting the key into the engine key switch and removing the key from the engine key switch must only be done from the OFF position. In the OFF position, there is no power to most electrical circuits in the cab. The engine may continue to run because the delayed engine shutdown feature is active. Turn the engine start switch to the OFF position before you attempt to restart the engine.

ON (TYPE 1 AND TYPE 2) – To activate the electrical circuits in the cab, turn the key clockwise to the ON position.

START (TYPE 1 AND TYPE 2) – To crank the engine, turn the key clockwise to the START position. After the engine starts, release the key. The key will return to the ON position.

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

Engine Idle Shutdown

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

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

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

- The control lever is in neutral.
- The engine coolant temperature is greater than 70° C (158° F).
- The battery voltage is greater than 24.5V
- The engine speed is less than 2000 rpm.
- The ambient temperature range is between 0° C (32° F) and 30° C (86° F).
- The Cat Regeneration System (CRS) is not working.

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



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

Operators Seat (9)

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

Air Conditioning and Heating Control (10)

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

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

Radio (11)

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

Engine Speed Control (12)



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



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



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

Power Mode (13)



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

Travel Speed Control (14)

⚠ WARNING

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

Personal injury can result from sudden changes in machine stability.



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

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

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

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

Automatic Engine Speed Control (15)

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

The engine rpm will recover automatically to the setting of the engine speed dial when any hydraulic function is activated. The AEC system operates in three modes. Refer to Table 23 for a description of each mode.

Automatic Engine Speed Control (AEC) – The Automatic Engine Speed Control switch is activated when the engine start switch is turned to the ON position. The indicator lamp will turn on. When you press the AEC switch, the function of the AEC switch changes from ON to OFF. The operator can choose from three possible modes for automatic engine speed control. Refer to Table 23 for more details.

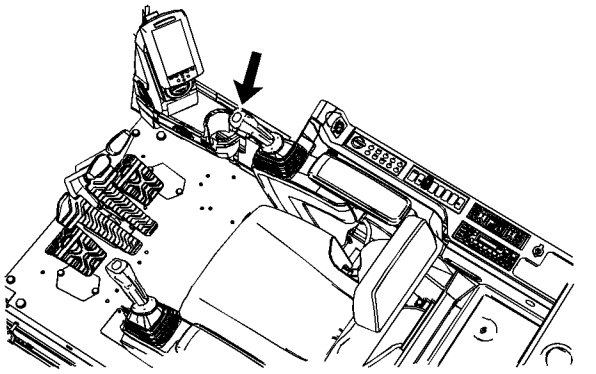


Illustration 161 g02050056

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

Manual Low Idle – Activate the manual low idle to reduce the engine speed to approximately 1060 rpm. Pressing the switch again will allow the engine speed to return to the original setting of the engine speed dial.

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

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

Table 23

AEC Mode	Position of AEC Switch	Setting of Engine Speed Dial	Position of Manual Low Idle Switch	Description of Mode
First stage	OFF	4 to 10	OFF	The electronic controller automatically reduces engine speed by 100 rpm after there has been no hydraulic demand for approximately 5 seconds.
Second stage	ON	3 to 10	OFF	The AEC system in the electronic controller will automatically reduce the engine rpm to approximately 1060 rpm after there has been no hydraulic demand for approximately 3 seconds.
Manual low Idle	ON or OFF	3 to 10	ON	The engine speed is reduced to approximately 1060 rpm.

Travel Alarm Cancel Switch (16)

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

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

Work Tool Control (17)

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

Heavy Lift Control (18)

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

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

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

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

Window Wiper and Window Washer (19-20)

Window Washer (19) – Push the switch to activate the window washer. While the switch is depressed, the indicator light will come on and washer fluid will spray from the nozzle. The window wiper will also operate while the switch is depressed. After the switch is released for approximately 3 seconds, the window wiper will stop.

Window Wiper (20) – Push the switch to activate the window wiper. Whenever the switch is depressed, the mode of the window wiper will change according to the indicator light that is illuminated.

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

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

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

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

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

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

Light Switch (21)

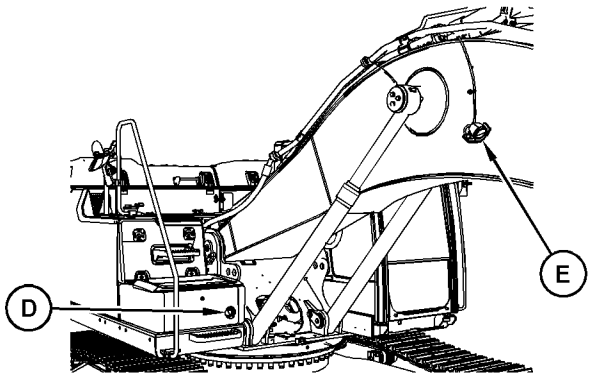


Illustration 162 g02049516

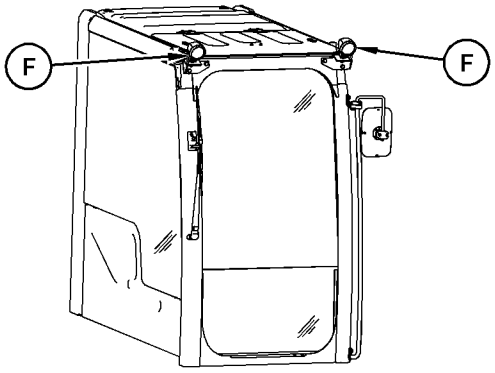


Illustration 163 g02049520

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

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

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

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

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

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

Rear/Side View Camera (22)

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

Quick Coupler Control (23)

Hydraulic Pin Grabber Quick Coupler

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

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

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

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

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

Quick Coupler



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



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

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

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

Cat Regeneration System (CRS) Aftertreatment Switch (24)



Force Regeneration – Push in the top of the switch for 2 seconds to begin a manual regeneration. An “Active Regen” message will be displayed on the monitor indicating that DPF regeneration cycle is in operation.



Disable Regeneration – Push in the bottom of the switch for 2 seconds to deactivate automatic regeneration and/or stop an active DPF regeneration cycle. A “Regen Disabled” message will be displayed on the monitor.

Note: To re-enable auto regeneration, cycle the engine start switch to OFF and back to ON.

For more information, refer to Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”.

Radio Mute Switch (25)



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

Lower Window Wiper and Window Washer (26-27) (If Equipped)



Lower Window Wiper (26) – Push down on the top of the switch to turn on the lower window wiper. Push down the bottom portion of the switch to turn off the lower window wiper.



Lower Window Washer (27) – Push down on the top of the switch and keep the switch depressed to activate the lower window washer. While the switch is depressed, the washer fluid will spray from the nozzle.

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

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

Boom Pressure Control (28A)



Boom Pressure Control – If equipped, press the switch to turn on the boom control pressure function. The boom pressure control function improves controllability for low load operation such as raking up rocks by reducing vibration and shock.

SmartBoom Control (28B)

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

Fine Swing Control (28C)

⚠ WARNING

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

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

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



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

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

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

Overload Warning Device (29)

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

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

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

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

Service Port

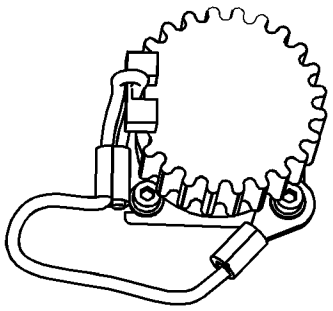


Illustration 164 g03320855

Electronic Technician service port

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

Contact your Cat dealer for additional information.

i06515894

Battery Disconnect Switch

SMCS Code: 1411-B11

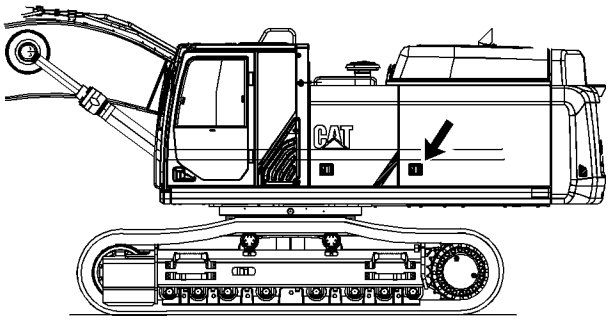


Illustration 165 g02108657

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

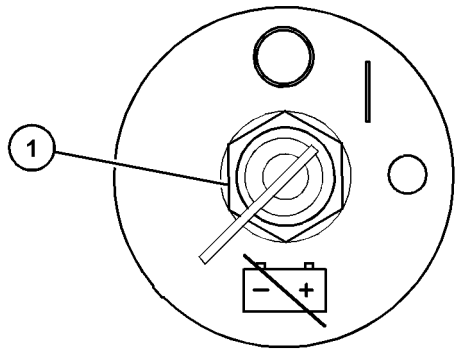


Illustration 166 g06010955

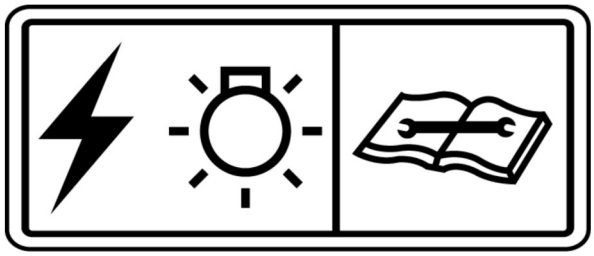


Illustration 167 g03796564

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

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

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

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

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

The battery disconnect switch and the engine start switch perform different functions. The entire electrical system is disabled when you turn the battery disconnect switch to the OFF position. The battery remains connected to the electrical system when you turn the engine start switch to the OFF position.

Turn the battery disconnect switch to the OFF position and remove the key when you service the electrical system or any other machine components. Lock out access to the battery disconnect switch by closing cover (2) and installing a padlock.

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

- short circuits
- current draw via some components
- vandalism

i05151989

Product Link
(Product Link Japan)

SMCS Code: 7490; 7606

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: TEW1–Up

NOTICE
Vehicles equipped with Product Link Japan are equipped with wireless devices that use public wireless radio waves. Be sure to read and understand the following precautions for use of this system.

Product Link Japan uses public wireless networks and cannot be used in areas where radio wave cannot be received.

A machine may become inoperable if the antenna and corresponding equipment are removed or damaged. If the antenna or corresponding equipment need to be removed, consult with your Cat dealer.

Persons with an implantable cardiac pacemaker or implantable defibrillator must not approach within 22 cm (8 inch) of the antenna that is installed at the rear of an operator seat as such devices can be negatively affected by the radio waves.

Electronic devices can be negatively affected by radio waves. If electronic devices are used near this system, consult the manufacturer of the electronic device regarding the affects of radio waves on operation.

This system consumes power even when the engine start switch is turned "OFF". If storing a machine for an extended period, make sure that the battery is fully charged and turn the power disconnect switch to OFF.

Your machine may be equipped with the Cat ® Product Link Japan system.

The Product Link Japan system is a remote management system in which machine information is automatically transmitted from a machine to a customers office.

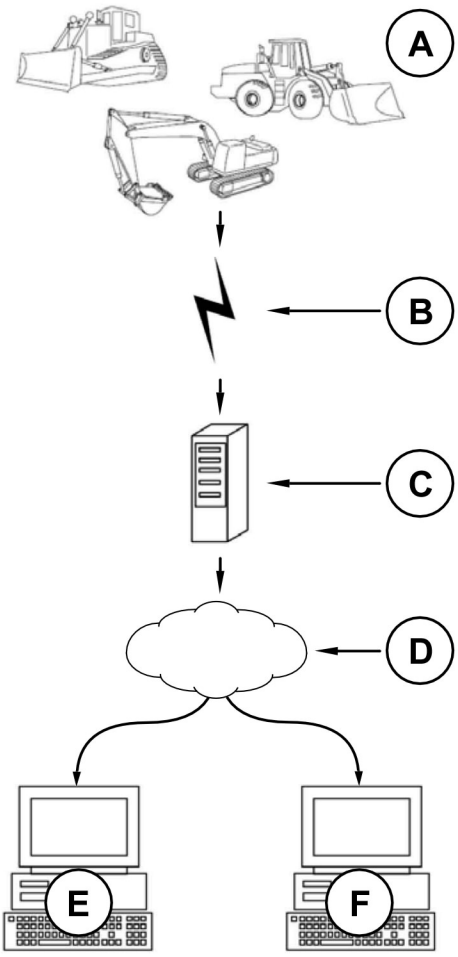


Illustration 168 g03317923

(A) Machine (equipped with Product Link Japan)
(B) Wireless network
(C) Product Link Japan Center Sever
(D) Internet
(E) Customers computer or similar device
(F) Cat dealer computer or similar device

For machines equipped with a wireless device the Product Link Japan system will send information from the machine to the Product Link Japan Center. The transmitted information can then be monitored through the Caterpillar website using a computer or similar device that is connected to the Internet.

Below is a list of items that can be monitored with the Product Link Japan system.

Table 24

Product Link Japan Functions	
Operating Information	Location information (latitude/longitude)
	Accumulated operating time
	Operating status by time period

(continued)

(Table 24, contd)

	Fuel level
Maintenance Information	Engine coolant
	Engine oil
	Hydraulic oil
	Travel drive oil
	Swing drive oil
	Water separator (primary fuel filter)
	Secondary fuel filter
	Fuel pump screen filter
	Fuel tank cap
	Engine oil filter
	Pilot filter
	Drain filter
	Return filter
	Attachment filter
	Blowby gas filter
	Ignition plug
Warnings	Starting restrictions/Area warnings
	Other warnings
Starting Restrictions	Date conditions
	Day of the week conditions
	Time conditions
	Area conditions

Product Link Japan can also be used to specify and apply machine starting restrictions by using a personal computer or similar device that is connected to the Internet. Starting restrictions will prevent the engine from being started in accordance with the specified conditions. See your Cat dealer for additional information.

A “Security System Operating” message will appear on the monitor when a starting restriction has prevented the engine from being started.

Note: Starting restrictions can be temporarily canceled. Notify your site manager for more information or contact your Cat dealer.

Note: A machine may become inoperable if the antenna and corresponding equipment are removed or damaged. Contact your Cat dealer if starting restrictions have been applied when starting restrictions have not been specified.

i08001446

Product Link

SMCS Code: 7490; 7606

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

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

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

Data Broadcasts

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

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

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

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

Operation in a Blast Site for Product Link Radios

⚠ WARNING

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

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

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

- Operation and Maintenance Manual, SEBU8142, “ Product Link - PL121, PL321, PL522, and PL523”
- Operation and Maintenance Manual, SEBU8832, “ Product Link PLE702, PLE602, PLE601, PL641, PL631, PL542, PL240, PL241, PL243, PL141, PL131, PL161, PL083 and PL042 Systems”

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

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

i03903396

Power Receptacle
(If Equipped)

SMCS Code: 1436; 7451

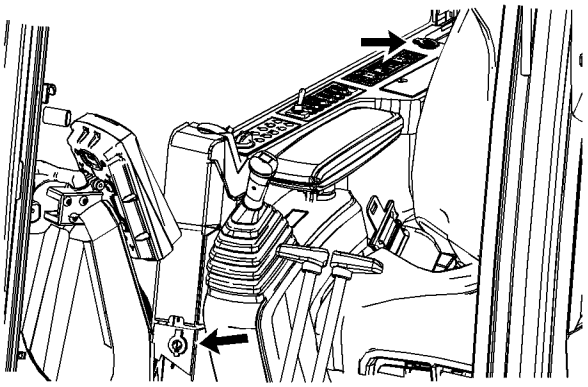


Illustration 169 g02145563

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

i07037877

Machine Security System
(If Equipped)

SMCS Code: 7631

Operation Section

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

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

Basic Operation

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

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

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

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

Security Management

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

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

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

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

Regulatory Compliance Section

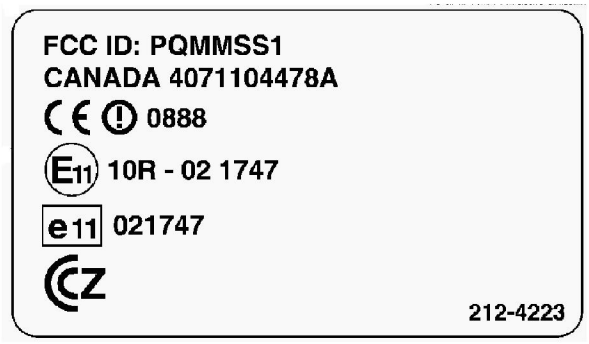
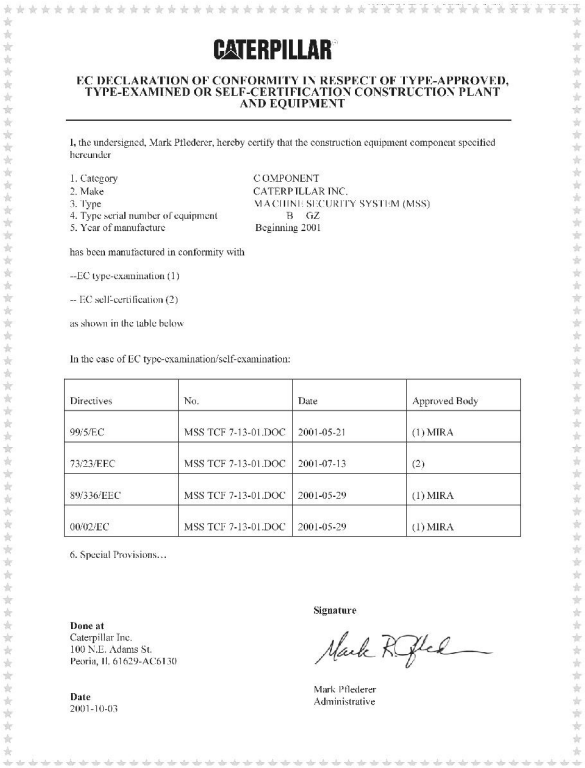


Illustration 170 g00832427

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



CATERPILLAR

EC DECLARATION OF CONFORMITY IN RESPECT OF TYPE-APPROVED, TYPE-EXAMINED OR SELF-CERTIFICATION CONSTRUCTION PLANT AND EQUIPMENT

I, the undersigned, Mark Pflederer, hereby certify that the construction equipment component specified hereunder

1. Category — COMPONENT
2. Make — CATERPILLAR INC.
3. Type — MACHINE SECURITY SYSTEM (MSS)
4. Type serial number of equipment — B GZ
5. Year of manufacture — Beginning 2001

has been manufactured in conformity with

-- EC type-examination (1)

-- EC self-certification (2)

as shown in the table below

In the case of EC type-examination/self-examination:

Directives	No.	Date	Approved Body
99/5/EC	MSS TCF 7-13-01.DOC	2001-05-21	(1) MIRA
73/23/EEC	MSS TCF 7-13-01.DOC	2001-07-13	(2)
89/336/EEC	MSS TCF 7-13-01.DOC	2001-05-29	(1) MIRA
00/02/EC	MSS TCF 7-13-01.DOC	2001-05-29	(1) MIRA

6. Special Provisions...

Done at
Caterpillar Inc.
100 N.E. Adams St.
Peoria, IL 61629-AC6130

Date
2001-10-03

Signature

Mark Pflederer
Administrative

Illustration 171 g00822256

i06587362

Camera

SMCS Code: 7347; 7348

Rear View Camera (If Equipped)

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

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

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

Side View Camera (If Equipped)

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

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

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

i06970281

Monitoring System
(Monitor with Installed Cat Grade With Assist)

SMCS Code: 7451; 7490

⚠ WARNING

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

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

Personal injury could occur.

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

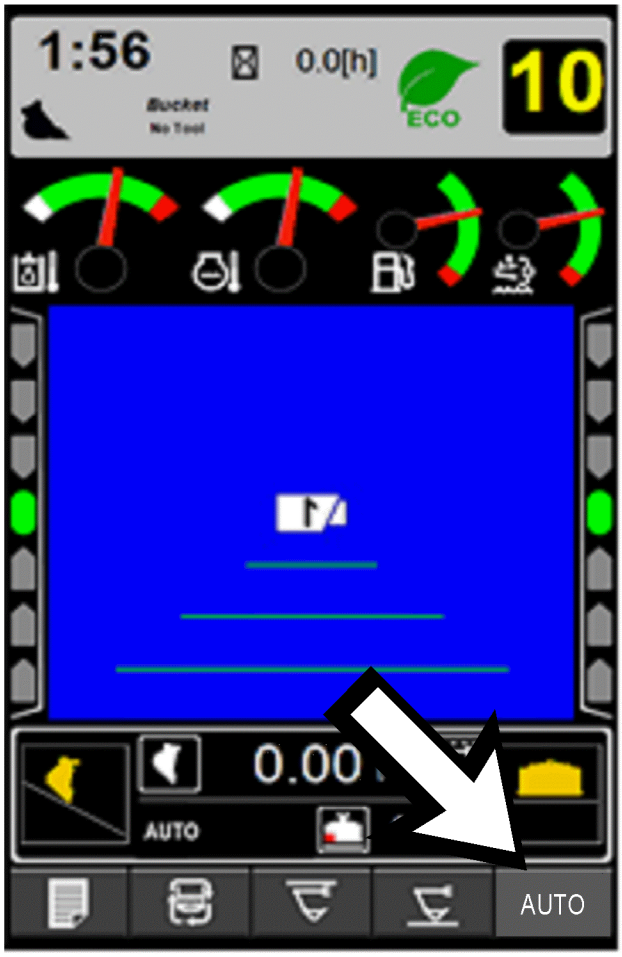


Illustration 172 g03874655

Multi-Information Area with Button to Select Auto Mode

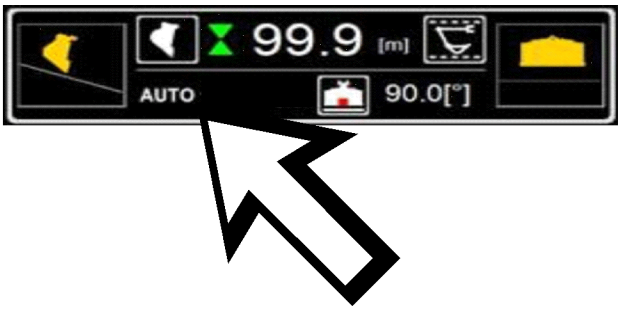


Illustration 173 g03874678

Multi-Information Area with Auto Mode Indicated

When in auto mode, all auto functions are enabled.

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

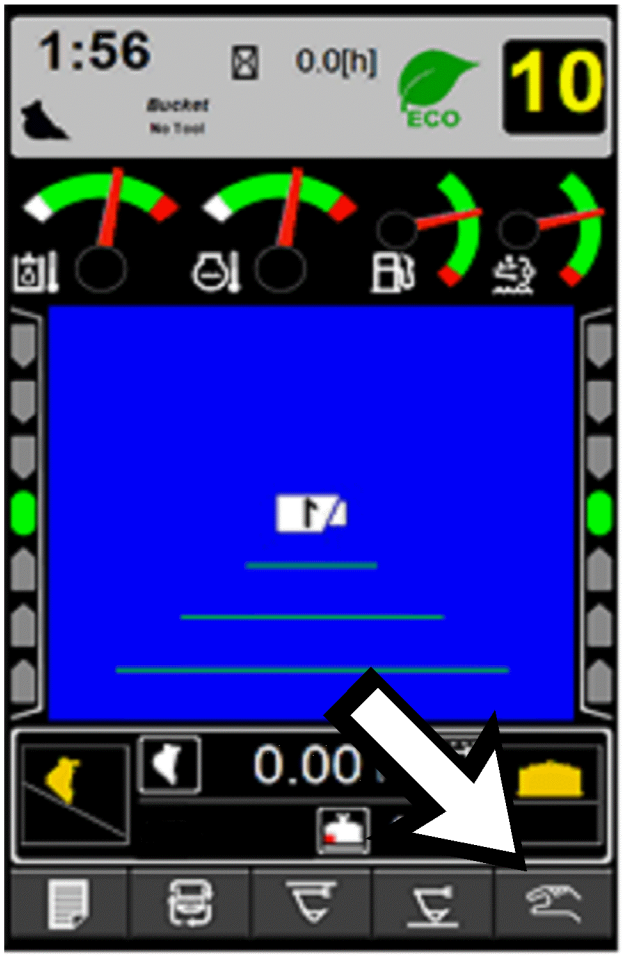


Illustration 174 g03874649

Multi-Information Area with Button to Select Manual Mode



Illustration 175 g03874670

Multi-Information Area Manual Mode Indicated

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

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

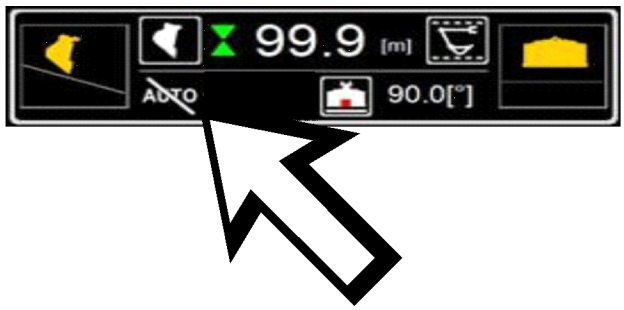


Illustration 176 g03874677

Auto Cancel Mode Indicated

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

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

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

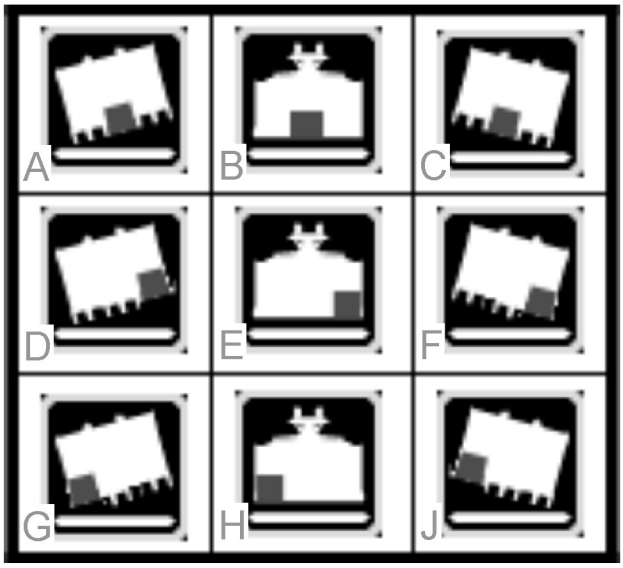


Illustration 177 g06108945

Bucket icon states

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

Illustration 177 shows the various angle states of the direction of the bucket slope and the bucket focus states for the icon. The square on the bucket indicates the position of the bucket focus.

Note: The default bucket focus position is bucket center.

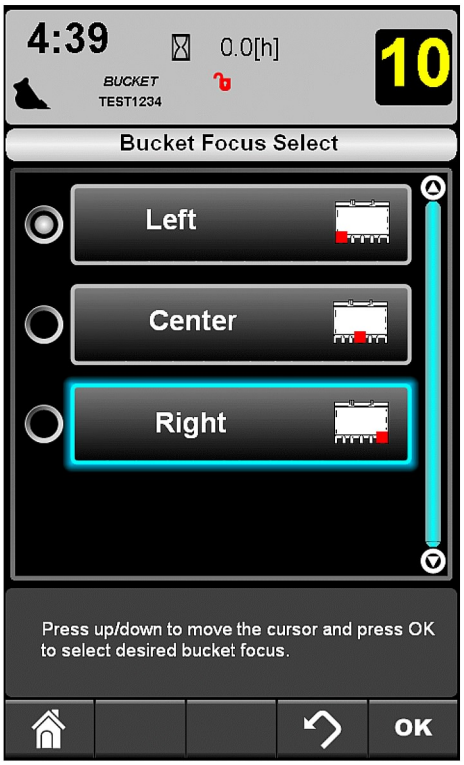


Illustration 178 g06108996

Bucket focus state selection monitor

i07532174

Monitoring System

SMCS Code: 7451; 7490

NOTICE

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

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

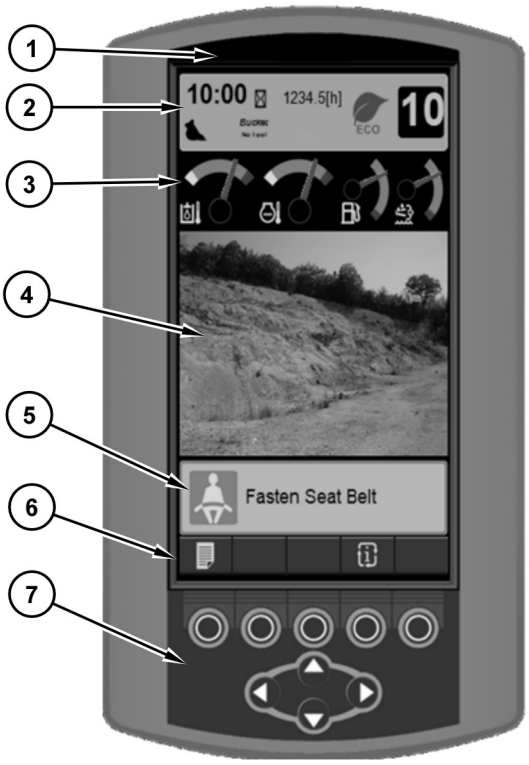


Illustration 179 g03510903

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

Action Lamp (1)

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

Clock Bar (2)

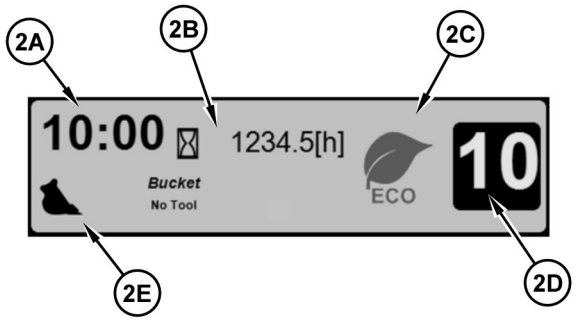


Illustration 180 g03510998

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

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

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

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

Time To Regen (2B) – This indicator shows the estimated time needed until the next regeneration.

Note: The monitor will display “AUTO” if the auto regeneration was allowed. If the auto regeneration was not allowed, the monitor will display the estimated time.

Note: Press the screen cycle key to cycle through indicators (2B).

Power Mode (2C)

Economy Mode – This indicator shows that the machine is set to operate in the economy mode.

High Hydraulic Power Mode – This indicator shows that the machine is set to operate in the high hydraulic power mode.

In certain regions the modes that can be selected are: “ECONOMY” and “STANDARD HYDRAULIC POWER” and will not have an indicator for the standard mode.

Throttle Dial (2D)

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

Active Tool (2E)

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

Gauges (3)

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

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

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

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

Camera View (4) (If Equipped)



Illustration 181 g06032090

(1) Rear view
(2) Side view

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

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

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

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

Horizontal guide lines can be enabled/disabled. Consult your Cat dealer when you want to change the setting.

Warning Display Area (5)

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

Multi-information Area (6)

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

Key Pad (7)

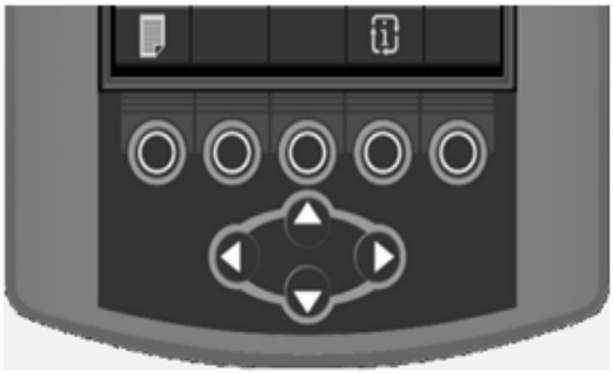


Illustration 182 g03547409

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

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

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

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

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

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

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

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

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

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

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

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

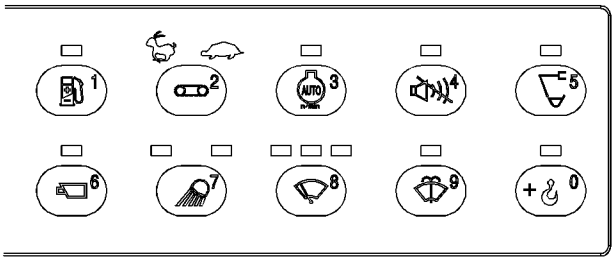


Illustration 183 g03294460

Soft switch panel

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

Gain/Response Control (IF Equipped)

The Gain/Response function can change the controllability of the joysticks to match the machine to a particular task. To enable or disable the Gain/Response function, Flip the Gain/Response switch.

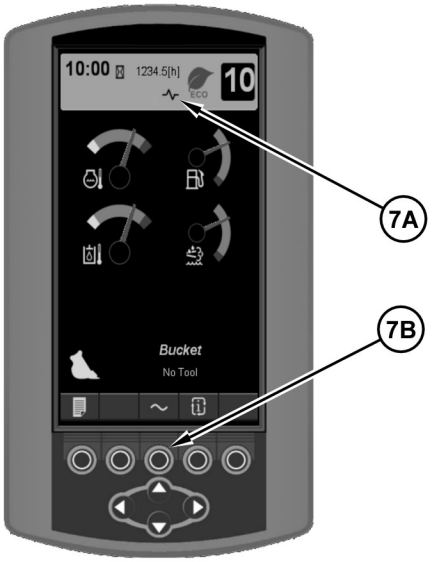


Illustration 184 g03514819

The Operator may select 1 of the following Gain/Response modes:

- Normal
- Soft
- Quick

Press the Gain key (7B) to change the Gain type to Normal / Soft / Quick.

Note: The Gain/Response setting (7A) can be continuously displayed on the monitor.

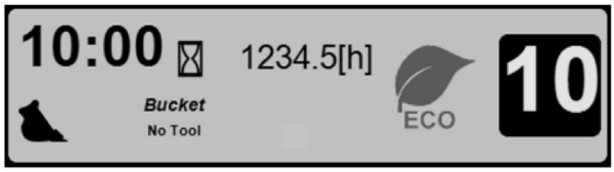


Illustration 185 g03512217

Normal

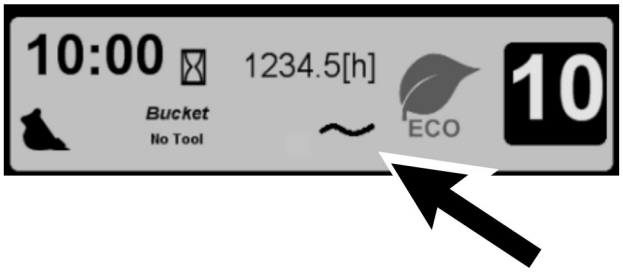


Illustration 186 g03514801

Soft



Illustration 187 g03514778

Quick

Soft – Push the Gain/Response key once on the monitor to select the soft mode. This mode slows down the movements of the boom, stick, work tool, and swing.

Quick – Push the Gain/Response key twice on the monitor to select the quick mode. This mode reduces the range of fine control of the joysticks.

Consult your Cat dealer to change the presets of the Gain/Response modes.

Prestart Monitoring Function

Turn the engine start switch to the ON position.

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

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

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

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

Note: The service hours for the filters are checked. The service hours for the fluids are also checked. If a filter or a fluid is over the recommended change interval, “CHECK Service Parts INFO” appears on the display. Refer to filter and fluid Information located this Operation and Maintenance Manual for more information. This message will disappear after 5 seconds.

Note: If more than one fluid level is low, the symbols for the right key and the left key are indicated in the bottom right area of warning message. Press the right key or the left key to check the other warning message. The low fluid level indicators will disappear within 5 seconds after the engine is started.

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

If the engine is started during the fluid level check, the monitor will cancel these checks.

Machine Warnings

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

The monitoring system provides three warning categories.

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

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

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

Warning Category 1

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

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



“ACCUMULATOR PRESSURE WARNING” – Used in Hybrid applications. An abnormality has been detected in the swing accumulator. Stop the engine and contact your Cat dealer.



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



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



“DPF LEVEL HIGH REGEN REQUIRED” – DPF levels are high. Perform a forced regeneration. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”.



“EMISSION FAULT” – DEF System Failure. Stop the engine and contact you Cat dealer.



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



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



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



“ENGINE SHUTDOWN IDLE TIME EXCEEDED” – The engine is stopped by engine idle shutdown function. Machine shutdown such as air conditioner is pending. Turn the engine start key to the OFF position.



“FUEL FILTER PLUGGED” – The fuel filter is restricted. Engine output will be decreased. Immediately inspect the fuel filter. Replace the fuel filter, if necessary. Perform any necessary repairs. Refer to Operation and Maintenance Manual, “Fuel System Primary Filter (Water Separator) Element - Replace”.



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



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



“REGEN CONDITION ENG TEMP LOW” – The engine temperature does not meet the conditions necessary to start a forced regeneration. Increase the engine temperature. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”.



“REGEN CONDITION NOT MET” – Conditions for a forced regeneration have not been met. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”.



“REGEN SYSTEM FAULT” – An abnormality has been detected in regeneration system. Stop the engine and contact your Cat dealer. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



“SWING ACCUMULATOR SYSTEM MALFUNCTION” – Used in Hybrid applications. An abnormality has been detected in swing accumulator. The swing accumulator system has been disabled. Contact your Cat dealer.



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

Warning Category 2

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



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



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



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



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



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



DEF PURGE ACTIVE – The DEF system is purging. Do not turn the battery disconnect switch to the OFF position while this message is active.



“DPF LEVEL HIGH REGEN REQUIRED” – DPF levels are high. Perform a forced regeneration. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



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



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



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



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



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



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



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



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



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



“Lever is Not Neutral” – The lever is not in the NEUTRALposition. Move the lever to the NEUTRAL position



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



“REGEN FAULT PERFORM REGEN” – The specified time to regeneration has expired. Perform regeneration immediately. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



“REVERSE FAN ERROR” – An error has occurred while the reverse fan is operating. Another warning should appear. This other warning will indicate a specific cause. Check this warning and take appropriate action. If the problem cannot be resolved, contact you Cat dealer.



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



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



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



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

Warning Category 3

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



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



“Counterweight Removal” – The Counterweight removal switch is in the ON position.



“DPF LEVEL HIGH SHUTDOWN SAFELY” – The DPF level exceeds threshold. Stop the machine immediately and perform a forced regeneration. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



“EMISSION FAULT” – DEF System Failure. Stop the engine and contact you Cat dealer.



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



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



“FUEL FILTER PLUGGED POWER DERATE” – The fuel filter is restricted. Engine speed is restricted. Stop the engine. Determine the cause of the fault and perform any necessary repairs.



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



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



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



“OPERATOR OVERRIDE HOT SHUTDOWN” – The operator has moved the key switch to the emergency stop position.



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



“REGEN FAULT PERFORM REGEN” – The specified time to regen has expired. Perform regeneration immediately. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



“REGEN LOCKOUT SERVICE REQUIRED” – Service required. Shut down the engine. Contact your Cat dealer. See this Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration”



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

Other Messages

Prestart

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



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



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



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



“FASTEN SEAT BELT” – Fasten your seat belt.

Miscellaneous

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



“ACTIVE REGEN” – An active regeneration is in process. Push the inhibit regeneration button to stop. In case of emergency, turn the key left to stop the engine.



“COOLANT TEMP LOW ELEVATED IDLE” – The coolant temperature is low. Engine idle will be elevated.



“ECONOMY MODE SELECTED” – The economy power mode has been selected.



“ENGINE COOLDOWN ACTIVE” – Engine cool down is active. Do not disconnect battery power while the engine cool down is active. In case of emergency, turn the key left to stop the engine.



“HIGH POWER MODE SELECTED” – The high-power mode has been selected.



“POWER MODE LOCKING” – Power mode has been locked through the power mode setting menu. Refer to this Operation and Maintenance Manual, “Monitoring System”



“QUICK COUPLER LOCKING” – The quick coupler is locking. See this Operation and Maintenance Manual, “Quick Coupler Control”



“REGEN DISABLED” – Regeneration has been disabled.



“REVERSE FAN STARTING” – The reverse fan is currently operating. Do not operate the machine until the reverse fan has stopped.

“STANDARD POWER MODE SELECTED” – The standard power mode has been selected.



“START AUTO WARMING UP” – The urea temperature is low.



“START AUTO WARMING UP?” – To start the automatic hydraulic warm-up function, place the bucket on the ground. Move the hydraulic lockout lever to the LOCKED position, and then press “*” on the monitor.



“SYSTEM PROTECTION COMPLETE” – Indicates that the DEF purge is complete. When the temperature of the DEF injector is high, an engine cooldown is executed followed by the DEF purge.



“VERIFY TOOL LOCKING” – The quick couple has been locked. Verify that the quick coupler is securely fixed to the work tool.



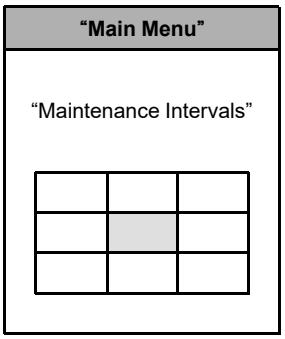
“WARM-UP MODE POWER DERATE” – If the joysticks are held for more than 30 seconds, the machine ECM will go into the warm-up mode power derate setting. The machine ECM limits the hydraulic pump torque to 50 percent. Release the joysticks to cancel this setting. Refer to Operation and Maintenance Manual, “Engine and Machine warmup”.

Main Menu

The “Main Menu” allows the operator to view information concerning the machine. This menu also allows the operator to change information concerning the machine.

1. Push the menu key when the default display is active.

Table 25



2. The "Main Menu" will be displayed with menu options that are installed on the machine. The number of choices can vary. For more information on these menus, refer to the respective descriptions below.

3. Press the right key or the left key to highlight the desired menu. Press the OK key to open the desired menu.

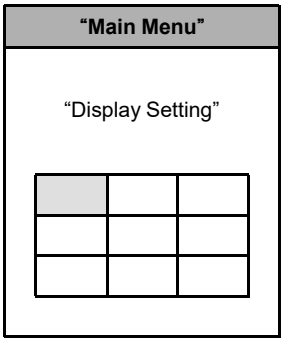
Note: Press the back key or the home key to exit this menu and return to the default display.

Display Setting

The "Display Setting" menu allows the operator to change the various display settings of the monitor.

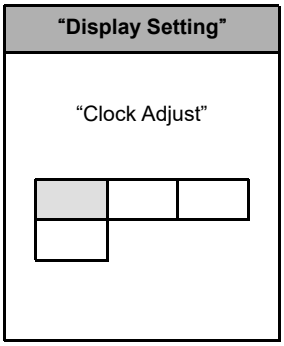
1. Press the menu key.

Table 26



2. Press any of the arrow keys to highlight the "Display Setting" menu. Press the OK key.

Table 27



3. The "Display Setting" menu will be displayed with four new menu options. For more information on these menus, refer to the respective descriptions below.

4. Press any of the arrow keys to highlight the desired menu. Press the OK key to open the desired menu.

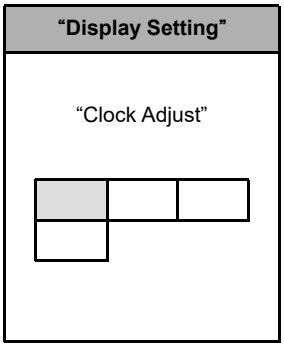
Note: Press the home key to return to the default display.

Adjusting the Clock

The "Clock Adjust" menu allows the operator to change the time on the clock.

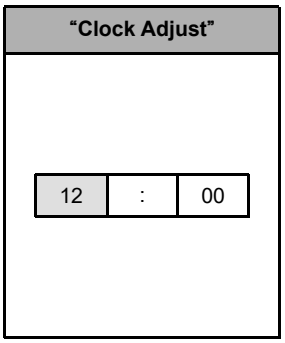
1. Press any of the arrow keys to highlight the "Clock Adjust" menu. Press the OK key.

Table 28



2. The "Clock Adjust" menu will be displayed with the current time. Press the left arrow key or the right arrow key to select the hour or the minute. Press the OK key.

Table 29



3. The hours or the minutes will be highlighted. Press the up arrow key to increase the value. Press the down arrow key to decrease the value.

4. When the clock is set to the desired time, press the OK key to save the new time in memory.

Note: Press the back key to return to the previous display without saving.

Note: Press the home key to return to the default display.

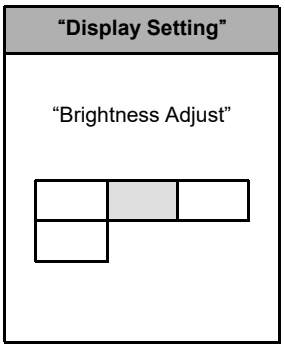
Adjusting the Brightness

The “Brightness Adjust” menu allows the operator to change the brightness of the monitor.

1. Press any of the arrow keys to highlight the “Brightness Adjust” menu. Press the OK key.

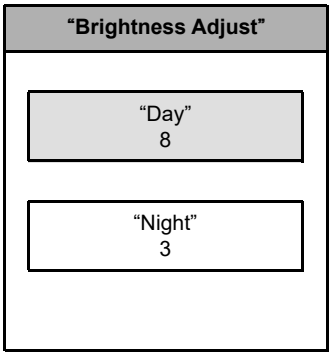
Note: There are two brightness settings. The first setting is used for machine operation during the day. The second setting is used for machine operation at night.

Table 30



2. Press the up arrow key or the down arrow key to select the “Day” setting or the “Night” setting. Press the OK key.

Table 31



3. Press the right key to increase the brightness. Press the left key to decrease the brightness. The brightness can be set between 1 and 10.

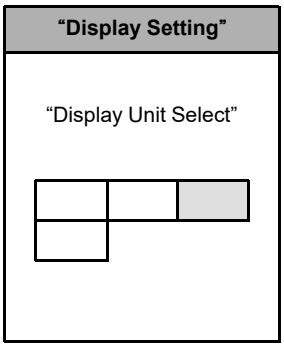
Note: Press the home key to return to the default display.

Display Unit Select

The “Display Unit Select” menu allows the operator to change the display units.

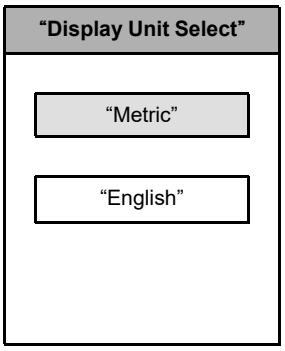
1. Press any of the arrow keys to highlight the “Display Unit Select” menu. Press the OK key.

Table 32



2. Press the up arrow key or the down arrow key to select the “Metric” setting or the “Imperial” setting. Press the OK key.

Table 33



3. Press the “Back” key to return to the previous screen or press the “Home” key to return to the main menu.

Default Screen Preset

The “Default Screen Preset” menu allows the operator to change the default screen image when the monitor is turned on.

Note: This menu function is only available when the machine is equipped with a rear view camera.

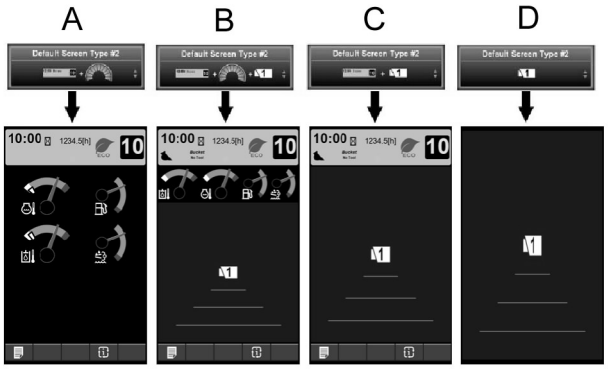
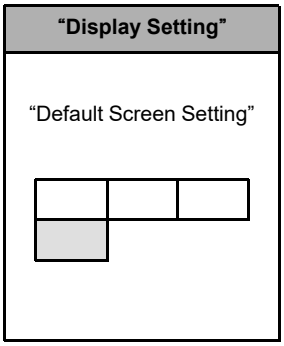


Illustration 188 g03512276

(Pattern A) Camera view is not displayed, and gauges displayed in large view.
(Pattern B) Gauges and camera view displayed simultaneously. Pattern B is the default display if the rear view camera is equipped on the machine.
(Pattern C) Gauges are not displayed. Large view of rear view camera.
(Pattern D) Camera view displayed on full monitor screen. Any warnings or events will default to Pattern B.

1. Press any of the arrow keys to highlight the “Default Screen Setting” menu. Press the OK key.

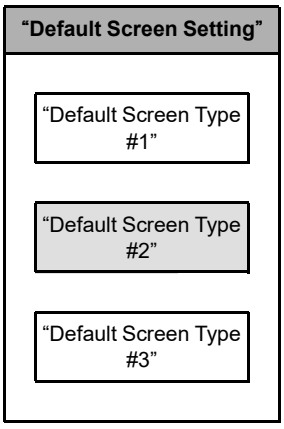
Table 34



2. Press the up arrow key or the down arrow key to select the default screen type. Press the OK key to enter the edit mode.

Note: Default screen #1 is preset at the factory and cannot be changed.

Table 35



3. Press the up arrow key or the down arrow key to select the default screen type. Press the OK key to highlight default screen type. Press the up arrow key or the down arrow key to set the display pattern.

Note: Press the monitor view key to preview the selected default screen.

4. Press the OK key to store the pattern that was selected.

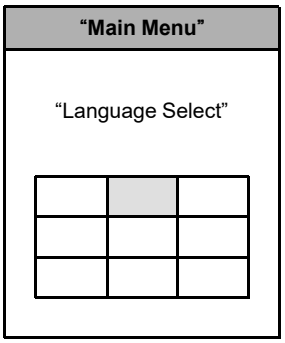
5. Press the “Back” key to return to the previous screen or press the “Home” key to return to the main menu.

Language Selection

The “Language Select” menu allows the operator to change the language settings.

1. Press the menu key.

Table 36



2. Press any of the arrow keys to highlight the “Language Select” menu. Press the OK key.

Table 37

“Language Select”
“ENGLISH”
“DANISH”
“FINNISH”
“ICELANDIC”
“NORWEGIAN”
“SWEDISH”

3. The “Language Select” menu will be displayed with a list of available languages. Press the up key or the down key to scroll through the available languages. Press the OK key to select the desired language.

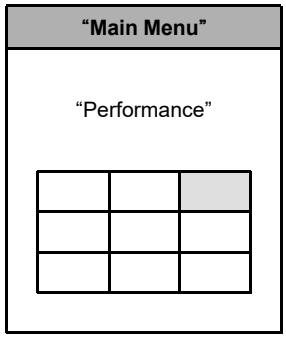
Note: Press the home key to return to the default display.

Performance (If Equipped)

The “Performance” menu allows the operator to view measurements of various system components. The following components are a few examples of the components that can be viewed through the “Performance” menu: battery voltage, engine speed, and pump pressure.

1. Press the menu key.

Table 38



2. Press the right key or the left key to highlight the “Performance” menu. Press the OK key.

Table 39

“Performance”
“Battery Voltage”
“26.0 [V]”
“Engine Speed”
“1300 [RPM]”
“Engine Coolant Temp”
“20 [°C]”

3. The “Performance” menu will be displayed with a list of system components and measurements. Press the up key or the down key to scroll through the list.

Note: Press the home key to return to the default display.

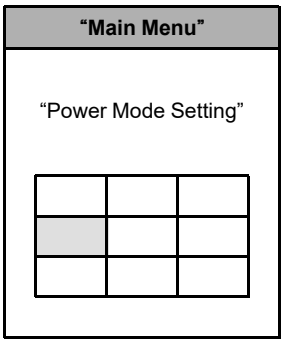
Power Mode Setting

The “Power Mode Setting” menu allows the operator to change the various operating power modes.

Note: The mode(s) that are set to "Enabled" through this procedure can only be activated by the "Power Mode" switch on the right side control panel. For more information, refer to Operation and Maintenance Manual "Operator Controls".

1. Press the menu key.

Table 40



2. Press any of the arrow keys to highlight the “Power Mode Setting” menu. Press the OK key.

3. You will be prompted to enter a password. After the password has been entered successfully, the “Power Mode Setting” menu will be displayed.

Note: When the machine leaves the factory, the password is initially set at 1.

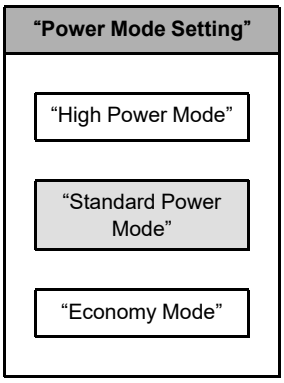
Table 41



4. Press the up key or the down key to highlight the desired setting. Press the OK key to confirm the desired selection.

Note: Due to country specific fuel consumption criteria, your machine may not be equipped with all Power Mode options.

Table 42



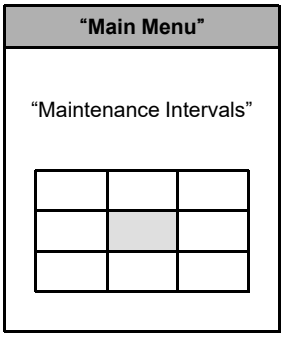
Note: Press the home key to return to the default display.

Maintenance Intervals

The “Maintenance Intervals” menu allows the operator to view the current hours of use and the recommended change intervals for various system components.

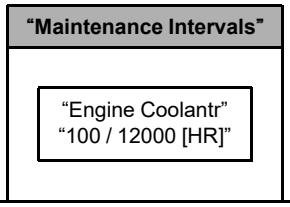
1. Press the menu key.

Table 43



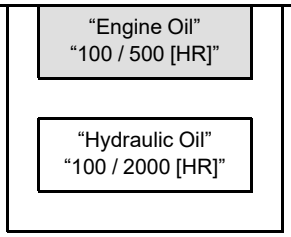
2. Press any of the arrow keys to highlight the “Maintenance Intervals” menu. Press the OK key.

Table 44



(continued)

(Table 44, contd)



3. A list of system components will be displayed. Press the up key or the down key to scroll through the list. For each of the system components, the current hours of use will be displayed. If the component has a recommended change interval, the recommended interval will be displayed.

4. Press the reset key to reset the maintenance hours.

Note: Resetting the maintenance hours will require a password. The password is initially set to "1" when the machine leaves the factory.

Reference: Refer to "Changing the Password" for further information on changing the password.

Note: Press the home key to return to the default display.

Selecting the Work Tool

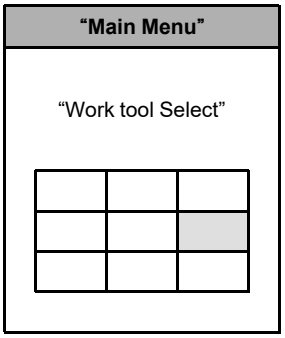
The "Work Tool Select" menu allows the operator to change the settings for the work tool.

Note: Make sure that the hydraulic lockout control is in the LOCKED position before you change the settings for the work tool.

Note: If a bucket is installed on the machine, or no work tool is installed, select "Bucket/No Tool" in the menu.

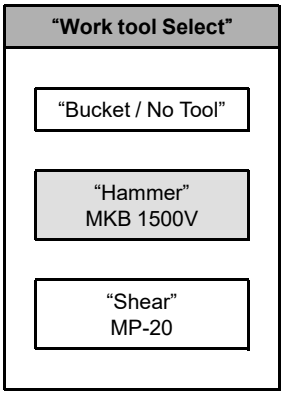
1. Press the menu key.

Table 45



2. Press any of the arrow keys to highlight the "Work Tool Select" menu. Press the OK key.

Table 46



3. Press the up key or the down key to highlight the "Work Tool Select" menu. Press the OK key.

Note: If the work tools have been configured through the Electronic Technician (ET), the names of the work tools will be displayed instead of the numbers.

4. The "Work Tools Select" menu will be displayed with the current options for work tools. Press the up key or the down key to highlight the desired work tool. Press the OK key to select the new work tool.

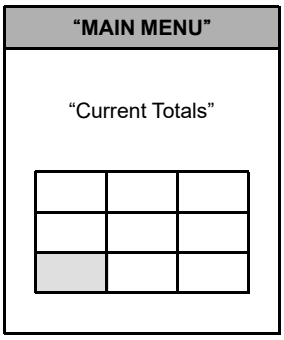
Note: Press the home key to return to the default display.

Current Totals

The "Current Totals" menu allows the operator to view the current totals for the machines systems.

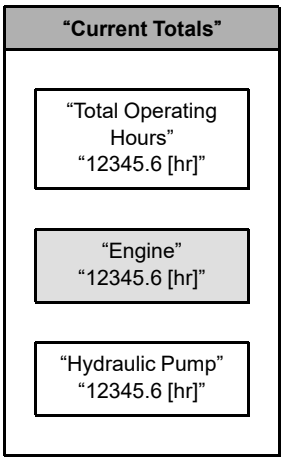
1. Press the menu key.

Table 47



2. Press any of the arrow keys to highlight the "Current Totals" menu. Press the OK key.

Table 48



3. A list of system components will be displayed. Press the up key or the down key to scroll through the list.

Note: Press the home key to return to the default display.

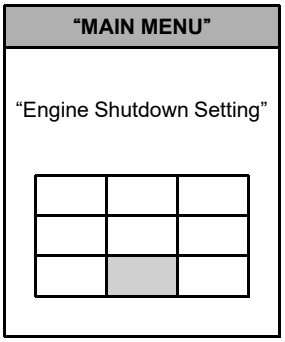
Engine Shutdown Setting

The "Engine Shutdown Setting" menu allows the operator to enable, disable, or adjust the engine idle shutdown function.

1. Press the menu key. You will be prompted to enter a password. After the password has been entered successfully, the "Shutdown Delay Timer" menu will be displayed.

Note: The password is initially set at "1" when the machine leaves the factory,

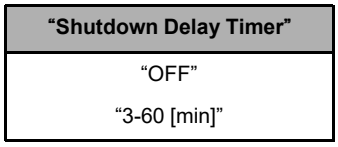
Table 49



2. The "Shutdown Delay Timer" will appear on the monitor in "BLUE" . Press the OK key to activate the edit mode.

Note: The "Shutdown Delay Timer" will appear on the monitor in "GREEN" when the edit mode is activated.

Table 50



3. Press the up key or the down key to change the value. You may select "OFF" to disable the engine idle shutdown function, or select a value between 3 minutes and 60 minutes.

4. Press the OK key to confirm your selection.

Note: The "Shutdown Delay Timer" will appear on the monitor in "BLUE" when the selection has been confirmed.

Note: Press the home key to return to the default display.

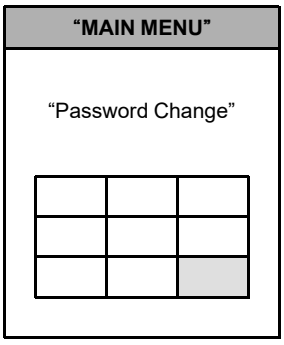
Changing the Password

The "PASSWORD CHANGE" menu allows the operator to change the password.

Note: The password is initially set at "1" when the machine leaves the factory,

1. Press the menu key.

Table 51



2. Press any of the arrow keys to highlight the "Password Change" menu. Press the OK key.

Note: You will be prompted to enter a password.

Table 52



3. After the password has been entered successfully, the "Enter new password" screen will appear.

Table 53



4. Press any of the arrow keys to select the desired character.

Note: The password is numeric. You may choose from "0" to "9" .

5. Press the OK key to enter the character.

Note: Press the back key to delete the last character that was entered.

6. After you enter the password, you will be asked to confirm your selection. Press the "ENTER" key to save the password in memory and return to the "Main Menu" screen. Press the back key to return to the "Password Change" menu without saving the password.

Note: Press the home key to return to the default display.

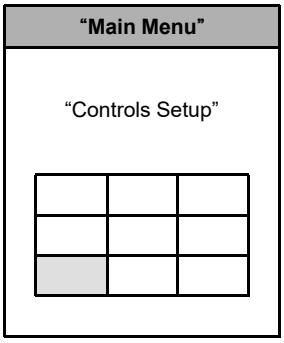
Joystick Control Pattern (If Equipped)

The "Controls Setup" menu allows the operator to change the settings for the joystick pattern.

Note: Before the joystick pattern is changed, park the machine on a firm level surface, lower the work tool to the ground, and place the hydraulic lockout control in the LOCKED position.

1. Press the menu key.

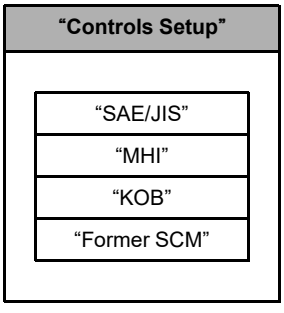
Table 54



2. Press the arrow keys to scroll through the menu to find the "Controls Setup" menu. Highlight the "Controls Setup" menu and press the OK key.

Note: You will be prompted to enter a password. When the machine leaves the factory, the password is initially set at 1.

Table 55



3. The "Controls Setup" menu will be displayed with the current options for joystick patterns. Press the up key or the down key to highlight the desired joystick pattern. Press the OK key to select the new joystick pattern.

Note: Press the home key to return to the default display.

Reverse Fan (If Equipped)

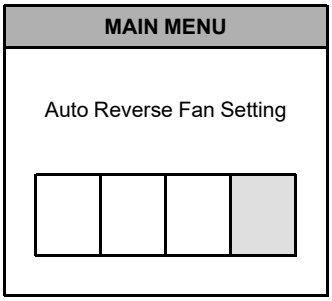
Note: Make sure that the hydraulic lockout control is in the LOCKED position before you activate the reverse fan function.

The “REVERSE FAN” menu allows the operator to operate the radiator cooling fan in reverse.

Note: The reverse fan function is an optional attachment which may not be equipped on your machine.

1. Press the menu key.

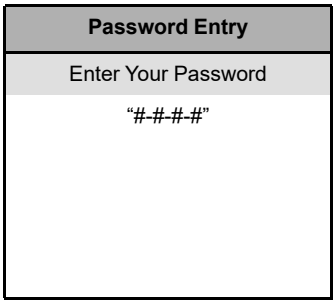
Table 56



2. Press the right key or the left key to highlight the “Auto Reverse Fan Setting” menu. Press the OK key.

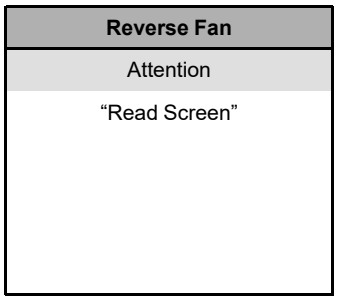
Note: You will be prompted to enter a password. Refer to “Changing the Password” for information on entering a password.

Table 57



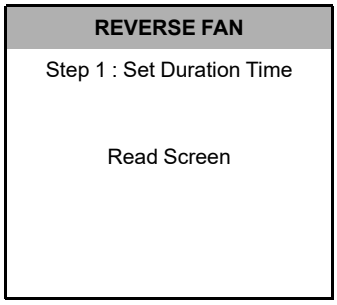
3. After the password has been entered successfully, press the up key or the down key to highlight the “Reverse Fan” menu. Press the OK key.

Table 58



4. Press the up key or the down key to highlight the “REVERSE FAN” menu. Press the OK key.

Table 59



Note: Make sure that the hydraulic lockout control is in the LOCKED position before you activate the reverse fan function.

5. The monitor should indicate that the reverse fan function is in “STAND BY” mode. Press the OK key to activate the reverse fan function.

Table 60

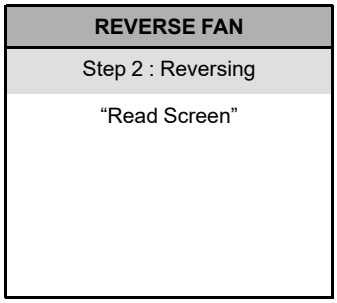


Table 61

REVERSE FAN
Step 3: Complete

6. The monitor should now indicate that the reverse fan function is “Complete” in active mode.

Note: The reverse fan function will automatically stop when the fan has completed a cycle. However, the reverse fan function can be stopped manually by pressing the left key.

7. Press the home key to return to the default display.

Note: The reverse fan function will not be Canceled if the home key is pressed. Instead, a message that indicates “REVERSE FAN STARTING” will be shown on the default display until normal operation of the fan resumes.

Error Messages for the Reverse Fan

Table 62

REVERSE FAN
ERROR
“-HYD OIL TEMP HIGH”

Typical example of an error message for the reverse fan function

Reverse Fan Function Will Not Start

The monitor will provide one of the following error messages if the reverse fan function does not start:

“NOT INSTALLED” – The reverse fan is not installed on this machine. If this message is received in error, consult your Caterpillar dealer.

“HYD OIL TEMP HIGH” – The hydraulic oil temperature is too high. Shut off the engine and do not operate the machine until the hydraulic oil temperature is below 85 °C (185 °F).

“COOLANT TEMP HIGH” – The coolant temperature is too high. Shut off the engine and do not operate the machine until the coolant temperature is below 95 °C (203 °F).

“HYD LOCK SW OFF” – The hydraulic lockout control is in the UNLOCKED position. Move the hydraulic lockout control to the LOCKED position.

“SOL MALFUNCTION” – The reverse fan is malfunctioning. Consult your Caterpillar dealer.

Table 63

REVERSE FAN
Error
“Error ID : $0002”
Error ID : $0003
Error ID : $0004
Error ID : $0005

Reverse Fan Function Is Interrupted

If one of the following conditions occur, the reverse fan function will stop, and regular operation of the radiator cooling fan will resume:

- The hydraulic lockout control is moved to the UNLOCKED position.
- The temperature of the hydraulic oil rises above 90 °C (194 °F).
- The coolant temperature rises above 100 °C (212 °F).

This event will be accompanied by a “REVERSE FAN ERROR” message.

i04358832

Storage Box

SMCS Code: 7268

Exterior Storage Box

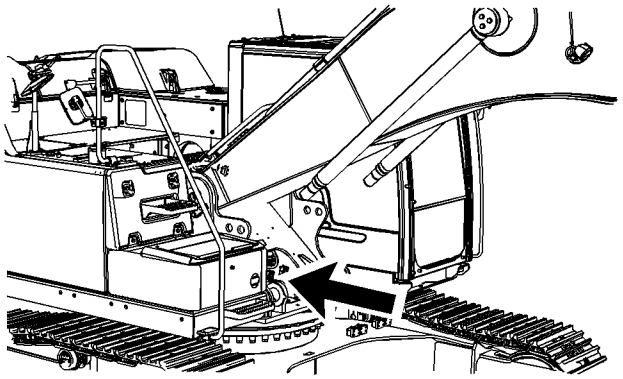


Illustration 189 g02453247

Open the storage box by pressing the push button. The storage box is also used to store miscellaneous tools. The storage box is also used to store the refueling pump (if equipped).

i05944088

Fuel Transfer Pump (Refueling) (If Equipped)

SMCS Code: 1256

S/N: BZ21–10000

S/N: KEA1–10000

S/N: WNA1–10000

S/N: HLB1–10000

S/N: NDC1–10000

S/N: HPD1–10000

S/N: YEG1–10000

S/N: A9J1–10000

S/N: KBP1–10000

S/N: TEW1–10000

Use the following procedure to pump fuel and store hose.

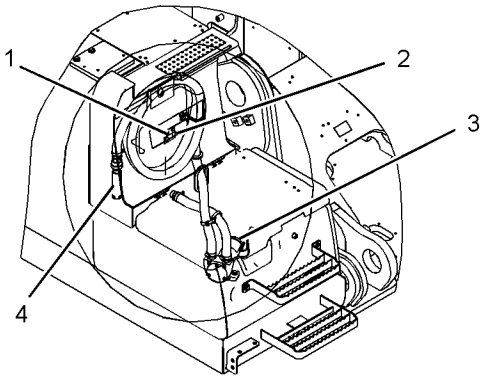


Illustration 190 g03270316

Open the cover of the storage box that is located on the right side in front of the fuel tank.

The electric refueling pump (3) pumps fuel into the fuel tank.

NOTICE
Do not continuously operate the refueling pump for more than 30 minutes. Do not operate the refueling pump more than a few seconds without fuel. Pump damage can result.

Off – Push switch (1) in order to deactivate the refueling pump.

On – Push switch (2) in order to activate the refueling pump.

1. Remove the cap from the fuel tank.

2. Properly insert the free end of suction hose (4) into a container of fuel.

3. Push switch (2) in order to supply the fuel to the tank. When the tank is full, the pump stops refueling.

Note: Look at the level gauge inside the filler neck in order to determine the fuel level.

4. After refueling, install the cap to the fuel tank.

5. Make sure that excess fuel is drained from suction hose (4) before storing the suction hose.

6. When you store suction hose (4), wind the hose on the bar. Secure the hose end in place.

NOTICE
To prevent hose damage, do not coil the hose in a tight radius.

7. Close the cover of the storage box.

i06744284

Fuel Transfer Pump (Refueling)
(If Equipped)

SMCS Code: 1256

S/N: BZ210001–Up

S/N: KEA10001–Up

S/N: WNA10001–Up

S/N: HLB10001–Up

S/N: NDC10001–Up

S/N: HPD10001–Up

S/N: YEG10001–Up

S/N: A9J10001–Up

S/N: KBP10001–Up

S/N: TEW10001–Up

The fuel transfer pump (5) pumps fuel into the fuel tank. The fuel transfer pump (5) is located in the storage box on the right side of the machine and in front of the fuel tank.

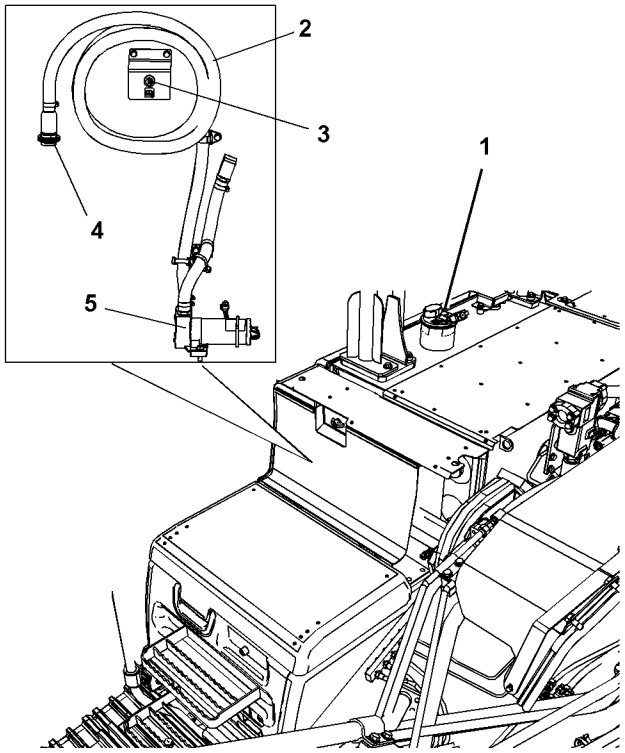


Illustration 191 g06101531

(1) Fuel tank cap
(2) Hose
(3) ON/OFF switch
(4) Suction valve
(5) Fuel transfer pump

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 fuel tank cap (1) from the fuel tank.

4. Open the storage box that is on the right side of the machine.

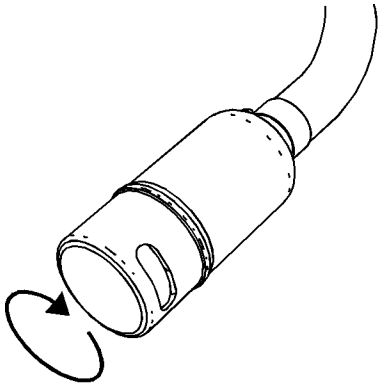


Illustration 192 g03660074

Suction valve (4) is at the end of hose (2).

Turn the end of the suction valve clockwise to open the valve

5. Uncoil hose (2) and turn the end of suction valve (4) clockwise to open the suction valve.

6. Properly insert the end of suction valve (4) into a container of fuel.

7. Push switch (3) 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 switch (3) 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 switch (3) 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 hose (2) and turn the end of suction valve (4) counter-clockwise to close the suction valve.

10. When you store hose (2), wind the hose on the bar. Secure the suction valve in place.

NOTICE
To prevent hose damage, do not coil the hose in a tight radius.

11. Close the cover of the storage box.

12. install fuel tank cap (1) to the fuel tank.

13. Turn the engine start switch to the OFF position.

i03912100

Radio
(If Equipped)

SMCS Code: 7338

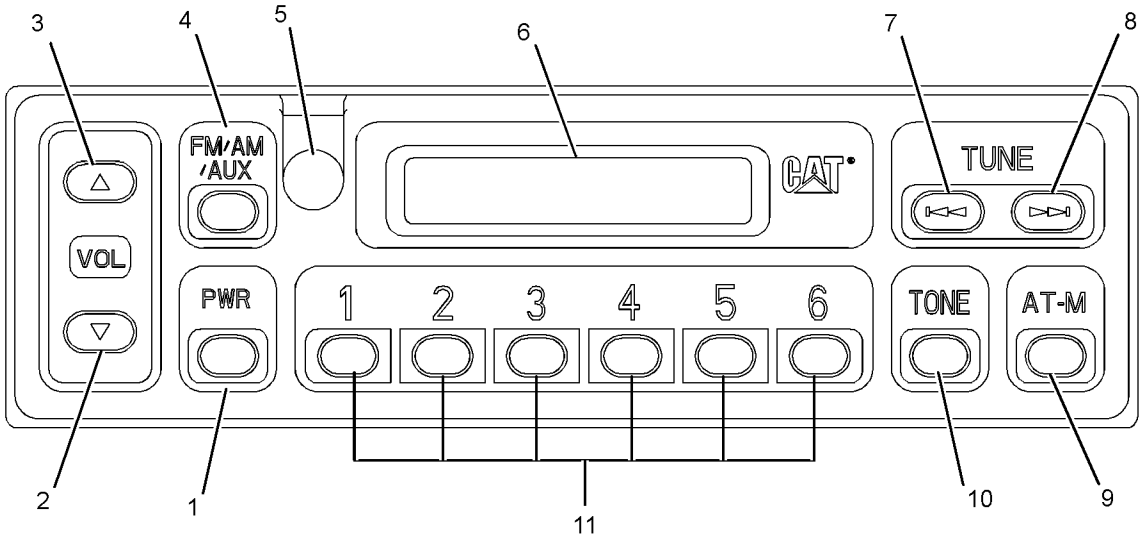


Illustration 193 g02117159

(1) Power switch
(2) Volume control
(3) Volume control
(4) “AM/FM/AUX” selector
(5) Auxiliary plug
(6) Display panel
(7) “Tune” button
(8) “Tune” button
(9) Button for scan and auto memory function
(10) “Tone” control
(11) Preset buttons

Note: When the machine is in operation, turn down the volume of the radio.

Note: The radio can be used only when the battery disconnect switch and the engine start switch are in the ON position.

Note: When a button is pushed, a beep will occur.

(1) Power Switch – Push the power switch in order to turn on the radio. Push the power switch again in order to turn off the radio.

(2) and (3) Volume Control – Push the volume control in order to control the volume. Push the upper volume control in order to increase the sound level and push the lower volume control in order to decrease the sound level.

(4) “AM/FM/AUX” Selector – After you push the “AM/FM/AUX” selector, the selected radio band appears on display panel (6). This button is also used to activate the auxiliary function.

(5) Auxiliary Plug – The front auxiliary plug allows for the connection of a portable audio device.

(6) Display – The display shows various functions such as the station frequency, band, and the volume level.

(7) and (8) “Tune” Buttons – Push the “tune” buttons in order to select a radio station. Pressing “tune” button (7) will decrease the frequency. Pressing “tune” button (6) will increase the frequency. Pressing the “tune” button for less than 0.5 seconds changes the radio station one at a time. Pressing the “tune” buttons for more than 0.5 seconds will change the frequency automatically until a radio station is found.

(9) Scan and Auto Memory – Press button (5) for less than 0.5 seconds in order to listen to 5 seconds of each preset radio station. Press button (5) at least 1.5 seconds in order to store the radio stations with the six strongest signals.

(10) Tone Control – Music is optimized by pressing the tone control so that display (C) will show “MUSIC” .

(11) Preset Buttons – The circuitry in the memory system allows you to preset six radio stations. To preset any of the “preset” buttons, follow the “Presetting Radio Stations” procedure.

Presetting Radio Stations

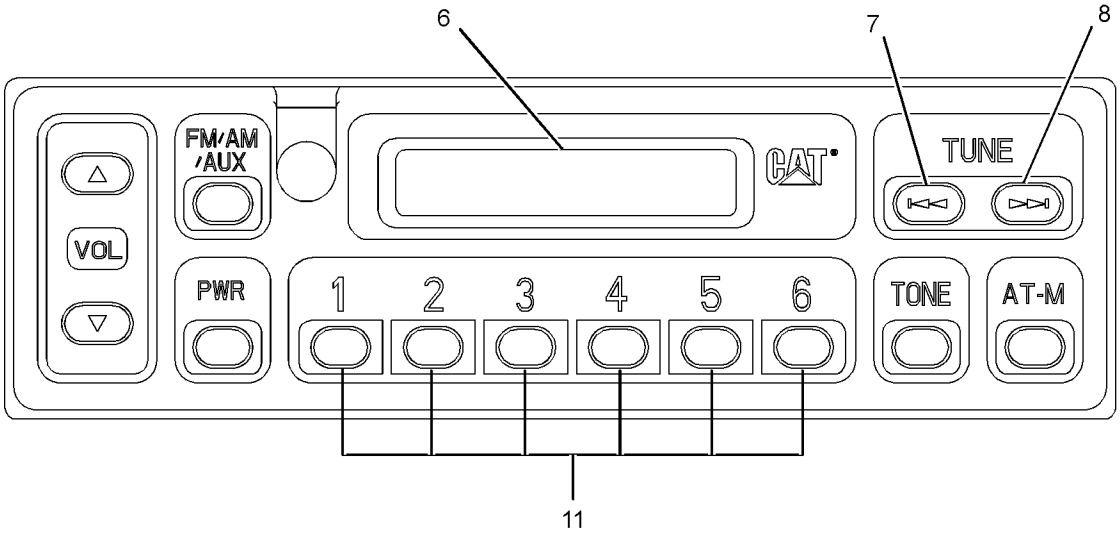


Illustration 194 g02117163

(6) Display
(7) “Tune” button
(8) “Tune” button
(11) Preset buttons

1. Turn on the radio. Select the AM band or the FM band.

2. Select the first radio station by using tuning switch (7) or tuning switch (8).

3. Depress one of preset buttons (11) for more than 1.5 seconds. The radio station will be stored in the memory for the selected preset.

4. Push preset button (11) in order to tune in the radio station.

5. Repeat the same procedure for the remaining preset switches.

Note: When the preset station is faint, use the “tune” buttons to locate a stronger signal.

Scan and Auto Memory

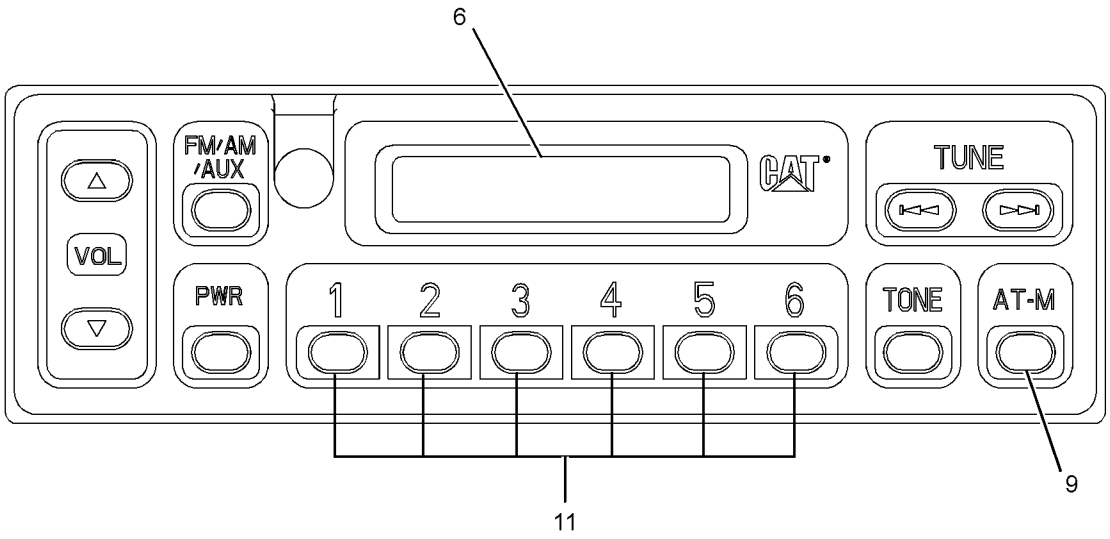


Illustration 195 g02117175

(6) Display (Frequency)
(9) Button for scan and auto memory function
(11) Preset buttons

Scan – Press button (9) for less than 0.5 seconds in order to listen for 5 seconds to each of the preset radio stations. Press button (9) again in order to stop scanning through the preset stations and keep listening to the current station. When this function is used “SCAN” is shown on display (6). The frequency of the radio station is also shown on the display.

Auto Memory – Press button (9) for more than 1.5 seconds in order to store the radio stations that have the strongest signal. The radio stations are stored in the six presets (11). Stations that are already stored in the memory will be erased.

Loss of Memory

The memory system is erased after a few days if the battery is disconnected.

Radio Reception

Note: The radio must be connected to a power source in order to set the area of reception.

Set the area of reception according to the following table:

Table 64

	Display Setting	
AREA	**EU**	**US**
North America		X
Central and South America		X
European Union	X	
Asia / Oceania	X	

Use the following procedure in order to set the desired area.

1. Turn off the radio.
2. Press preset button “1” , preset button “4” and button (9) at the same time. Hold until “EU” or “US” is displayed on the display panel.

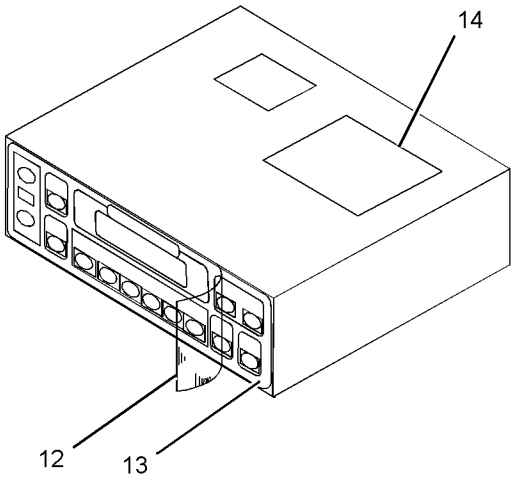


Illustration 196 g02117176

(12) Protective film
(13) Control panel
(14) Method of selection

Note: Remove the film from the radio. Remove the vinyl from the operator seat. The film and vinyl may cause noise interference in the radio.

i06259786

Radio
(If Equipped)

SMCS Code: 7338

An AM/FM radio may be installed in the right side instrument panel.

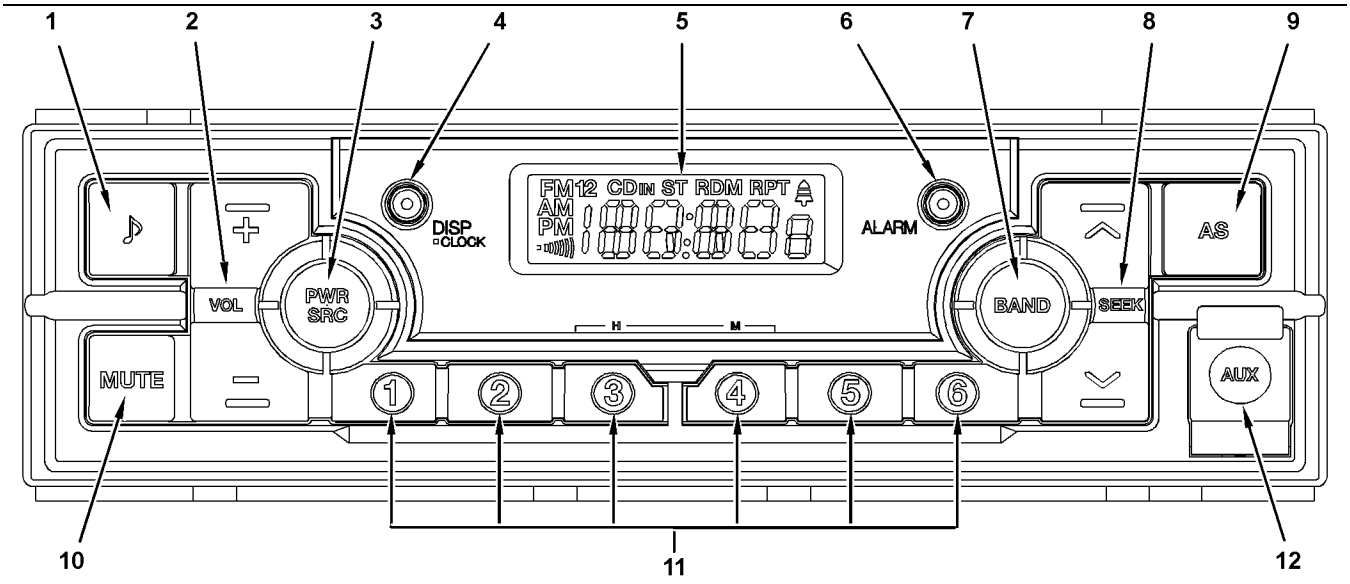


Illustration 197 g02831713

(1) Tone button
(2) Volume control
(3) PWR/SRC button
(4) Display/Clock button
(5) Radio display
(6) Alarm button
(7) AM/FM band button
(8) Tune button
(9) Auto Store button
(10) Mute button
(11) Preset buttons
(12) Auxiliary input

Note: When the machine is in operation turn down the volume of the radio.

Note: The battery disconnect switch and the engine start switch must be in the ON position in order for the radio to function.

Tone Button (1) – In order to adjust the sound effects and tone, press button (1) and select bass “BA” , treble “TR” , or balance “BA” . Use volume control (2) in order to make adjustments.

Volume Control (2) – Press “+” in order to increase the volume. Press “-” in order to decrease the volume.

PWR/SRC Button (3) – Press the PWR/SRC button in order to turn on the power. Press and hold the PWR/SRC button for 2 seconds in order to turn off the power. With the power on, press the PWR/SRC button in order to change the operation mode to either “RADIO” , “AU1(AUX1)” , or AU2(AUX2).

Display/Clock Button (4) – Press this button once in order to select the desired display in radio display (5). Press and hold this button for 2 seconds in order to switch to the clock setting mode. Use the preset button “3” in order to adjust the hour and preset button “4” in order to adjust the minute. Press the display/clock button again in order to return to the radio display.

Radio Display (5) – Displays information such as the clock, station, and band.

Alarm Button (6) – Press this button once in order to turn the alarm on or off. An alarm indicator will appear in the radio display when the alarm in on. Press and hold this button for 2 seconds in order to switch to alarm setting mode. Use the preset button “3” in order to adjust the hour and preset button “4” in order to adjust the minute. Press the alarm button again in order to return to the radio display. During the alarm, there will be a beep for 3 minutes, press the alarm button once in order to stop the alarm.

AM/FM Band Button (7) – Press this button in order to switch between FM1, FM2, AM1, or AM2 while in radio mode.

Tune Button (8) – In order to select a a radio station manually, press “+” or “-” . in order to select a radio station automatically, press and hold “+” or “-” .

Auto Store Button (9) – Press this button in order to store good reception stations with automatically as one of the 6 preset buttons.

Mute Button (10) – Press this button to turn off the sound immediately. “MUTE” will appear in the radio display. Press this button again in order to return to normal operation.

Preset Buttons (11) – Use tune button (8) in order to select a desired radio station to store. Press and hold one of the preset buttons for 2 seconds in order to store the station in the preset memory.

Auxiliary Input (12) – An external input jack is provided in order to allow playback of sound and music from an external device. Use PWR/SRC button (3) in order to select “AU1” .

Radio Reception Area

This unit is set up to receive the following type of reception area frequencies:

- U.S. Standard
- Other Countries
- Europe Standard

Selecting the Radio Reception Area

Note: All station preset memory will be lost once the reception area is changed.

Press AM/FM band selector (2) and select the desired radio band.

U.S. Standard

While pressing tone button (1), press and hold the number “1” preset button for longer than 2 seconds.

Other Countries

While pressing tone button (1), press and hold the number “2” preset button for longer than 2 seconds.

Europe Standard

While pressing tone button (1), press and hold the number “3” preset button for longer than 2 seconds.

i03767393

Air Conditioning and Heating Control

SMCS Code: 7304; 7320; 7337

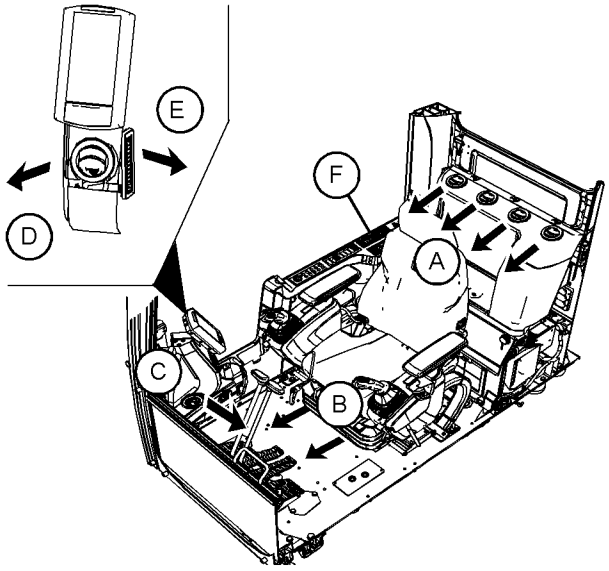


Illustration 198 g02031354

(A) Vent for upper body
(B) Floor vent
(C) Defroster vent
(D) Defroster Vent
(E) Vent for upper body
(F) Control panel

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

The climate control panel is located under the right window inside the cab:

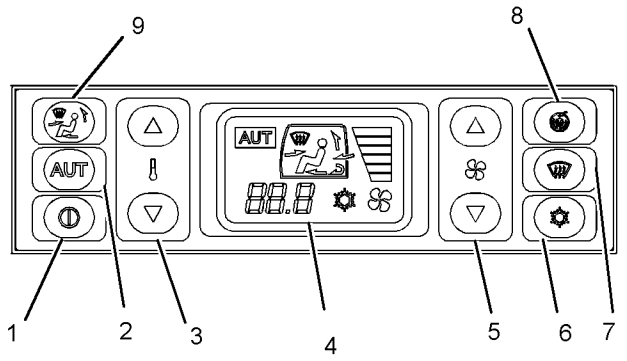


Illustration 199 g02031355

(1) On/Off switch
(2) Automatic control switch
(3) Temperature switch
(4) LCD panel
(5) Fan switch
(6) Compressor switch
(7) Defrost mode
(8) Air inlet select switch
(9) Air outlet select switch

Main Power ON/OFF Switch (1) – Push the ON/OFF switch in order to power on the system. Push the switch again in order to power off the system.

Automatic Control Switch (2) – In order to enter the full “AUT” mode for automatic climate control, push this switch. However, if you push the switch again, you cannot turn off the air conditioning. When the system is in full “AUT” mode, you can manually change specific functions by pushing another switch. If you manually change a specific function, “AUT” does not appear in the display, but the unchanged functions will remain in “AUT” mode. Even on a day that is sunny, a climate control system with only a heater can cool the cab in full “AUT” mode if the ambient temperature is no more than 20 °C (68 °F).

The climate control unit provides excellent operator comfort in the full “AUT” setting. Press the “AUT” switch for full “AUT” mode. Push temperature switch (3) in order to set the desired temperature. The temperature is only shown in metric values. All other functions of climate control will be handled automatically.

In order to take advantage of the full “AUT” setting of the climate control system, always keep the sunlight sensor clean. Do not obstruct the sunlight sensor. If the climate control system is in the full “AUT” setting at engine start-up and the temperature inside the cab is too warm or too cool, the damper for fresh air ventilation may automatically close for a few minutes. This will help to bring the air temperature to the preset temperature more quickly.

Temperature Switch (3) – These switches control the temperature of the air that is coming from the air outlets in order to achieve the preset temperature. This preset temperature appears on LCD panel (4). If the heating and air conditioning system is in the automatic mode, pushing these switches changes the preset temperature.

Increase – Push this switch in order to increase the temperature of the air that is coming out of the air outlets or push this switch in order to increase the preset temperature.

Decrease – Push this switch in order to decrease the temperature of the air that is coming out of the air outlets or push this switch in order to decrease the preset temperature.

Fan Switch (5) – The fan switch directly controls the fan speed. If the climate control system is operating in the automatic mode, pushing this switch overrides the automatically selected fan speed.

Increase – Push this switch in order to increase the fan speed.

Decrease – Push this switch in order to decrease the fan speed.

Compressor Switch (6) – Push the switch in order to turn on the compressor or push the switch in order to turn off the compressor. In humid conditions, the compressor may be used to remove moisture from the air in the cab. In cool weather, operate the compressor weekly in order to prevent leakage of the refrigerant gas. This will also help to maintain the compressor in optimum working order.

Defrost (7) – Depressing this switch will defog the windows. The air will also be dehumidified while the compressor is running. This selection directs air flow out of air outlet (C) and air outlet (D).

Air Inlet Select Switch (8) – This switch selects the position of the air inlet.

Recirculate – When this position is selected, the air inlet is closed. The air will recirculate inside the cab.

Fresh Air – When this position is selected, the air inlet is open. Fresh air will circulate into the cab.

Air Outlet Select Switch (9) – This switch selects the position of each air outlet. Each switch controls a different air outlet.

Upper Body – Selecting this switch will open air outlet (A) and air outlet (D).

Upper Body and Floor – Selecting this switch will open air outlet (A), air outlet (B) and air outlet (D).

Floor – Selecting this switch will open air outlet (B).

Floor and Defroster – Selecting this switch will open air outlet (B) and air outlets (C) and (D).

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

English Versus Metric Toggle

In order to convert the temperature reading from Degrees Celsius to Degrees Fahrenheit, depress both keys of the fan switch at the same time for five seconds. The same action is used for converting the temperature reading from Degrees Fahrenheit to Degrees Celsius.

i06932588

Window (Front)

SMCS Code: 7310-FR

Note: The cab visor (if equipped) must be down before the front window is raised. The front window will not lock in the overhead storage position with the cab visor in the raised position.

To provide full ventilation inside the cab, the upper window and the lower window can be fully opened.

⚠ WARNING

When opening or closing the windows, be extra careful to prevent any personal injury. The hydraulic lockout control must be in the LOCKED position in order to prevent any possibility of sudden movement of the machine due to inadvertent contact with the hydraulic control(s).

Do not change the position of the window until the following items have been done:

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

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

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

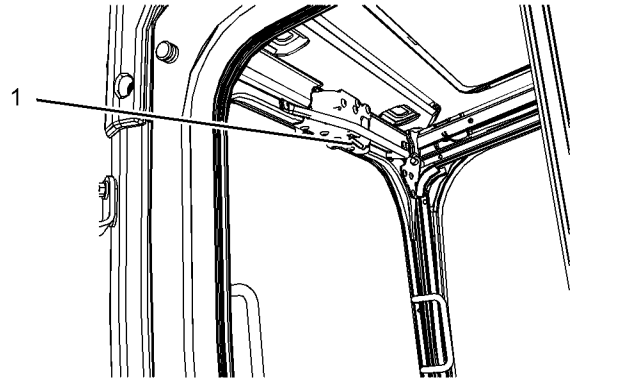


Illustration 200 g02028981

(1) Lever

1. Release the auto-lock latch by moving lever (1) to the right.
2. Hold both grips that are on the window frame. Pull the window upward.

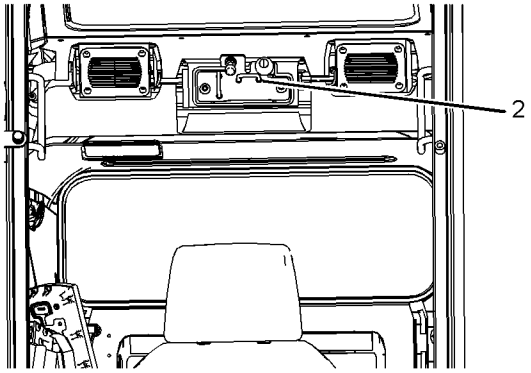


Illustration 201 g02028982

(2) Auto-lock latch

3. Hold both grips that are provided on the window frame and move the window into the STORAGE position until auto-lock latch (2) is engaged.

   Perform Steps 4 through 5 to close the upper window.

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

4. Move the lever of the auto-lock latch (1) in the direction of the arrow to release the auto-lock latch.

5. Reverse Steps 1 through 3 to close the upper window.

Perform Steps 6 through 8 to open the lower window and close the lower window.

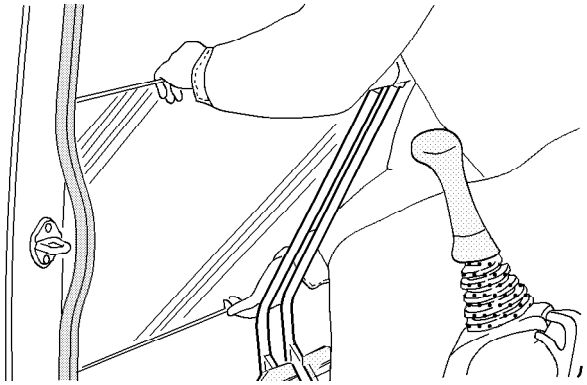


Illustration 202 g00103837

6. Raise the lower window out of the window frame.

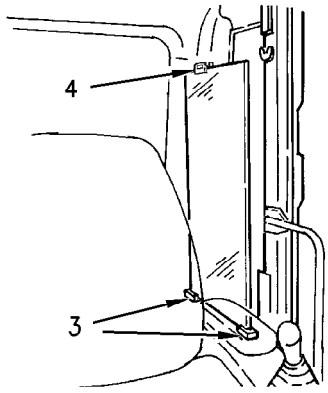


Illustration 203 g00680500

(3) Brackets
(4) Catch

7. Store the lower window in the holder that is located in the rear of the left side cab frame. To store the lower window, locate one end of the lower window into brackets (3). Secure the opposite end of the lower window with catch (4).

8. To close the lower window, reverse the procedure that is used for opening the lower window.

Note: The lower window is curved. The lower window can only be positioned one way in the holders.

i04631333

Mirror
(If Equipped)

SMCS Code: 7319

⚠ WARNING

Adjust all mirrors as specified in the Operation and Maintenance Manual. Failure to heed this warning can lead to personal injury or death.

⚠ WARNING

Slips and falls can result in personal injury. Use the machine's access systems when adjusting the mirrors. If the mirrors cannot be reached using the machine access systems follow the instructions found within the Operation and Maintenance Manual, "Mirror" in order to access the mirrors.

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

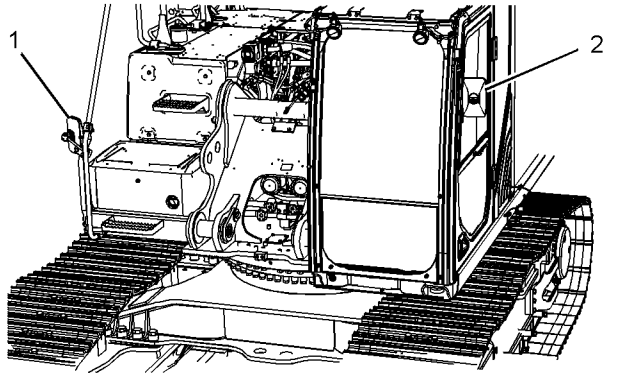


Illustration 204 g02427816

(1) Right side rear view mirror
(2) Left side rear view 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.

An appropriate job site organization is also recommended in order to minimize visibility hazards. For more information regarding job site organization refer to this Operation and Maintenance Manual, "Visibility Information"

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 in order to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.

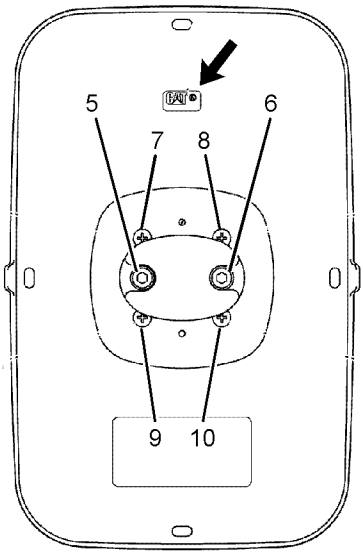


Illustration 205 g02726418

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

Tighten the bolts in sequence of (5) to (6) to 11 ± 2 N·m (8.1 ± 1.5 lb ft).

Tighten the bolts in sequence of (7) to (10) to 2 ± 0.4 N·m (1.5 ± 0.3 lb ft).

Note: Hand tools may be needed in order to adjust the mirrors. Refer to Specifications, SENR3130, “Torque Specifications” for the recommended torque.

Right Side Rear View Mirror (1)

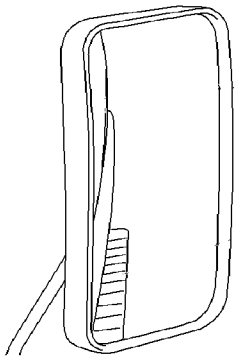


Illustration 206 g01665875

(1) Right side rear view mirror

Adjust the side mirror (1) on the storage box so that the right side access door and the right side track can be seen from the operator seat. Additionally, provide as much visibility to the rear of the machine as possible.

Left Side Rear View Mirror (2)

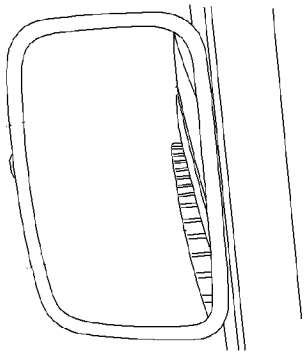


Illustration 207 g01666174

(2) Left side rear view mirror

Adjust the left mirror (2) on the cab so that the left access door and the left side track can be seen from the operator seat. Additionally, provide as much visibility to the rear of the machine as possible.

i02500596

Sun Screen
(If Equipped)

SMCS Code: 7165-ZZ

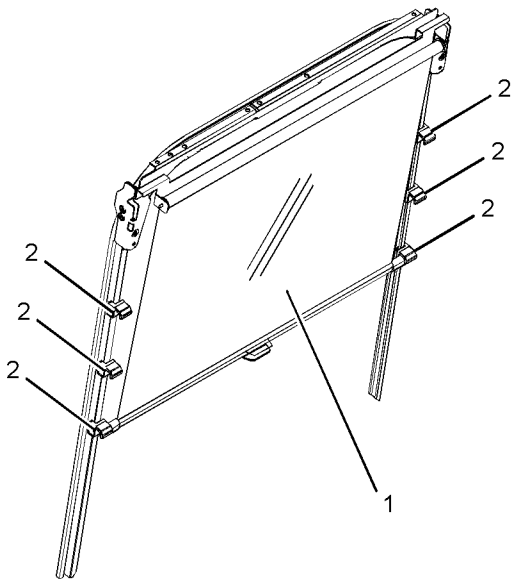


Illustration 208 g01250563

Pull out the sun screen (1). Hook the sun screen to the bracket (2). The sun screen may be positioned in 3 different places.

i01463742

Roof Hatch

SMCS Code: 7303

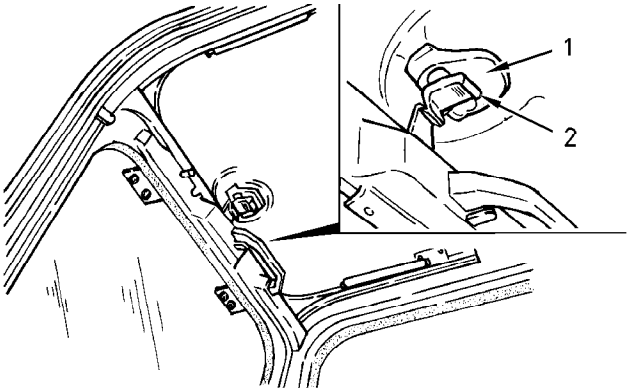


Illustration 209 g00681034

(1) Grip
(2) Lock

In order to open the roof hatch, release lock (2). Hold grip (1) and push the roof hatch backward.

To close the roof hatch, hold grip (1) and pull the roof hatch forward. Engage lock (2) securely.

i03781891

Cab Door

SMCS Code: 7308

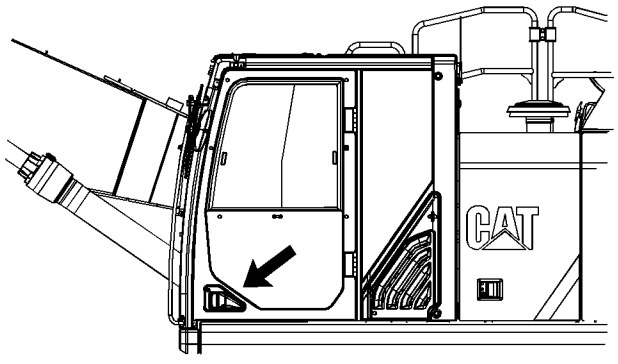


Illustration 210 g02041761

In order to open the cab door from the outside of the cab, pull outward on the door handle.

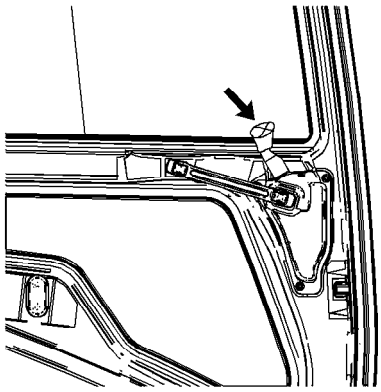


Illustration 211 g01095780

In order to open the cab door from the inside of the cab, push forward on the lever for the cab door latch.

For additional ventilation, open the cab door all the way in order to engage the catch on the exterior wall of the cab.

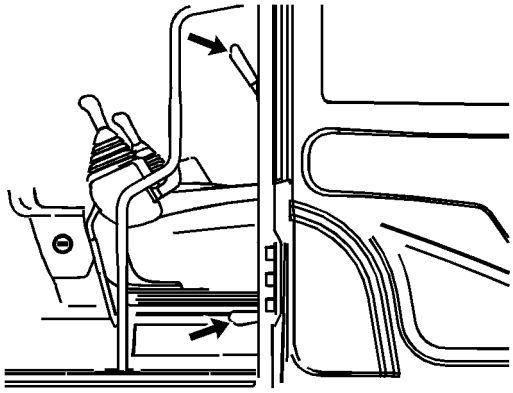


Illustration 212 g01121189

In order to release the cab door from the catch, pull downward on one of the two cab door release levers.

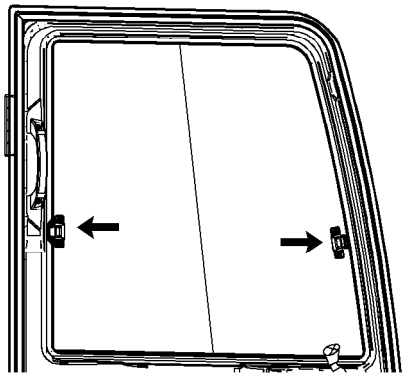


Illustration 213 g01096005

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

i01447292

Travel Control
(Straight Travel Pedal (If Equipped))

SMCS Code: 5462

⚠ WARNING

With certain attachment combinations, the third pedal can have different functions. Always check for third pedal function before using the third pedal. Improper operation of the third pedal could result in serious injury or death.

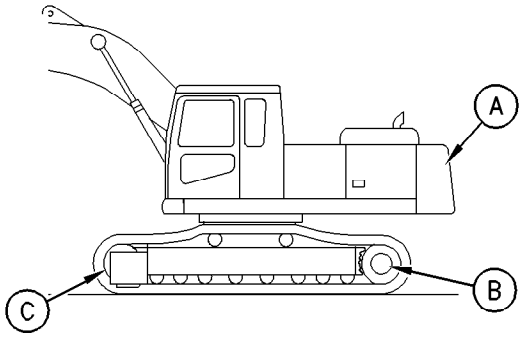


Illustration 214 g00753277

Position for normal travel

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

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

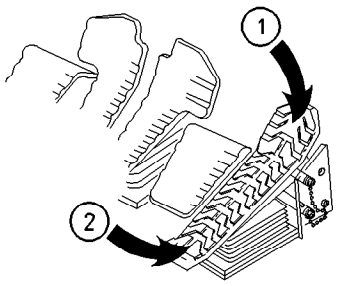


Illustration 215 g00757775

(1) Forward Travel
(2) Reverse Travel

The third pedal is to the right of the right travel pedal. The third pedal controls the forward and backward movement of the machine.

Note: If the third pedal is depressed and a travel pedal or a travel lever is operated, the machine will turn accordingly.

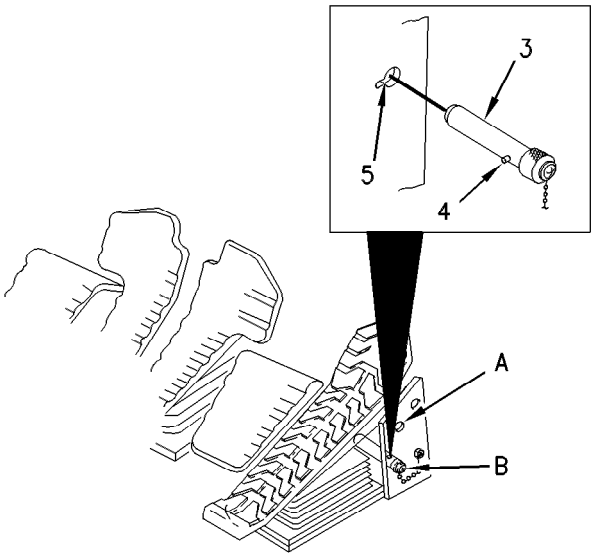


Illustration 216 g00555934

(3) Lock pin
(4) Pin
(5) Notch
(A) LOCKED position
(B) UNLOCKED position (STORAGE position)

When the machine is not operated with the third pedal, install lock pin (3) at the LOCKED position in order to prevent accidental operation.

Note: To prevent lock pin (3) from being pulled out, insert pin (4) through notch (5) and turn lock pin (3) counterclockwise by 1/4 turn.

i03764090

Joystick Controls
(Medium Pressure (If Equipped))

SMCS Code: 5705

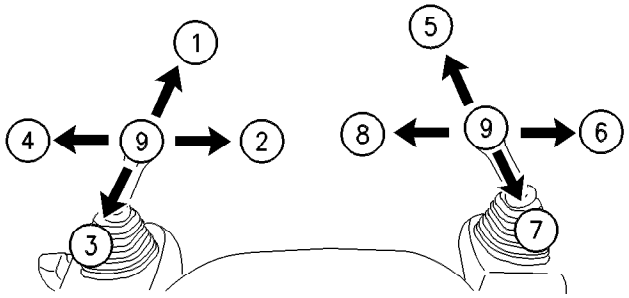


Illustration 217 g00559405

(1) STICK OUT
(2) SWING RIGHT
(3) STICK IN
(4) SWING LEFT
(5) BOOM LOWER
(6) TOOL OPEN
(7) BOOM RAISE
(8) TOOL CLOSE
(9) HOLD

⚠ WARNING

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

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

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

When you release the joysticks from any position, the joysticks will return to HOLD position (9). Movement of the upper structure will stop unless the fine swing control (if equipped) is ON. When the fine swing control is ON, the swing parking brake will not activate until 6.5 seconds after the joystick control for the swing function returns to the HOLD position.

The machine control pattern is initially set at the factory to the SAE system, as shown. The pattern on the left pertains to the left joystick and the pattern on the right 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.

Two functions may be performed at the same time by moving a joystick diagonally.

Rotating Tool Control

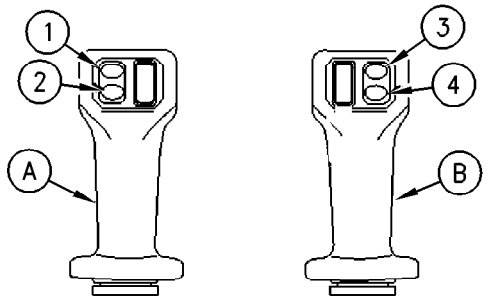


Illustration 218 g00875108

(A) Left joystick
(B) Right joystick
(1) Medium pressure switch
(2) Horn switch
(3) Medium pressure switch
(4) AEC switch

Rotate Clockwise – Press the medium pressure switch (1) on the left joystick in order to rotate the tool clockwise.

Horn – Press the horn switch (2) on the left joystick in order to activate the horn.

Rotate Counterclockwise – Press the medium pressure switch (3) on the right joystick in order to rotate the tool counterclockwise.

AEC Switch – Press the AEC switch (4) on the right joystick in order to activate low engine speed. Press the switch again in order to activate high engine speed.

i04036189

Joystick Controls

SMCS Code: 5705

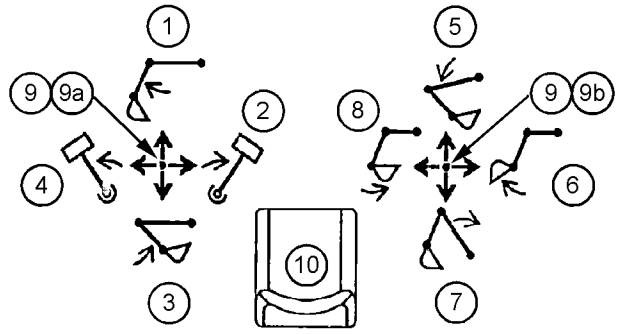


Illustration 219 g02233473

(1) STICK OUT
(2) SWING RIGHT
(3) STICK IN
(4) SWING LEFT
(5) BOOM LOWER
(6) BUCKET DUMP
(7) BOOM RAISE
(8) BUCKET CLOSE
(9) HOLD
(9a) HORN (IF EQUIPPED)
(9b) AUTOMATIC ENGINE SPEED CONTROL SWITCH (IF EQUIPPED)
(10) Seat

⚠ WARNING

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

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

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

When you release the joysticks from any position, the joysticks will return to HOLD position (9). Movement of the upper structure will stop unless the fine swing control (if equipped) is ON. When the fine swing control is ON, the swing parking brake will not activate until 6.5 seconds after the joystick control for the swing function returns to the HOLD position.

Two functions may be performed at the same time by moving a joystick diagonally.

The machine control pattern is initially set at the factory to the SAE system, as shown. The pattern on the left pertains to the left joystick and the pattern on the right pertains to the right joystick.

The machine control pattern can be varied. Refer to Operation and Maintenance Manual, “Joystick Controls Alternate Patterns” for more information.

i06970265

Joystick Controls
(Cat Grade With Assist System)

SMCS Code: 5705

⚠ WARNING

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

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

Personal injury could occur.

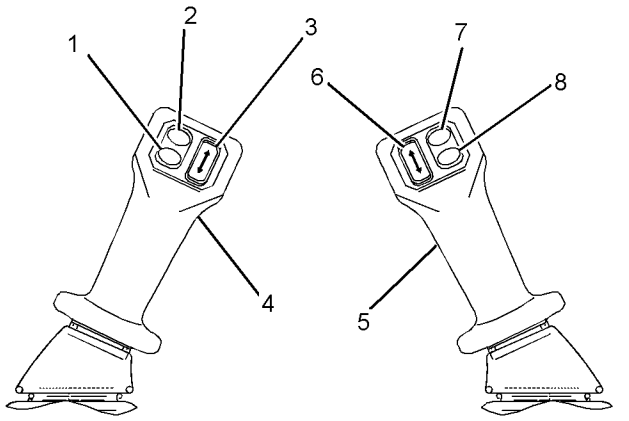


Illustration 220 g03874487

Table 65

Joystick Configurations			
Switch Location	**System Configurations**		
	Cat Grade Control	**Cat Grade With Assist**	**Cat Grade With Assist, With Tilt (If Equipped)**
1	Horn	Horn	
2	Touch Point/Laser	Constant Bucket Angle (Hold/ Store)	Return to Tilt Angle and Stored Bucket Angle Button
3	Adjust Target Depth	Medium Pressure Control	
4	Select Cat Grade Control	Select Cat Grade Control	
5	(N/A)	Assist Feature Setting (ON/OFF)/ Overcut Protection (Cancel)	
6	Adjust Target Slope	High-Pressure Control	
7	Bench Mark (Set/ Clear)	Constant Bucket Angle (Store/ Cancel)	
8	One Touch Low Idle	One Touch Low Idle	

Cat Grade Control System Configuration

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

For more information on Cat Grade Control, refer to Operation and Maintenance Manual, SEBU8358, “Cat Grade Control Depth and Slope for E Series and F Series Excavators”.

Horn

When horn switch (1) is depressed, the horn will sound.

Touch Point/Laser

Switch (2) is used with the touch point or laser function.

Adjust Target Depth

Switch (3) is used to adjust target depth.

Select Cat Grade Control

Switch (4) is used to select Cat Grade Control. Press and hold this trigger to activate (2)(3),(6),and (7).

Adjust Target Slope

Switch (6) is used to adjust target slope.

Set/Clear Bench Mark

Switch (7) is used to set and clear the bench mark. Pressing the trigger will set the bench mark. Pressing and holding the trigger will clear the bench mark.

One Touch Low Idle

When one-touch low idle (8) is pressed, the engine rpm is dropped. When a function is moved from the neutral position, one-touch low idle is turned off and the machine resumes the set throttle setting.

Cat Grade With Assist System Configuration

Horn

When horn switch (1) is depressed, the horn will sound.

Hold Store Constant Bucket Angle

Switch (2) will hold or store the constant bucket angle. Hold switches (2) and (7) for 3 seconds to set the bucket angle. Press switch (2) once to return to stored bucket angle. Press and hold switch (2) while operating the joystick for boom, stick, or bucket dump movements to hold bucket angle and keep the bucket angle. To stop holding the constant bucket angle, release switch (2) and return the joystick to neutral.

Select Cat Grade Control

Switch (4) is used to select Cat Grade Control. Press and hold this trigger to activate (2), (3), (6) and (7).

Refer to Cat Grade Control configuration for further details.

Assist Feature Setting (ON/OFF)/ Overcut Protection Cancel

Switch (5) is used to select overcut protection or cancel. If switch (5) is held, then the bucket can go through the target slope.

Store or Cancel Constant Bucket Angle

Switch (7) is used to store and cancel the bucket angle. Hold switch (7) for 3 seconds to clear stored bucket angle.

One Touch Low Idle

When one-touch low idle (8) is pressed, the engine rpm is dropped. When a function is moved from the neutral position, one-touch low idle is turned off and the machine resumes the set throttle setting.

Cat Grade With Assist System Configuration With Tilt (If Equipped)

Note: While performing any function without swing, the tilt assist will function as stated below. If switch (2) is pressed before or during swing special conditions apply.

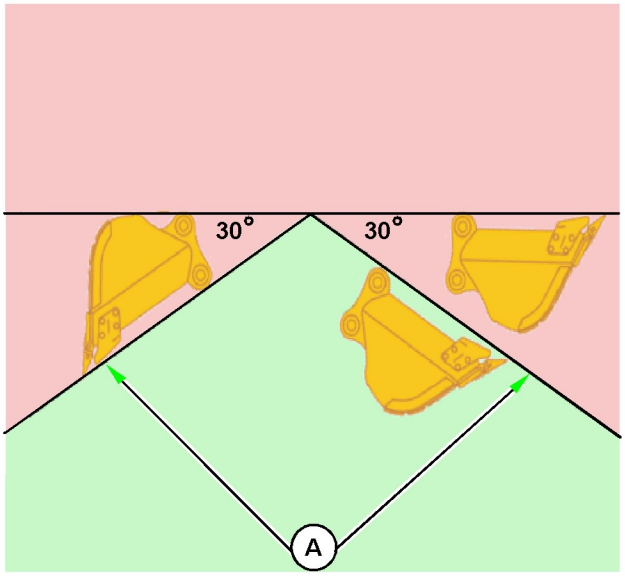


Illustration 221 g06113063

Normal working range for the variable tilt feature

Note: With the bucket at full open and full closed positions the variable tilt feature will be temporarily paused. To re-enable the tilt feature, the bucket must be within the normal working range (A), which is considered to be at least 30 degrees below the horizon from either open (dump) or closed (curled) position. Refer to Illustration 221 .

When Above Grade

Press switch (2) and release to change bucket tilt angle to match the grade. Press and hold switch (2) to change bucket tilt angle to match the grade or restored angle. To stop constant bucket angle, release (2) and return the joystick to neutral.

Note: If the controls are returned to neutral, the tilt assist function will stop.

When Within Grade Window (75 mm (3.0 inch))

If switch (2) is not pressed, the bucket will try to hold the existing angle, but will match the grade. The tilt angle will adjust automatically.

Press switch (2) and release to set the tilt angle to the programmed setting.

Press and hold switch (2) to maintain the tilt angle to the programmed setting.

Note: If the controls are returned to neutral, the tilt assist function will stop.

Special Conditions During Swing

If the tilt assist function button is pressed during swing, the tilt assist will pause while swinging. Once swing has stopped, the tilt assist will no longer be paused, and will continue movement to match grade. If the controls are returned to neutral, the function will stop.

If the tilt assist function button is pressed before swing, the tilt assist will pause once swinging starts. Once swing has stopped, tilt assist will no longer be paused, but will not continue movement.

If the bucket tilt control is adjusted during a swing, the tilt bucket will adjust as commanded, but the tilt assist will not perform any action.

i04561876

Joystick Controls Alternate Patterns

SMCS Code: 5059; 5137

Changing Machine Control Pattern By Four-Way Valve (If Equipped)

⚠ WARNING

Whenever a change is made to the machine control pattern, also exchange the pattern card in the cab to match the new pattern.

Check the machine control pattern for conformance to the pattern on the card in the cab. If the pattern does not match, change the card to match the machine control pattern before you operate the machine. Failure to do so could result in personal injury.

If the machine is equipped with a four-way valve, the machine control pattern can easily be changed. The machine control pattern can be changed to the SAE pattern, MHI pattern, KOB pattern, or the former SCM pattern by changing the four-way valve position. To change the four-way valve position, use the following procedure.

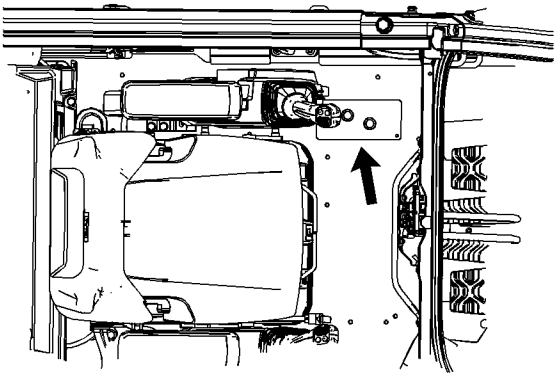


Illustration 222 g02042113

The four-way valve (if equipped) is located underneath the cab floor.

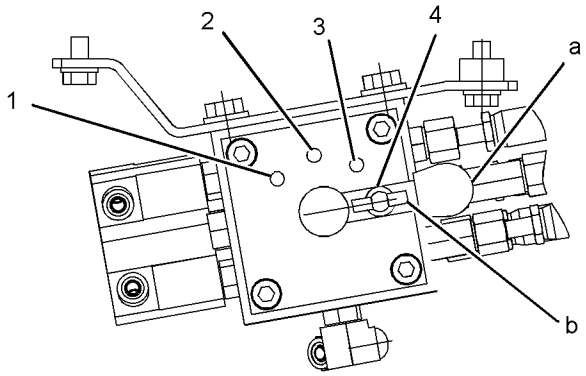


Illustration 223 g02042133

(a) Lever
(b) Bolt
(1) MHI machine control pattern
(2) CJL machine control pattern
(3) KOB machine control pattern
(4) SAE machine control pattern

1. Open the access cover in the floor of the cab.
2. Loosen bolt (b) and move lever (a) to the desired position. The lever can be moved to position (1), (2), (3), or (4).

   Position (1) will change the machine control pattern to the MHI pattern. Position (2) will change the machine control pattern to the CJL pattern. Position (3) will change the machine control pattern to the KOB pattern. Position (4) will change the machine control pattern to the SAE pattern.
3. After the pattern is set, tighten the bolt in order to secure the lever.

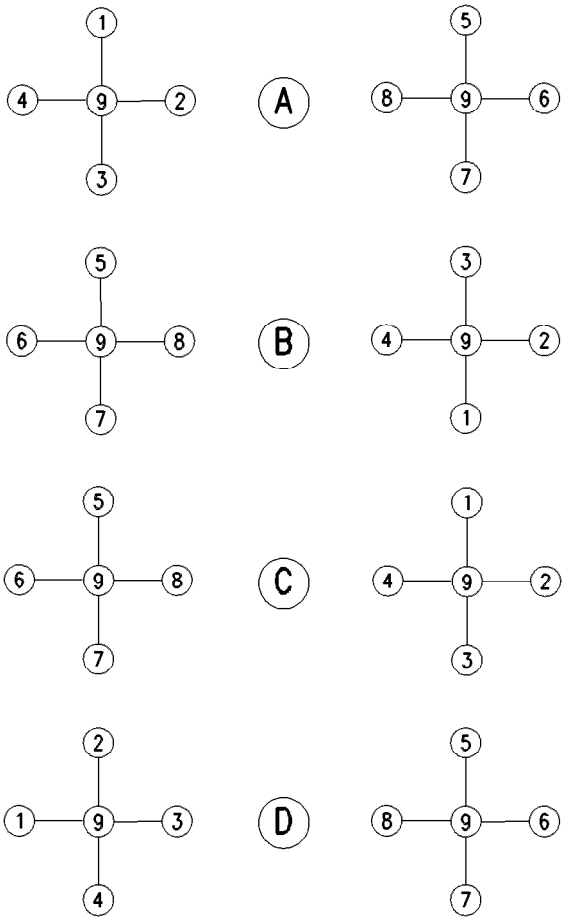


Illustration 224 g00102959

(A) SAE machine control pattern
(B) MHI machine control pattern
(C) KOB machine control pattern
(D) Former SCM machine control pattern

The patterns on the left side of the illustration show the possible configurations for the left control lever. The patterns on the right side of the illustration show the possible configurations for the right control lever.

STICK OUT (1) – Move the control lever to this position in order to move the stick outward.

SWING RIGHT (2) – Move the control lever to this position in order to swing the upper structure to the right.

STICK IN (3) – Move the control lever to this position in order to move the stick inward.

SWING LEFT (4) – Move the control lever to this position in order to swing the upper structure to the left.

BOOM LOWER (5) – Move the control lever to this position in order to lower the boom.

BUCKET DUMP (6) – Move the control lever to this position in order to dump the bucket.

BOOM RAISE (7) – Move the control lever to this position in order to raise the boom.

BUCKET CLOSE (8) – Move the control lever to this position in order to close the bucket.

HOLD (9) – When the control lever is released from any position, the control lever will return to the HOLD position. Movement of the upper structure will stop.

Two functions may be performed at the same time by moving a control lever diagonally.

If the machine is equipped with a hydraulic hammer, the function of position (6) and of position (8) is different.

HYDRAULIC HAMMER RAISE (6) – Move the control lever to this position in order to raise the hydraulic hammer.

HYDRAULIC HAMMER LOWER (8) – Move the control lever to this position in order to lower the hydraulic hammer.

Changing Machine Control Pattern by Two-Way Valve (If Equipped)

⚠ WARNING

Whenever a change is made to the machine control pattern, also exchange the pattern card in the cab to match the new pattern.

Check the machine control pattern for conformance to the pattern on the card in the cab. If the pattern does not match, change the card to match the machine control pattern before you operate the machine. Failure to do so could result in personal injury.

The machine control pattern can easily be changed to the SAE pattern or to the standard backhoe loader hydraulic pattern (BHL) by changing the position of the two-way valve (if equipped). Use the following procedure to change the position of the two-way valve.

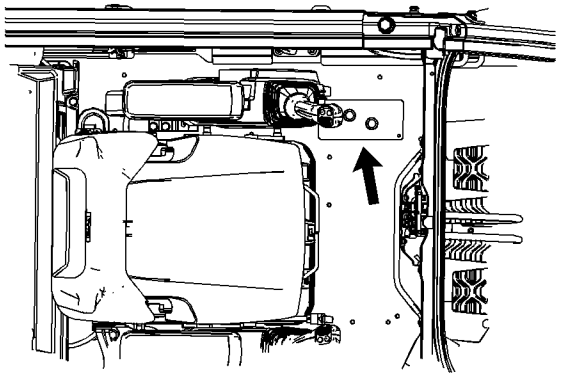


Illustration 225 g02042113

The two-way valve is located underneath the cab floor.

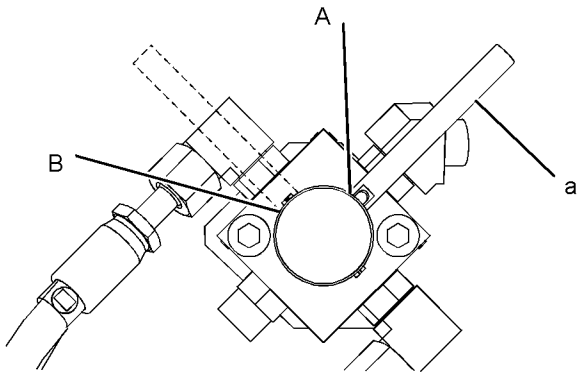


Illustration 226 g02042557

(a) Lever
(A) SAE machine control pattern
(B) BHL machine control pattern

1. Open the access cover in the floor of the cab.

2. Pull up on lever (a) and turn the lever to the SAE position or to the BHL position.

Note: Illustration 226 shows that the two-way valve is in the SAE position.

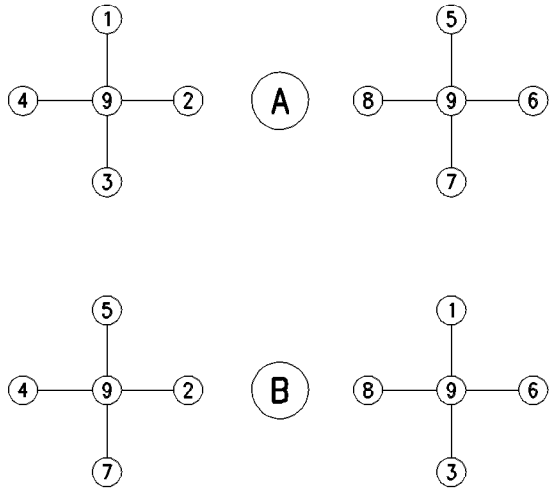


Illustration 227 g00102966

(A) SAE machine control pattern
(B) BHL machine control pattern for standard backhoe

The patterns on the left side of the illustration show the possible configurations for the left control lever. The patterns on the right side of the illustration show the possible configurations for the right control lever.



STICK OUT (1) – Move the control lever to this position in order to move the stick outward.



SWING RIGHT (2) – Move the control lever to this position in order to swing the upper structure to the right.



STICK IN (3) – Move the control lever to this position in order to move the stick inward.



SWING LEFT (4) – Move the control lever to this position in order to swing the upper structure to the left.



BOOM LOWER (5) – Move the control lever to this position in order to lower the boom.



BUCKET DUMP (6) – Move the control lever to this position in order to dump the bucket.



BOOM RAISE (7) – Move the control lever to this position in order to raise the boom.



BUCKET CLOSE (8) – Move the control lever to this position in order to close the bucket.

HOLD (9) – When the control lever is released from any position, the control lever will return to the HOLD position. Movement of the upper structure will stop.

Two functions may be performed at the same time by moving a control lever diagonally.

If the machine is equipped with a hydraulic hammer, the function of position (6) and of position (8) is different.

HYDRAULIC HAMMER RAISE (6) – Move the control lever to this position in order to raise the hydraulic hammer.

HYDRAULIC HAMMER LOWER (8) – Move the control lever to this position in order to lower the hydraulic hammer.

i06836341

SmartBoom Control
(If Equipped)

SMCS Code: 5461-ZS; 7332

S/N: KEA1–Up

S/N: NDC1–Up

S/N: KBP1–Up

⚠ WARNING

Personal injury or death can result from not following the proper procedures.

To avoid the possibility of injury or death, follow the established procedure.

⚠ WARNING

Activating the SmartBoom function and using the work tool joystick control while the front of the machine is elevated could result in unexpected machine motion. Unexpected machine motion could result in serious injury or death. Do not activate the SmartBoom function if the front of the machine is elevated by the front linkage.

⚠ WARNING

Do not elevate or lower the track when in the SmartBoom mode. Follow the operation procedures for the SmartBoom in the Operation and Maintenance Manual. Failure to follow these instructions can result in serious injury or death.

⚠ WARNING

Always make sure that the boom control joystick is in the NEUTRAL position before activating the SmartBoom control. Activating the SmartBoom control with the joystick out of the neutral position could resulted in unexpected machine motion which could result in serious injury or death.

⚠ WARNING

Do not select any SmartBoom mode, using the SmartBoom selector switch located on the console, while the tracks are elevated. Selecting the SmartBoom mode with the tracks elevated could result in a sudden drop of the machine which could result in serious injury or death.

⚠ WARNING

If any SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground, pressing the disable button that is located on the front of the right hand joystick could cause a sudden boom down motion. This control function could lift the machine upward, with unexpected machine movement that could result in serious injury or death. Do not press the disable button while the SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground.

⚠ WARNING

Do not attempt to lift the tracks of the machine by using the disable button and applying downward force with the boom lowering control while the machine is in any SmartBoom mode. Releasing the disable button will immediately return the machine to the active SmartBoom mode. This action could cause the machine to drop down abruptly which could result in serious injury or death.

The switches for the SmartBoom are on the right side instrument panel and on the right joystick.

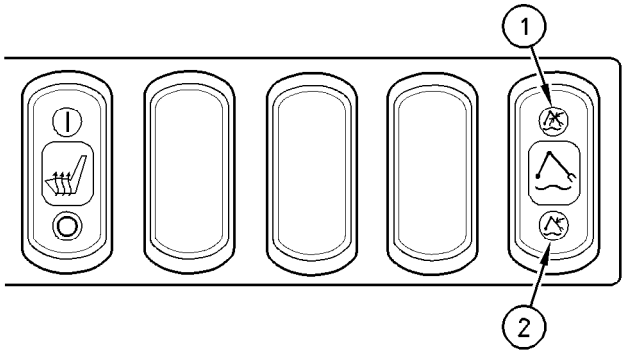


Illustration 228 g00753781

Right side instrument panel

(1) SmartBoom UP AND DOWN – Push down on the top of the rocker switch to activate the SmartBoom UP AND DOWN mode. When the boom control joystick is moved to the BOOM DOWN position, the boom will lower by the weight of the boom.` The boom can move upward freely.

(2) SmartBoom DOWN – Push down on the bottom of the rocker switch to activate the SmartBoom DOWN mode. The boom will lower by the weight of the boom when the control lever is moved to the BOOM LOWER position. This mode prevents the boom from moving upward. To move the boom upward, the operator must use the boom control joystick to activate the BOOM UP mode.

Note: When the rocker switch for the SmartBoom is in the CENTER position, the SmartBoom is no longer functional.

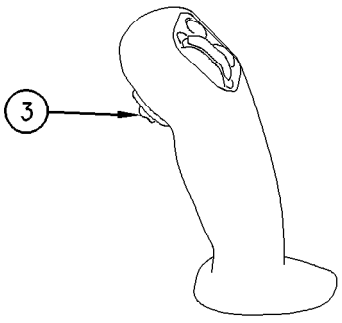


Illustration 229 g00753783

Right Joystick

(3) SmartBoom TEMPORARY DISABLE – Press the trigger switch on the front of the right joystick totemporarily override the SmartBoom function. Release the trigger switch to return to the selected SmartBoom function.

During operation of the SmartBoom, the operator may wish to apply downward force to the boom. When the rocker switch is in the SmartBoom DOWN position or the rocker switch is in the SmartBoom UP AND DOWN position, the operator can disable the SmartBoom function temporarily with the SmartBoom DISABLE switch. While the trigger switch is pressed, BOOM RAISE and BOOM LOWER will operate in the normal modes.

Note: Smart Boom Control function is deactivated when "Reach Front" is selected at "Boom Configuration" on Monitor menu.

i04177660

Fuel Tank Shutoff and Drain Control

SMCS Code: 1273

The fuel tank drain valve and the fuel shutoff valve are located inside the access door on the right side of the machine. The fuel tank drain valve is located under the main hydraulic pump. The fuel shutoff valve is located on the fuel system water separator.

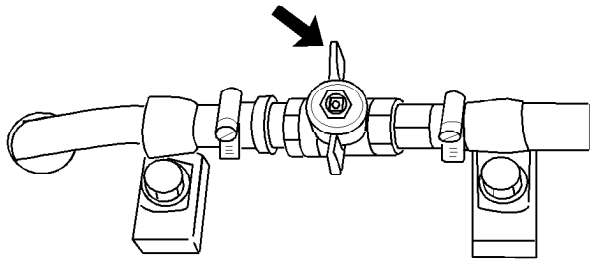


Illustration 230 g01043694

Fuel tank drain valve

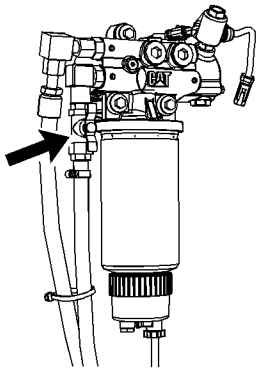


Illustration 231 g02368038

Fuel shutoff valve

Fuel Tank Drain Valve – 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 – To shut off the fuel supply, turn the fuel shutoff valve clockwise. To turn on the fuel supply, turn the fuel shutoff valve counterclockwise.

Note: For more detailed information that pertains to draining the water and sediment from the fuel tank, refer to Operation and Maintenance Manual, “Fuel Tank Water and Sediment - Drain”.

Engine Starting

i04947264

Engine Starting

SMCS Code: 1000; 1090; 1456; 7000

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

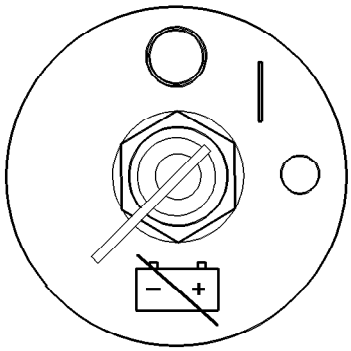


Illustration 232 g00406959

1. Turn the battery disconnect switch to the ON position.

2. Make sure that the reset button for the circuit breaker remains depressed. Refer to Operation and Maintenance Manual, “Circuit Breakers - Reset”.

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

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

4. Move the joysticks to the HOLD position.

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

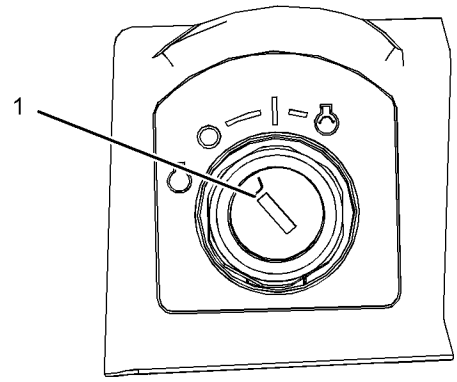


Illustration 233 g02041555

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

7. The monitoring system starts.

Note: For more information on the monitoring system, refer to Operation and Maintenance Manual, “Monitoring System”.

8. If the engine start switch is placed in the ON position for 2 seconds or more, the prestart check of the monitoring system will be activated. If any fluid levels are low, the low fluid level will be shown on the message display. Refer to Operation and Maintenance Manual, “Monitoring System” for more information on the prestart monitoring function.

If the fluid level is too low, add the corresponding fluid to the specified level. Add the fluid before you start the engine.

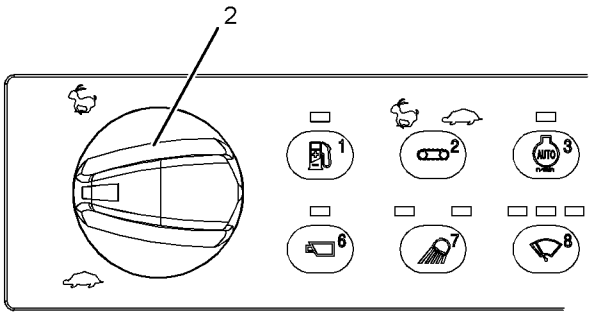


Illustration 234 g02204433

9. Turn engine speed dial (2) to speed position “1” .

NOTICE
Do not crank the engine for more than 30 seconds. If the engine does not start, allow the starter to cool for two minutes before cranking again. The engine start switch must be turned to the OFF position before trying to restart.

10. Turn engine start switch (1) to the START position.

11. Release the engine start switch key after the engine starts.

This machines engine with standard specifications can start in areas that have temperatures as low as −18°C (0°F). For areas that are cooler, a starting kit for cold weather is available.

i06954966

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.
- Maintain desired operation of the regeneration system.

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. The regeneration active indicator may also illuminate during extended idling conditions to signal that a regeneration is in progress.

Hydraulic System

⚠ WARNING

When you cycle the machine controls, the machine can move suddenly. Contact between the machine and external objects or ground personnel can result in serious injury or death. Before you cycle the machine controls, the machine should be located in an unobstructed, hazard-free work area that is away from external objects and ground personnel.

1. Make sure that the area is clear of personnel and equipment.

Note: The hydraulic lockout control must be in the UNLOCKED position before the hydraulic controls will function.

2. Allow the engine to warm up at low idle for at least 5 minutes. Engage the work tool controls and disengage the work tool controls. This will speed up the warm-up of the hydraulic components.

When you idle the machine for warm-up, observe the following recommendations:

- If the temperature is greater than 0°C (32°F), warm up the engine for approximately 15 minutes.
- If the temperature is less than 0°C (32°F), warm up the engine for approximately 30 minutes.
- If the temperature is less than − 18°C (0°F) or if hydraulic functions are sluggish, additional time may be required.

NOTICE
The hydraulic oil temperature should be higher than 25 °C (77 °F) before performing work with the machine. Make sure that the warm-up procedure is performed.

If the hydraulic oil temperature is less than 25 °C (77 °F) and the machine is operated abruptly, serious damage to the hydraulic components may occur.

Note: The recommended operating temperature of the hydraulic fluid for this machine is 55 °C (131 °F).

3. To warm up the hydraulic oil, turn the engine speed dial to the medium engine speed. 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.

Note: If the joysticks are held for more than 30 seconds, the machine ECM will go into a “Warm-Up Mode Power Derate” setting. “Warm-Up Mode Power Derate” will be shown on the monitor screen. When “Warm-Up Mode Power Derate” is active, the machine ECM limits the hydraulic pump torque to 50 percent. Release the joysticks in order to cancel the “Warm-Up Mode Power Derate” setting.

4. Turn the engine speed dial to the maximum engine speed and repeat step 3.

5. Cycle all controls in order 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 dial one position 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.

Dynamic Cool Engine Elevated Idle (DCEEI)

The Dynamic Cool Engine Elevated Idle (DCEEI) feature will temporarily increase the low idle engine speed when the engine coolant is below normal operating temperature. Increasing the low idle speed will accelerate the warm-up of the engine and fluids. When the engine coolant reaches normal operating temperature, the engine speed returns to the low idle speed.

Extended periods of low engine idle can also result in lower coolant temperatures. During extended periods of low engine idle, the engine idle speed will automatically increase if the engine coolant drops below the operating temperature. This increase in the engine idle speed will prevent overcooling of the engine.

Improve Cold Weather Performance

Covers installed over the vents in the radiator compartment door will help to control overcooling in ambient temperatures below −15° C (5° F).

The materials used for the covers and the method used to install the covers is at the installers discretion.

Install the covers if overcooling is observed while the machine is idling in ambient temperatures below −15° C (5° F).

Stop the machine, and remove the covers under the following conditions:

- The ambient temperature is above −15° C (5° F).
- The engine temperature gauge indicates overheating.
- The hydraulic oil temperature gauge indicates overheating.

Installation

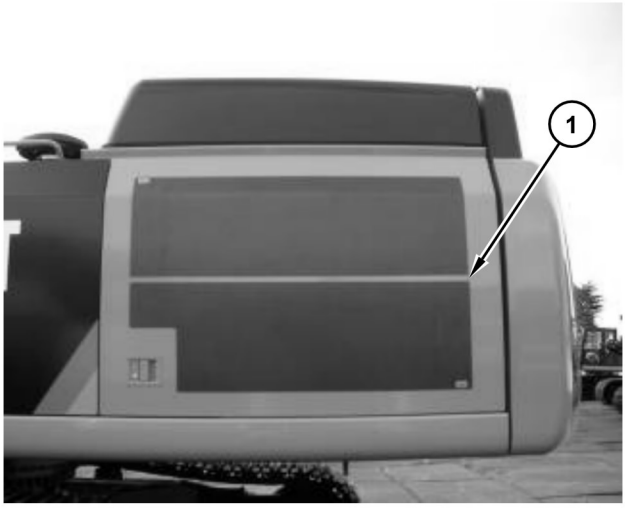


Illustration 235 g03707408

Typical example of cover location on the radiator compartment door

(1) Covers

1. Clean the surface of the radiator compartment door.

2. Install the covers in the location shown in Illustration 235 . The covers should fully cover the door vents.

Operation

i06231546

Operation Information

SMCS Code: 7000

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

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

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

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

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

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

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

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

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

1. Adjust the operator seat.

2. Fasten the seat belt.

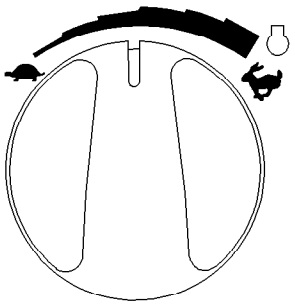


Illustration 236 g00732198

3. Turn the engine speed dial to the operating range.

4. Move the hydraulic lockout control to the UNLOCKED position.

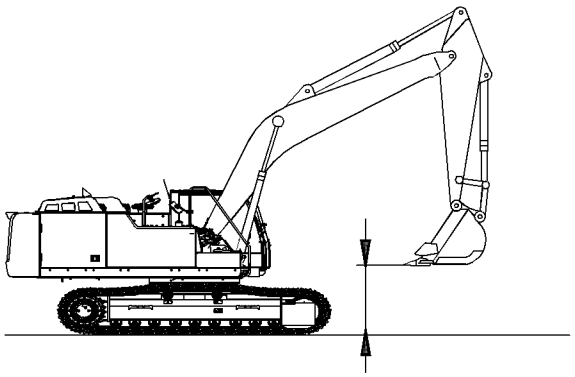


Illustration 237 g02145475

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

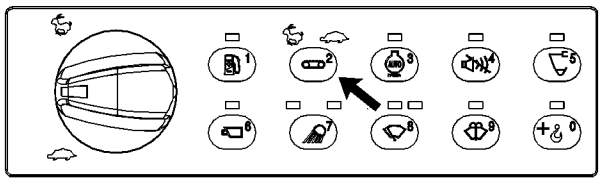


Illustration 238 g03262356

6. Select the desired travel speed by operating the travel speed control switch.

7. Make sure that the position of the upper structure and of the undercarriage is known before you move the machine. The drive sprockets should be at the rear of the machine.

Note: The directional steering controls will operate normally if the drive sprockets are at the rear of the machine and the idlers are at the front of the machine and under the cab. When the sprockets are under the cab, the travel controls will operate backward.

8. Turn the engine speed dial in order to increase the engine speed (rpm) to the desired speed.

9. Push both travel levers forward at the same time in order to travel forward. If both travel levers are pushed farther, the travel speed at the selected engine speed (rpm) will be faster.

Note: If the machine does not operate or if the machine does not travel in a straight line, consult your Caterpillar dealer.

10. See Operation and Maintenance Manual, “Operator Controls” for information about spot turning and about pivot turns.

11. When you make turns in soft material, travel in a forward direction occasionally in order to clear the tracks.

12. Slowly move both of the travel levers or both of the travel pedals to the CENTER position in order to stop the machine.

Lifting Objects

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

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

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

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

i00059294

Frozen Ground Conditions

SMCS Code: 7000

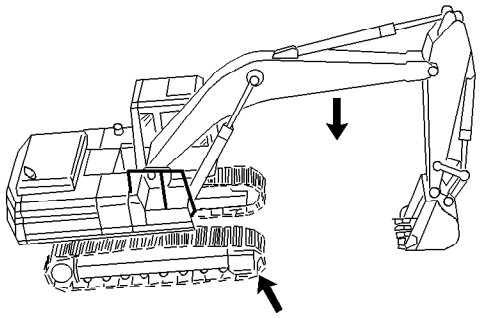


Illustration 239 g00101468

To free the tracks from frozen ground, swing the boom to the front of the machine. Use boom down pressure to free the idler end of the machine.

Swing the boom to the rear of the machine. Use boom down pressure to free the sprocket end of the machine.

i04364834

Equipment Lowering with Engine Stopped

SMCS Code: 7000

In order 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 in order to lower the boom.

Machines Equipped with a Boom Lowering Control Valve

⚠ WARNING

Boom load may cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing possible injury or death.

To avoid possible injury or death, be sure no one is under or near the work tool before manually lowering the boom.

Keep all personnel away from the boom drop area when lowering the boom with the engine stopped.

If the engine is shut down or the hydraulic system is disabled, the operator can still lower the boom.

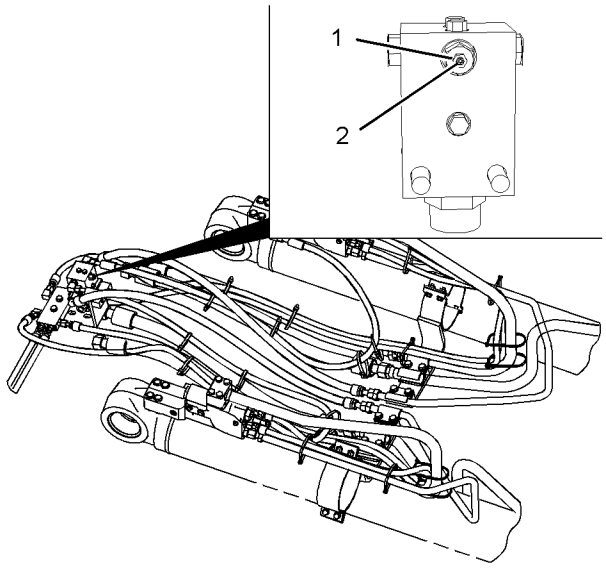


Illustration 240 g01753833

(1) Locknut
(2) Check valve

The boom lowering control valve is located at the back of the base of the boom. The boom lowering control valve allows the operator to manually lower the boom if the engine is stopped.

1. Loosen locknut (1) of the boom lowering check valve.

2. Slowly turn check valve (2) counterclockwise until the check valve stops. The boom will lower to the ground.

3. Make sure that the work tool has been lowered onto the ground. Tighten check valve (2) to a torque of 2.25 ± 0.25 N·m (1.66 ± 0.18 lb ft).

4. Tighten locknut (1) to a torque of 4 ± 0.5 N·m (3.0 ± 0.37 lb ft).

5. Before operating the machine, make any necessary repairs.

For additional information, consult your Caterpillar dealer.

Machines without a Boom Lowering Control Valve

⚠ WARNING

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

When you must manually lower the boom due to engine shutdown, use the following procedure.

Relieve the pressure in the hydraulic system before manually lowering the boom. Move the hydraulic lockout lever to the UNLOCKED position. Move the travel levers/pedals forward and backward in order to relieve the pressure.

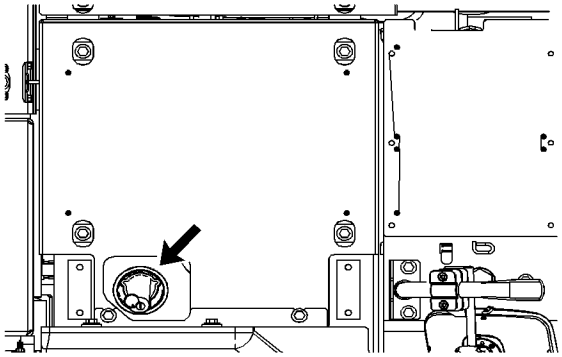


Illustration 241 g02024028

Hydraulic tank filler cap location

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

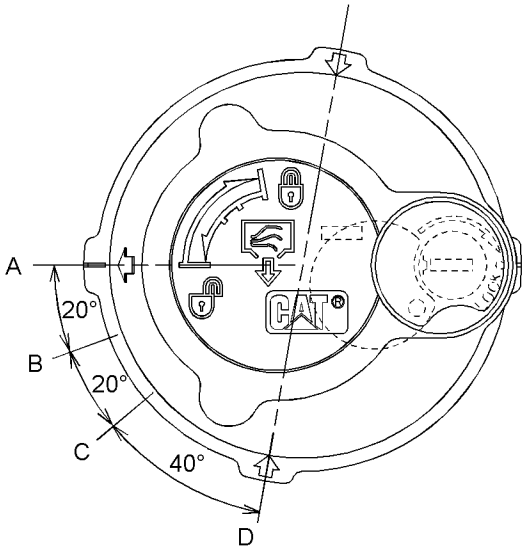


Illustration 242 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

1. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 242 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the filler cap down and move the arrow from position (C) to position (D).

d. After the tank pressure is relieved, remove the filler cap.

2. Open the engine hood.

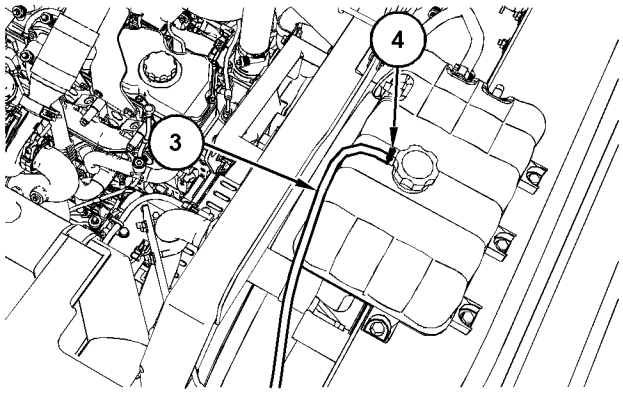


Illustration 243 g02518196

(3) Hose
(4) Clamp

3. Loosen clamp (4) and disconnect hose (3) from the radiator.

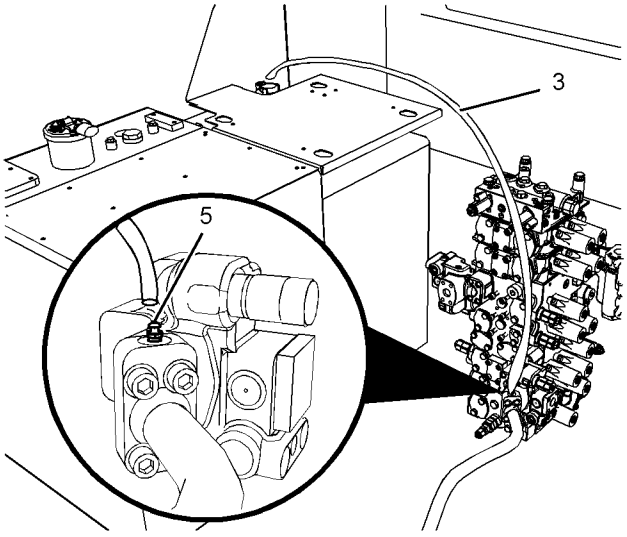


Illustration 244 g02518977

(3) Hose
(5) Screw

4. Connect one end of hose (3) to screw (5). Put the other end of hose (3) into the filler plug opening.

5. Slowly loosen screw (5) by a maximum of 1/2 turn. 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 a torque of 13 ± 2 N·m (9 ± 1 lb ft).

7. Disconnect hose (3) from screw (5). Do not allow the oil that is contained in hose (3) to spill. Drain the oil into a suitable container.

8. Connect hose (3) to the original position on the radiator and install hydraulic tank filler cap.

9. Close the engine hood.

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

Pressure Release of Auxiliary Lines

⚠ WARNING

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

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

Do not allow hot oil or components to contact skin.

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

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

- The work tool is changed.
- The position of the ball valve is changed.

1. Turn the engine start switch to the OFF position.

2. Place the hydraulic lockout lever to ON position.

3. Release the pressure in the auxiliary lines by pressing the auxiliary control buttons or the auxiliary control pedal three times.

4. Place the hydraulic lockout lever in the OFF position.

5. Change the work tool.

Note: There should be movement in the auxiliary hydraulic lines as the pressure is released. If there is no movement in the auxiliary hydraulic lines, start the engine and run the engine for 20 seconds. Repeat steps 1 to 5.

For additional information, consult your Cat dealer.

Operating Techniques

i05125989

Operating Technique Information

SMCS Code: 7000

⚠ WARNING

Know the maximum height and the maximum reach of your machine. Serious injury or death by electrocution can occur if the machine or the work tools are not kept a safe distance from electrical power lines. Keep a distance of at least 3000 mm (118 inch) plus an additional 10 mm (0.4 inch) for each 1000 volts over 50000 volts.

For safety, one of the following may require a greater distance:

- Local codes
- State codes
- Requirements of the job site

NOTICE
When swinging into a ditch, do not use the ditch to stop the swinging motion. Inspect the machine for damage if the boom is swung into a bank or an object.

Repeated stopping by an object can cause structural damage if the boom is swung into a bank or an object.

With certain boom-stick-bucket combinations, the bucket or worktool can hit the cab and/or the front structure of the machine. Always check for interference when first operating a new bucket or a new work tool. Keep the bucket or work tool away from the cab and away from the front structure during operation.

Whenever the tracks of the machine raise off the ground while digging, lower the machine back to the ground smoothly. DO NOT DROP OR CATCH IT WITH THE HYDRAULICS. Damage to the machine can result.

With certain combinations of work tools, the third pedal can have different functions. Always check the function of the third pedal before you use the third pedal.

Know the location of any buried cables. Mark the locations clearly before you dig.

Consult your Caterpillar dealer for special work tool tips that are available for use in severe applications.

Move the machine whenever the position for operating the machine is not efficient. The machine can be moved forward or backward during the operating cycle.

When you operate the machine in close places, utilize the bucket or the other work tool in order to perform the following functions:

- Pushing the machine
- Pulling the machine
- Lifting the tracks

Use a comfortable travel speed while you operate the machine.

Operating efficiency can be increased by using more than one machine control to perform a task.

Never swing a load over a truck cab or workers.

Position the truck so that material can be loaded from the rear of the truck or from the side of the truck. Load the truck evenly so that the rear axles are not overloaded.

An oversize bucket or a bucket that is equipped with side cutters should not be used in rocky material. These types of buckets slow down the cycle. Damage to the bucket and to other machine components could result.

Restricted Operation

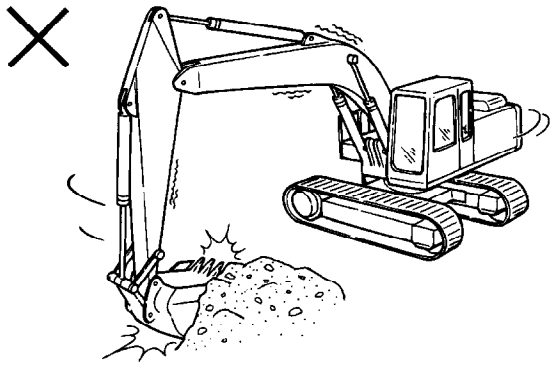


Illustration 245 g00529436

Do not use the swing force to perform the following operations:

- Soil compaction
- Ground breaking
- Demolition

Do not swing the machine while the bucket tips are in the soil.

These operations will damage the boom, the stick, and the work tool and the operations will reduce the life of the equipment.

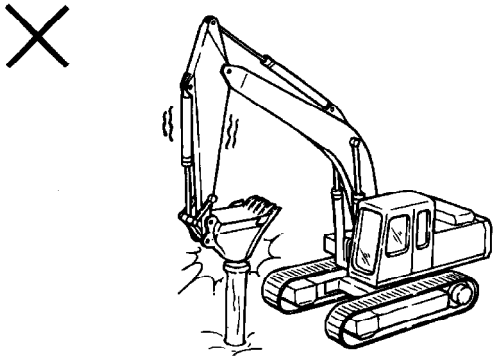


Illustration 246 g00529457

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

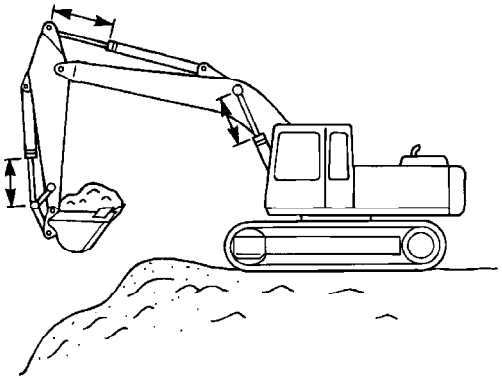


Illustration 247 g00529458

If the cylinder is operated at the end of the stroke during operations, excessive force will occur on the stopper on the inside of the cylinder. This will reduce the life of the cylinder and structures. To avoid this problem, always leave a small margin of play when the cylinder is operated.

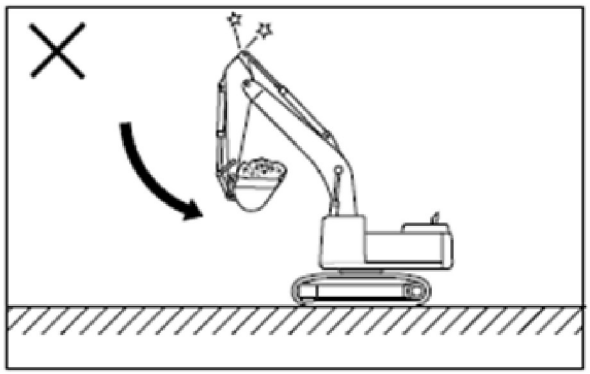


Illustration 248 g03286378

If the stick IN function is operated at full speed with a fully loaded bucket or heavy work tool attachment to the end of the cylinder stroke, excessive force will occur inside the stick cylinder. This action will reduce the life of the stick cylinder. To avoid this problem, always operate a stick IN function with moderate speed towards the end of cylinder stroke.

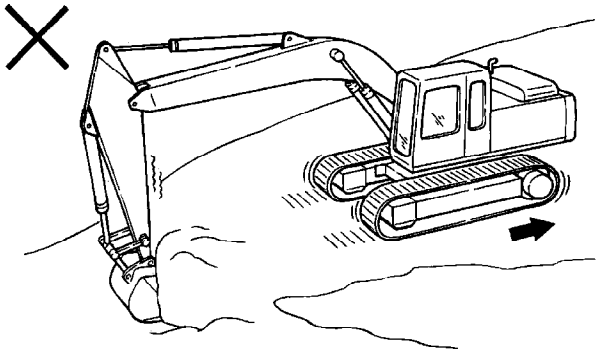


Illustration 249 g00529459

While the bucket is in the ground, do not use the travel force for any excavation. This operation will cause excessive force on the rear of the machine.

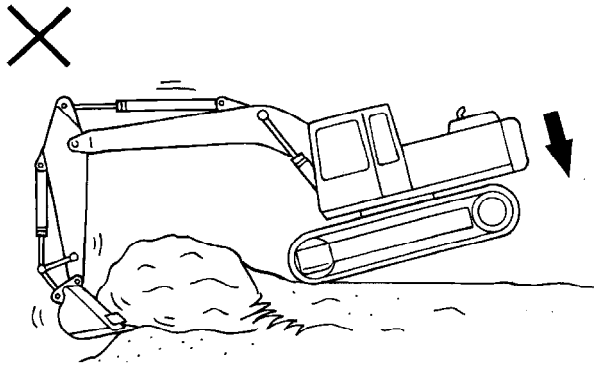


Illustration 250 g00529460

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

Operating Precaution

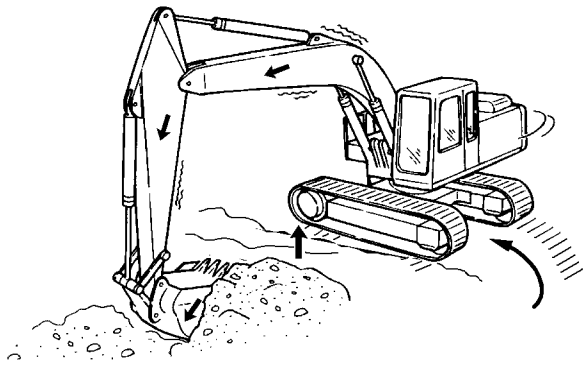


Illustration 251 g01250228

NOTICE
Do not allow the machine to swing from the force of traveling when you use the bucket , the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.

Do not use the force of the bucket, the stick, or the boom to assist in turning the machine while the machine is traveling. This technique is referred to as “jump steering”. This technique will damage the swing motor and the swing brake.

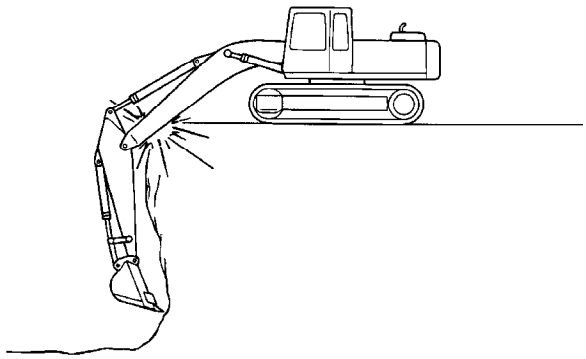


Illustration 252 g00529462

When deep holes are dug, do not lower the boom so that the bottom side of the boom touches the ground.

When deep holes are dug, do not allow the boom to interfere with the tracks.

i05032265

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.

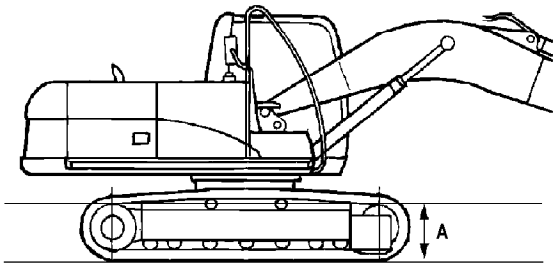


Illustration 253 g00807842

Depth of water to the center of the track carrier roller

The following guidelines pertain to travel across water and travel through mud, sand, or gravel.

The machine can travel across a river only under the following conditions:

- The bed of the river is flat.
- The flow of the river is slow.
- The machine dips into the water only to the center of the track carrier roller (dimension A).

NOTICE
Do not allow the fan on the engine to contact the water while the machine travels through the water. Do not allow the fan on the engine to contact the water during a swing while the machine is in the water. Damage to the fan may occur if the fan contacts the water.

While you cross the river, carefully confirm the depth of the water with the bucket. Do not move the machine into an area that has a water depth that is greater than Dimension A.

The machine may sink gradually on soft ground. Therefore, you should frequently check the height of the undercarriage from ground level and the depth of water on the ground.

Check the swing gear by looking through the port for inspection that is on the upper frame. If there is water in the swing gear, contact your Cat dealer for the required maintenance on the swing gear.

After you travel through water, carefully clean the machine in order to remove any salt, sand, or other foreign matter.

Procedure for Removing the Machine from Water or Mud

NOTICE
Do not allow the machine to swing from the force of traveling when you use the bucket , the stick, or the boom to assist in travel. If the force from traveling causes the machine to swing, damage may occur to the swing motor and to the swing drive.

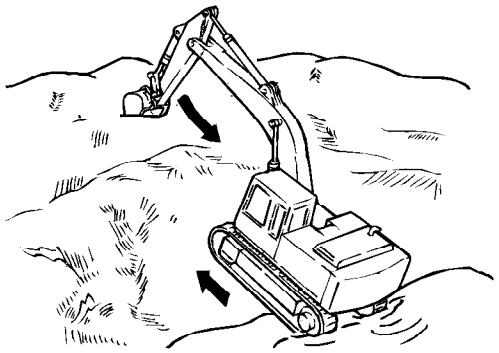


Illustration 254 g00808148

1. You may not be able to move the machine by using the travel controls only. In this case use both the travel control levers/pedals and the stick to pull the machine out of the water or ground.

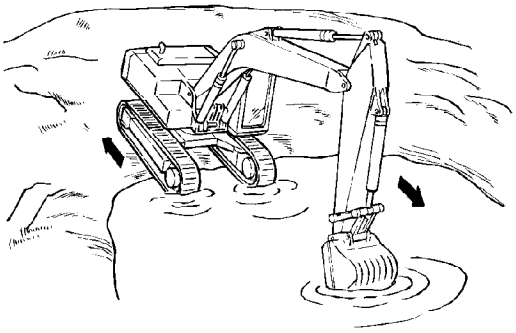


Illustration 255 g00808151

2. The machine may slip because of a steep slope. The procedure in Step 1 may not work. In this case, first rotate the upper structure by 180°. Then use both the travel control levers/pedals and the stick to move the machine up the slope.

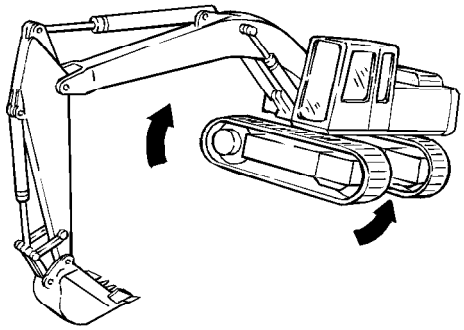


Illustration 256 g00808152

3. It may be impossible to travel because the bottom of the frame comes into contact with the ground or the undercarriage is clogged with mud or gravel. In this case, operate the boom and the stick together. Raise the track and rotate the track forward and backward in order to remove the mud and the gravel.

i05150572

Boom, Stick and Bucket Operation

SMCS Code: 7000

Digging

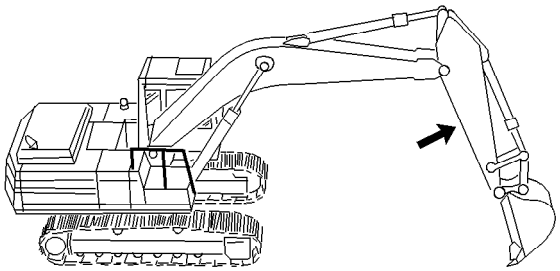


Illustration 257 g00101523

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

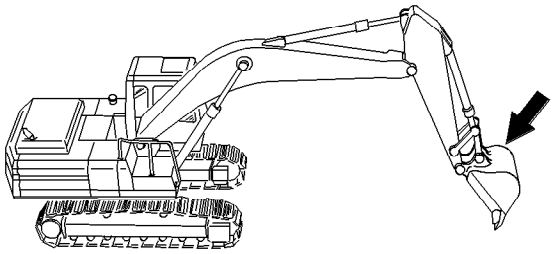


Illustration 258 g00101525

2. Position the bucket cutting edge at a 120 degree angle to the ground. Maximum breakout force can now be exerted with the bucket.

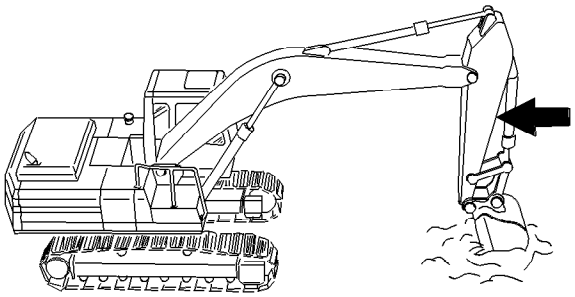


Illustration 259 g00101526

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

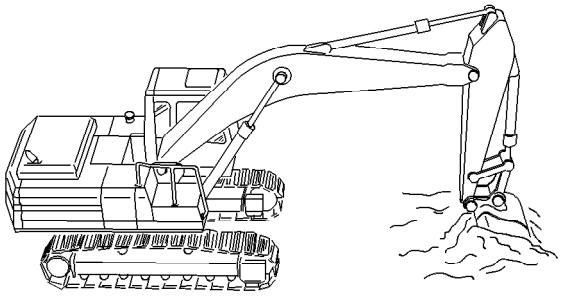


Illustration 260 g00101527

4. If the stick stops due to the load, raise the boom and/or perform a curl in order to adjust the depth of the cut.

5. To apply the greatest force at the cutting edge, decrease the down pressure as you move the stick toward the cab.

6. Maintain a bucket attitude that ensures a continuous flow of material into the bucket.

7. Continue the pass in a horizontal direction so that material peels into the bucket.

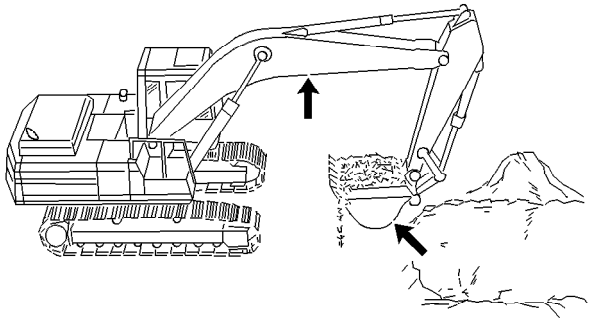


Illustration 261 g00101528

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

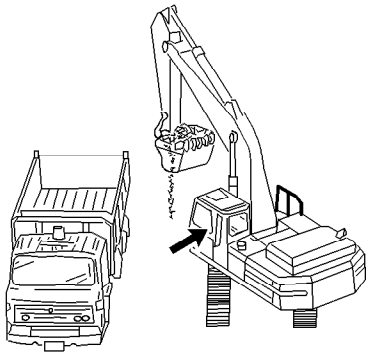


Illustration 262 g00101529

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

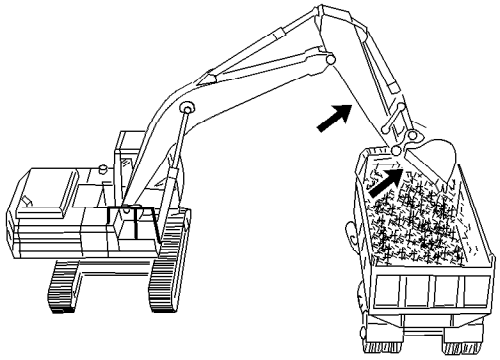


Illustration 263 g00101530

10. To dump a load, move the stick outward and open the bucket in a smooth motion.

Lifting Objects

⚠ WARNING

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on level ground, load capacities will vary.

NOTICE
Damage to bucket cylinder, bucket or linkage could result if slings are placed incorrectly.

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

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

Japan regulations require some machines to use a shovel crane configuration in order to lift ceratin objects.

Contact your Cat dealer for additional information.

Short slings will prevent excessive load swing.

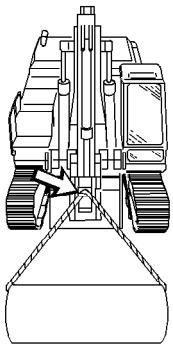


Illustration 264 g00101531

Use the lifting eye that is provided on the linkage to lift objects.

If the lifting eye is used, the connection must be made with a sling or with a shackle.

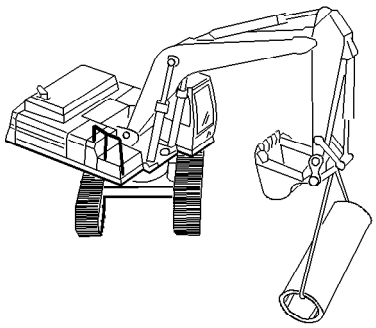


Illustration 265 g00101532

An unstable condition can exist if a load exceeds the machine load rating or if a heavy load is swung over an end or over a side.

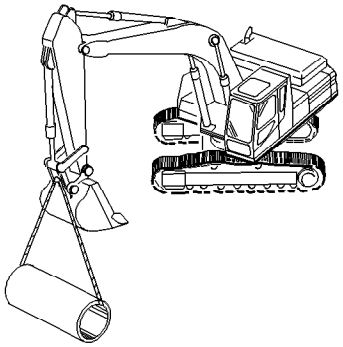


Illustration 266 g00101533

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

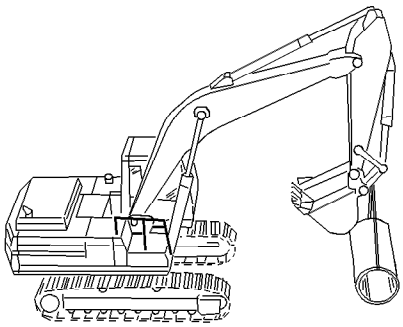


Illustration 267 g00101534

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

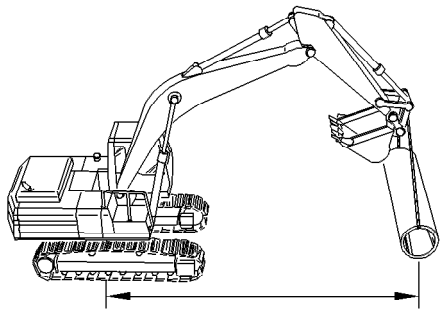


Illustration 268 g00101535

Lift capacity decreases as the distance from the swing centerline is increased.

Machines that are Equipped with a Long Reach Configuration

Machines with a long reach configuration require larger swing drift than standard machines when stopping, because inertial force in time of swing is large. Taking this into account, adjustments are made in timing for applying the swing brakes and speed of swinging.

Machines with a long reach configuration could be damaged and stability of the machine would be adversely affected if a control was suddenly operated, because inertial force of work tool is large.

i03875131

SmartBoom Operation
(If Equipped)

SMCS Code: 5461-ZS; 7332

S/N: KEA1–Up

S/N: NDC1–Up

S/N: KBP1–Up

⚠ WARNING

Personal injury or death can result from not following the proper procedures.

To avoid the possibility of injury or death, follow the established procedure.

⚠ WARNING

Activating the SmartBoom function and using the work tool joystick control while the front of the machine is elevated could result in unexpected machine motion. Unexpected machine motion could result in serious injury or death. Do not activate the SmartBoom function if the front of the machine is elevated by the front linkage.

⚠ WARNING

Do not elevate or lower the track when in the SmartBoom mode. Follow the operation procedures for the SmartBoom in the Operation and Maintenance Manual. Failure to follow these instructions can result in serious injury or death.

⚠ WARNING

Always make sure that the boom control joystick is in the NEUTRAL position before activating the SmartBoom control. Activating the SmartBoom control with the joystick out of the neutral position could resulted in unexpected machine motion which could result in serious injury or death.

⚠ WARNING

Do not select any SmartBoom mode, using the SmartBoom selector switch located on the console, while the tracks are elevated. Selecting the SmartBoom mode with the tracks elevated could result in a sudden drop of the machine which could result in serious injury or death.

⚠ WARNING

If any SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground, pressing the disable button that is located on the front of the right hand joystick could cause a sudden boom down motion. This control function could lift the machine upward, with unexpected machine movement that could result in serious injury or death. Do not press the disable button while the SmartBoom mode is active and the boom control joystick is in the BOOM DOWN position (forward) with a bucket or a work tool on the ground.

⚠ WARNING

Do not attempt to lift the tracks of the machine by using the disable button and applying downward force with the boom lowering control while the machine is in any SmartBoom mode. Releasing the disable button will immediately return the machine to the active SmartBoom mode. This action could cause the machine to drop down abruptly which could result in serious injury or death.

The Caterpillar SmartBoom provides significant advantages in the following operations:

Excavation and Loading

The operator should select the SmartBoom UP AND DOWN mode for excavating operations and for loading operations. This mode is effective during the return cycle. The BOOM DOWN movement is assisted by gravity, and the pump flow that is normally required for the boom circuit is available for faster STICK OUT and SWING functions. More work is performed for the amount of hydraulic oil flow that is provided by the pumps. This results in faster cycle times and improved fuel efficiency.

When the SmartBoom UP AND DOWN mode is active, no downward hydraulic force is applied to the boom. The operator can intermittently apply downward hydraulic force when the force is required for bucket penetration. A button on the right joystick enables the operator to override the SmartBoom mode.

Hammering

The operator should select the SmartBoom DOWN mode for hammering operations. In the SmartBoom DOWN mode, the weight of the hammer plus the boom and the stick provides sufficient downward force for effective hammering. This mode prevents the hammer from rebounding. The boom follows the hammer downward freely as the tool penetrates the rock. This mode also reduces strain on the machine structures.

Advantages

In hammering, the SmartBoom provides the following advantages:

- The mode reduces shock in the cab.
- The mode reduces strain on machine structures.
- The mode prevents blank shots.
- The mode maintains optimum frequency.

In rock cleaning, the SmartBoom provides the following advantages:

- The mode reduces strain on machine structures.
- The mode reduces wear on the bucket and the teeth.
- The mode maintains optimum frequency.

In a leveling operation, the SmartBoom eases the operation. Only STICK IN actuation and bucket actuation are required to level the surface.

In material handling, the SmartBoom reduces the chance of damage below the material.

i05068589

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

SMCS Code: 6129; 6522; 7000

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

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

General Operation

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

The work tools are held onto the quick coupler by hydraulic pressure. If pressure is lost, a check valve in the hydraulic cylinder traps oil in the cylinder. In addition to the check valve, a blocking bar locks the work tools to the quick coupler. Ensure that the hydraulic system and the blocking bar are working properly before using the quick coupler.

A lifting eye is included on the quick coupler. Release the work tool from the quick coupler in order to use the lifting eye to pick up loads. In order to lift a load with the lifting eye, extend the bucket cylinder until the quick coupler is in a VERTICAL position. Do not exceed the rated load for the machine.

NOTICE
Once the work tool has been properly attached to the coupler, no loosening of the work tool should occur. Refer to the “Quick Coupler Installation and Removal” section of the quick coupler Operation and Maintenance Manual for additional information. If at any point after the proper attachment and back drag testing of the work tool, should the work tool then become loose or if the rear pin of the work tool detaches from the movable hook, stop work immediately and safely ground and detach the work tool. Consult your Cat dealer to inspect the coupler prior to putting the coupler back into service. This situation could indicate potential coupler damage that may not be readily visible to the customer or operator of the machine and coupler.

NOTICE
Inspection of the Center-Lock coupler is required after a failure of the primary engaging system or a miscoupling of the tool, causing the work tool to swing by the secondary lock. Contact your Cat dealer.

Refer to Special Instruction, REHS5676, “The Inspection Procedure for the Center-Lock Coupler” for the proper procedure.

Note: Machines operating hydromechanical work tools equipped with a Center-Lock Pin Grabber Coupler, the addition of a Hydromechanical Conversion Kit may also be required. Refer to the Operation and Maintenance Manual for the quick coupler for more information or consult your Cat dealer.

Quick Coupler Operation

Description of the Instruction Film

An instruction film is included with the quick coupler. The instruction film illustrates the operation of the quick coupler.

Note: For detailed instructions on the operation of the quick coupler, refer to “Coupling the Work Tool” and “Uncoupling the Work Tool”.

The instruction film should be legible at all times. Clean the film or replace the film if the film is not legible. When you clean the film, use a cloth, water, and soap. Do not use solvent, gasoline, or harsh chemicals to clean the film. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the film. Loose adhesive will allow the film to fall. If the film is damaged or the film is missing, replace the film. For more information, consult your Cat dealer.

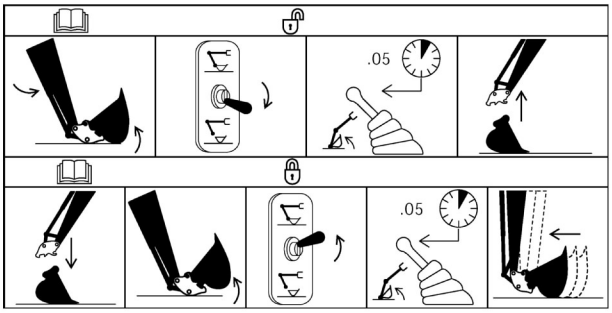


Illustration 269 g01231702
Instruction film

Description of the Top Frame on the Film (Uncoupling the Work Tool)

1. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.
2. Move the electric switch to the UNLOCK position.
3. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked.
4. Place the work tool in the storage position close to the ground. Retract the bucket cylinder until the tool is disengaged from the quick coupler.

Description of the Bottom Frame on the Film (Coupling the Work Tool)

1. Engage the quick coupler onto the work tool.
2. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position.
3. Move the electric switch to the LOCK position.
4. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked.
5. Make sure that the quick coupler pins are engaged. Retract the bucket cylinder and drag the attachment on the ground. This method will ensure that the quick coupler pins are engaged.

⚠ WARNING

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

NOTICE
Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

Electric Switch Operation

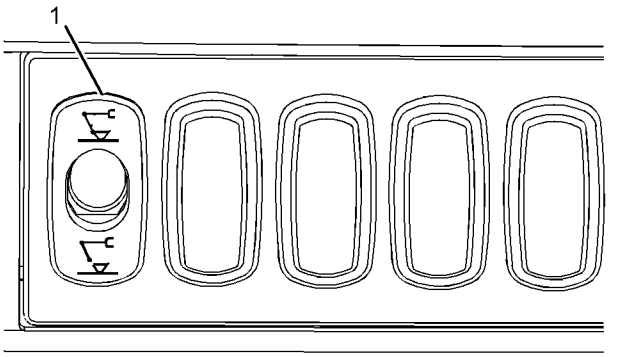


Illustration 270 g01354192

The electric switch (1) is located inside the cab. The electric switch has two positions that are used for coupling the work tool and uncoupling the work tool. Examples of the early switch type and the later switch type have been shown above. Refer to this Operation and Maintenance Manual, “Operator Controls” for the location of the electric switch.

UNLOCK – In order to unlock the coupler, extend the stick cylinder and extend the bucket cylinder until the bucket is fully curled under the stick. Pull the switch outward and move the switch toward the UNLOCK position. A buzzer will sound. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked. The switch must remain in the UNLOCK position until another work tool is attached. The switch must remain in the UNLOCK position in order to prevent the blocking bar from jamming.

LOCK – In order to lock the coupler, engage the quick coupler onto the work tool. Extend the stick cylinder and extend the bucket cylinder until the bucket is fully curled under the stick. Pull the switch outward and move the switch toward the LOCK position. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked. Make sure that the quick coupler is engaged onto the pins. Retract the bucket cylinder and drag the attachment on the ground. This method will ensure that the quick coupler is engaged onto the pins.

Coupling the Work Tool

WARNING

Place the work tool or bucket in a safe position before engaging the quick coupler. Ensure that the work tool or bucket is not carrying a load.

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

WARNING

Inspect the quick coupler engagement before operating the machine.

Serious injury or death may result from improperly engaged coupler.

WARNING

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

WARNING

The buzzer will not sound when the switch is in the lock position. The position of the switch does not confirm the coupler pins are engaged. A physical test is required by dragging the attachment on the ground to confirm the coupler pins are engaged.

NOTICE
With certain work tool combinations, including quick couplers, the work tool can hit the cab or the front of the machine. Always check for interference when first operating a new work tool.

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.

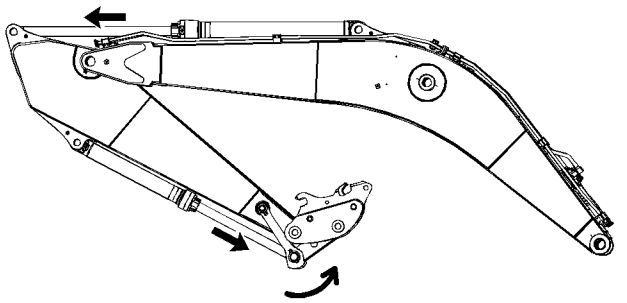


Illustration 271 g01231266

3. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the LOCK position to the UNLOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.

4. Pull the switch outward and move the switch to the UNLOCK position. A buzzer will sound.

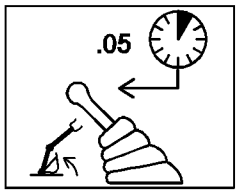


Illustration 272 g01231447

5. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been unlocked. The switch must remain in the UNLOCK position until the work tool is attached in order to prevent the blocking bar from jamming. The buzzer will continue to sound until the switch is moved to the LOCK position.

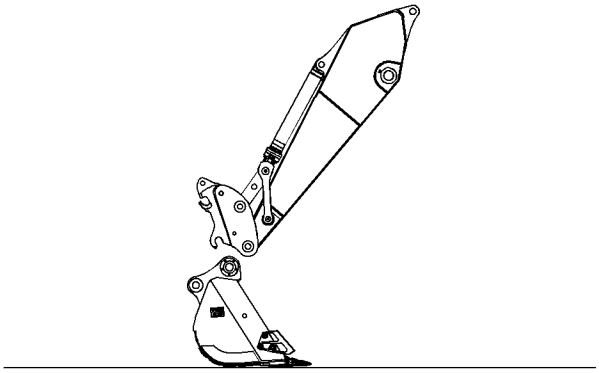


Illustration 273 g01231316

6. Align the quick coupler with the work tool.

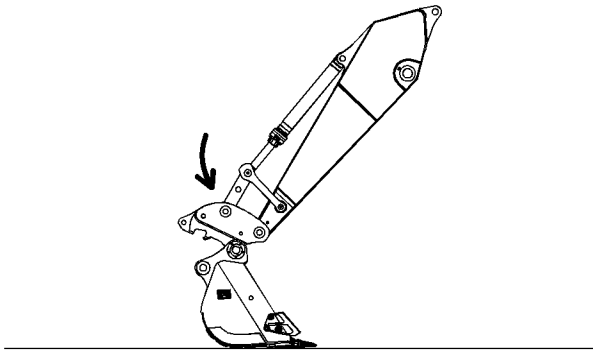


Illustration 274 g01231317

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

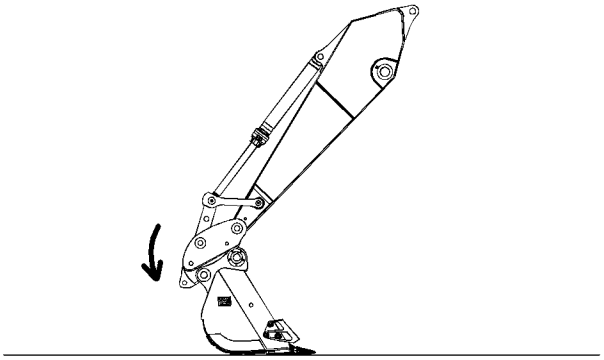


Illustration 275 g01231320

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

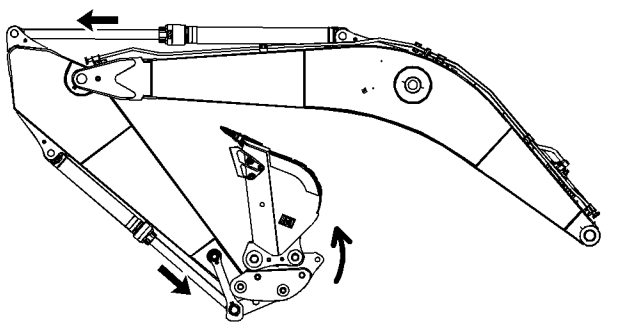


Illustration 276 g01231322

9. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position. This must be performed before you move the switch from the UNLOCK position to the LOCK position.

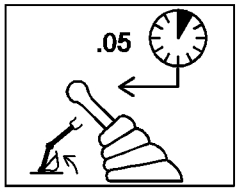


Illustration 277 g01231447

NOTICE
Hold the bucket cylinder control lever in the EXTEND position while the switch is moved into the LOCK position. Failure to do so may result in unwanted movement of the worktool.

10. Move the switch to the LOCK position. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds in order to lock the hook.

11. The “Work Tool Select” menu will be displayed on the monitor system. Scroll through the menu in order to select the desired work tool. Refer to this Operation and Maintenance Manual, “Monitoring System” for more information.

⚠ WARNING

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

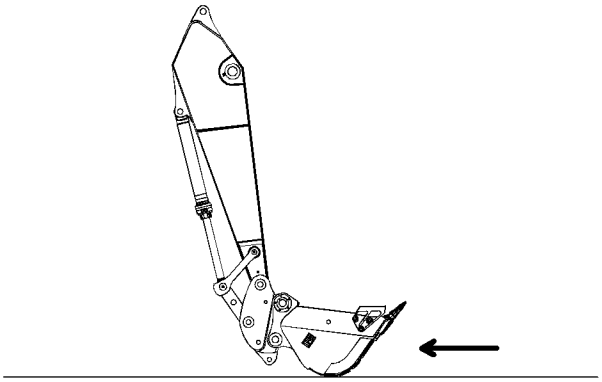


Illustration 278 g01231327

⚠ WARNING

Inspect the quick coupler engagement before operating the machine.

Verify that the quick coupler is engaged per the procedure in the Operation and Maintenance Manual. Verify prior to operating the machine, after every engine start, and after an extended time of inactivity.

Serious injury or death may result from improperly engaged coupler.

12. Verify that the quick coupler and the work tool are locked together.

a. Retract the bucket cylinder and place the work tool on the ground.

b. Apply pressure to the work tool against the ground.

c. Drag the work tool backward.

NOTICE
Back drag the work tool on the ground to ensure the quick coupler is properly locked.

Do Not strike the work tool on the ground to ensure the quick coupler is properly locked. Striking the work tool on the ground will result in damage to the coupler cylinder.

Uncoupling the Work Tool

⚠ WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

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

NOTICE
Auxiliary hoses for work tools must be disconnected before the quick coupler is disengaged.

Pulling the work tool with the auxiliary hoses could result in damage to the host machine or the work tool.

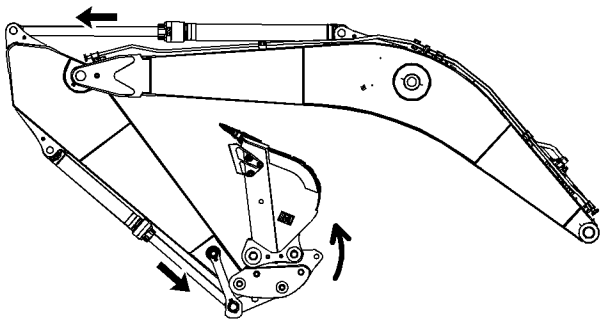


Illustration 279 g01231322

1. Extend the stick cylinder and extend the bucket cylinder until the work tool is curled past a vertical position. This must be performed before you move the switch from the LOCK position to the UNLOCK position.
2. Pull the switch outward and move the switch to the UNLOCK position.

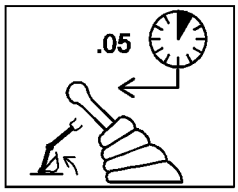


Illustration 280 g01231447

3. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds in order to unlock the hook. A buzzer will sound until the switch is moved to the LOCK position. In order to lift objects with the lifting eye of the quick coupler, refer to “Coupler Lifting Eye Operation without Bucket”.

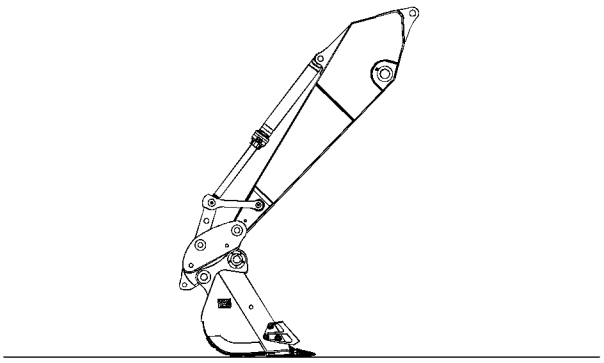


Illustration 281 g01231426

4. Move the boom and the stick until the tool or the bucket is in the storage position. Keep the tool close to the ground.

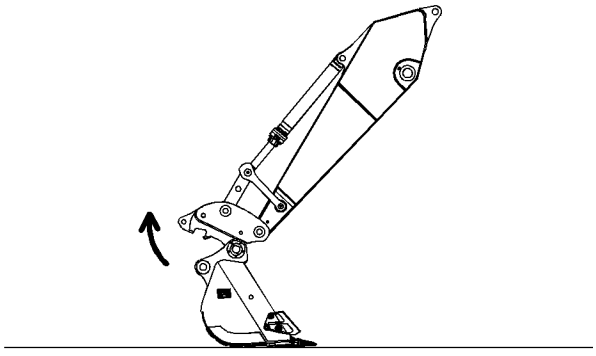


Illustration 282 g01231430

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

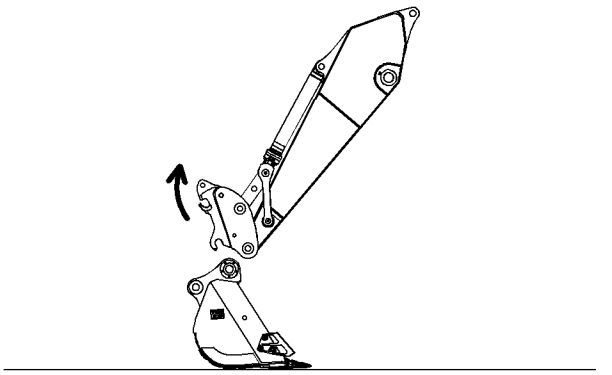


Illustration 283 g01231432

6. Continue to rotate the quick coupler upward in order to release the top pin and completely release the work tool from the quick coupler.
7. Move the stick to a position that is clear of the work tool.

Note: In order to lift objects with the lifting eye of the quick coupler, refer to “Coupler Lifting Eye Operation without Bucket”.

Coupling a Bucket that is Reversed

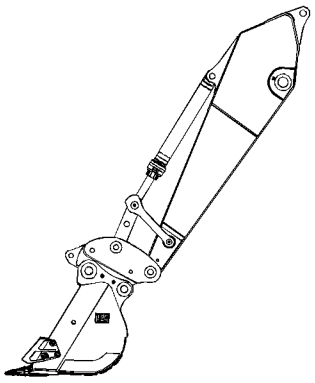


Illustration 284 g01231682

1. When you use a hydraulic pin grabber quick coupler, you can connect to a bucket that is in a reversed position. Refer to Illustration 284 for an example of connecting to a bucket that is in a reversed position.

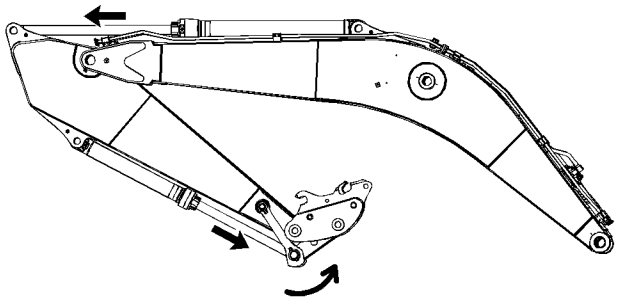


Illustration 285 g01231266

2. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the LOCK position to the UNLOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.
3. Follow the same steps for coupling the work tool in order to couple the host machine to a bucket that is reversed. Refer to “Coupling the Work Tool” for the proper procedure.

NOTICE
When some Caterpillar buckets are used in the reverse position, it can be more difficult to couple the bucket and uncouple the bucket than in the normal position.

Care must be taken to ensure that the position of the boom, stick, and bucket are aligned to ensure smooth coupling. The coupler must be in position between the bucket bosses.

If the bucket is not fully engaged in the jaw of the coupler, the quick coupler can become snagged on the bucket bosses. The full weight of the bucket is then carried by the quick coupler sideplates, which can cause damage to the quick coupler.

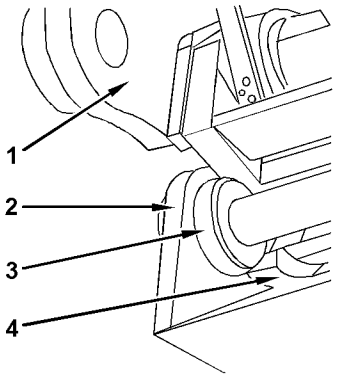


Illustration 286 g01231689

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

Coupler Lifting Eye Operation without Bucket

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

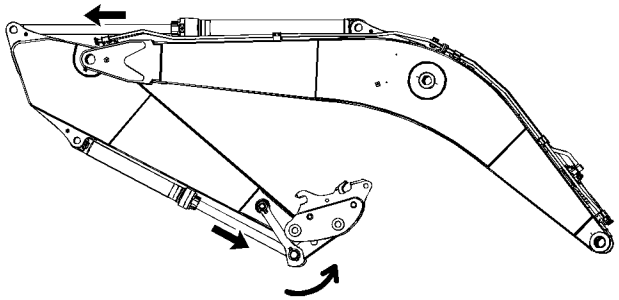


Illustration 287 g01231266

2. In order to prevent the blocking bar from jamming, the quick coupler must be curled past a vertical position before you move the switch from the UNLOCK position to the LOCK position. Extend the stick cylinder and extend the bucket cylinder until the quick coupler is curled past a vertical position.

3. Pull the switch outward and move the switch to the LOCK position. The buzzer will no longer sound.

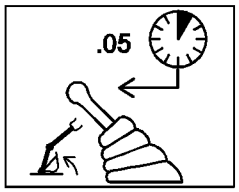


Illustration 288 g01231447

4. Hold the control lever for the bucket cylinder in the EXTEND position for 5 seconds after the electric switch has been locked.

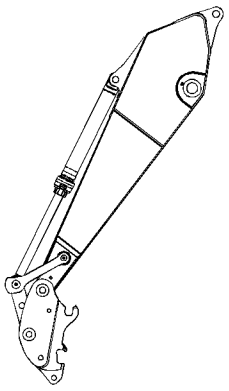


Illustration 289 g01231666

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

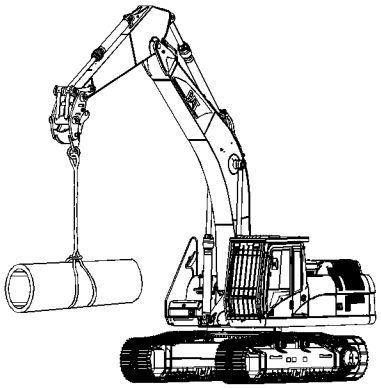


Illustration 290 g01187716

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

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

i05944562

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

SMCS Code: 6129; 6522; 7000

S/N: KEA1–Up

S/N: NDC1–Up

S/N: KBP1–Up

Operation

This procedure describes the use of the hydraulic circuit with a Caterpillar dedicated quick coupler. If a different quick coupler is used, please contact your Caterpillar dealer for pressure adjustment and consult the documentation for the quick coupler for proper operation.

- The engine start switch is on.
- The engine is running.
- The hydraulic lockout control must be in the UNLOCKED position in order to operate the quick coupler controls.
- During the operation, the alarm will sound.

When the above conditions are achieved, the system will perform the desired operation. A warning alarm will sound if the switch for the quick coupler is turned to the LOCKED position or the UNLOCKED position as long as the hydraulic lockout control is in the UNLOCKED position.

Resetting the Quick Coupler Controls

Operation of the quick coupler may be interrupted by deactivating the hydraulic lockout control. The quick coupler controls will be disabled. Use the following procedure to reset the quick coupler control.

1. Return the quick coupler switch to the LOCKED position.

2. Turn the engine start switch to the OFF position and then turn the engine start switch to the ON position.

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

Securing the Work Tool

⚠ WARNING

Inspect the coupler wedge engagement before you operate the excavator.

Serious injury or death may result from an improperly engaged coupler.

Inspect coupler wedge engagement from the cab by rotating the bucket or the work tool inward. Extend the bucket cylinder to bring the coupler actuator into view and bring the stick in until the wedges are visible.

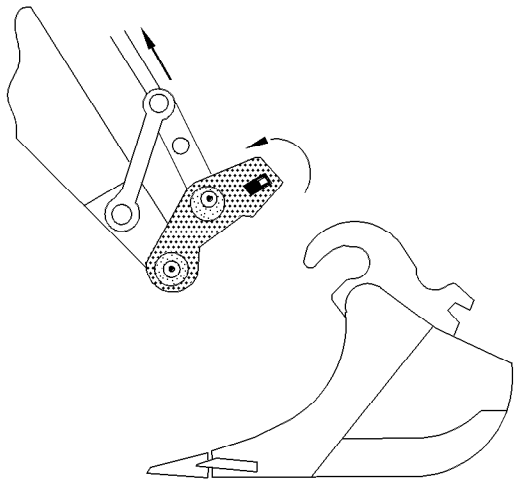


Illustration 291 g00104707

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.

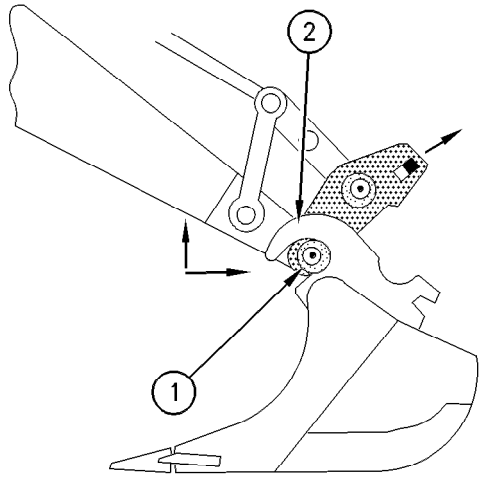


Illustration 292 g00104708

(1) Lower bosses
(2) Hinges

3. Move the stick forward and raise the stick until the lower bosses (1) engage the hinges (2) of the work tool.

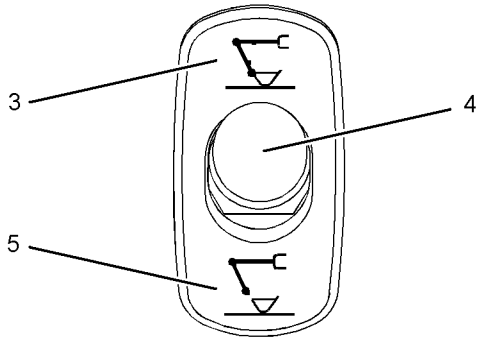


Illustration 293 g03733058

(3) Locked
(4) Quick coupler switch
(5) Unlocked

4. Move the switch for the quick coupler to the UNLOCKED position in order to extend the wedge. Use this position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

Note: Whenever the switch is on the UNLOCKED position, a warning alarm will sound.

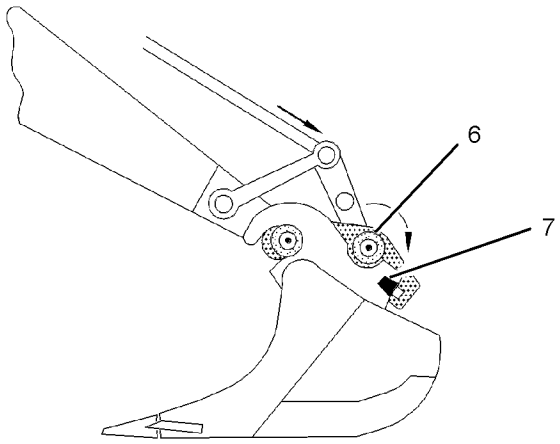


Illustration 294 g01620262

(6) Center bosses
(7) Locking area

5. Extend the bucket cylinder in order to rotate the quick coupler toward the work tool.

Center bosses (6) must engage with the cutout of the hinge.

6. Move the switch for the quick coupler to the LOCKED position in order to retract the wedge. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

The springs in the quick coupler will move the wedge into the locking area (7).

Note: The warning alarm will sound for 10 seconds.

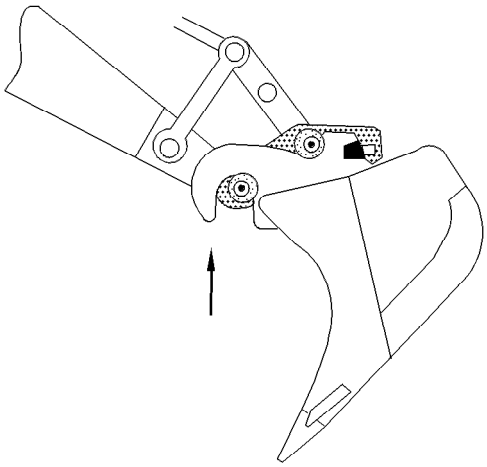


Illustration 295 g00104710

7. Raise the boom or raise the stick. Retract the bucket cylinder in order to confirm that the wedge is fully engaged. If the wedge is fully engaged, the work tool is locked in place. The work tool is ready to use.

Releasing the Work Tool

⚠ WARNING

Place the work tool or bucket in a safe position before disengaging the coupler. Disengaging the coupler will release the work tool or bucket from control of the operator.

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

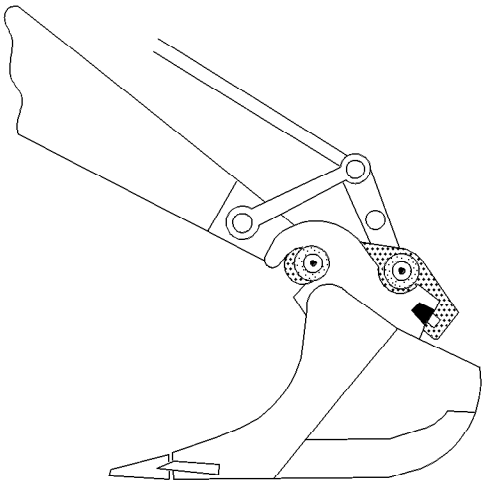


Illustration 296 g00104711

1. Level the bucket or level the work tool on the ground.

2. Move the switch for the quick coupler to the UNLOCKED position in order to extend the wedge. Use this position only during the coupling or uncoupling of the work tool. The hydraulic system is pressurized for 10 seconds when the switch is in the UNLOCKED position.

Note: The warning alarm will sound.

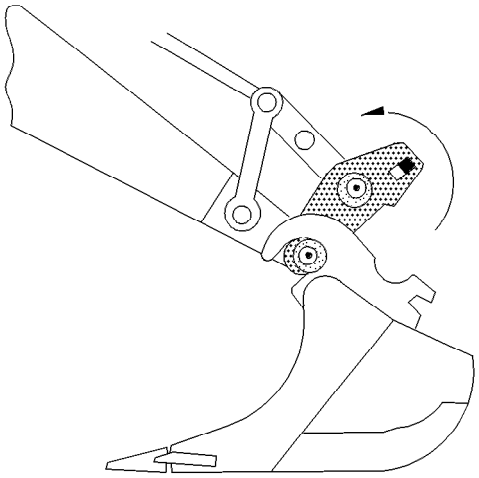


Illustration 297 g00104713

3. Retract the bucket cylinder in order to move the quick coupler toward the machine.

4. Move the switch for the quick coupler to the LOCKED position in order to retract the wedge.

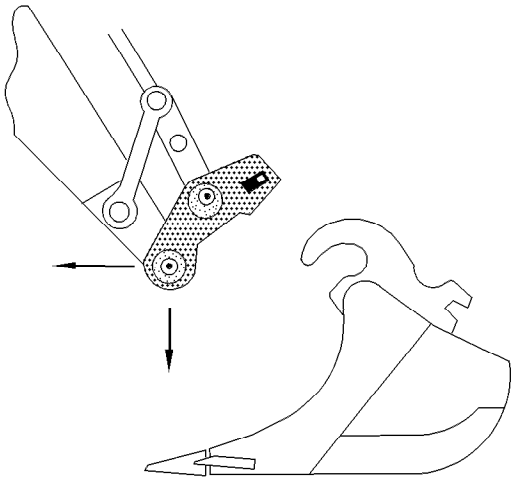


Illustration 298 g00104714

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

i04067162

Bucket - Remove and Install

SMCS Code: 6001; 6001-012; 6001-011; 6101; 6102; 6523

Captured Flag

⚠ WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- **Confirm the verbal communication and the hand signals that will be used during the installation.**
- **Be alert for sudden movement of the front linkage and the work tool.**
- **Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.**

NOTICE
To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

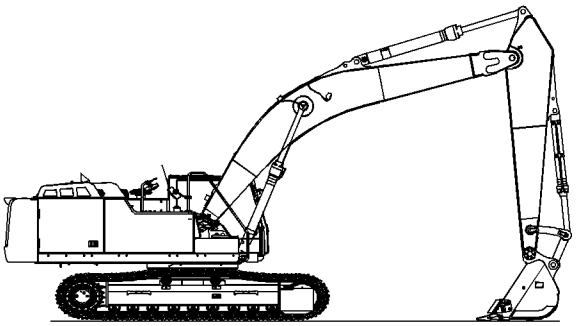


Illustration 299 g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

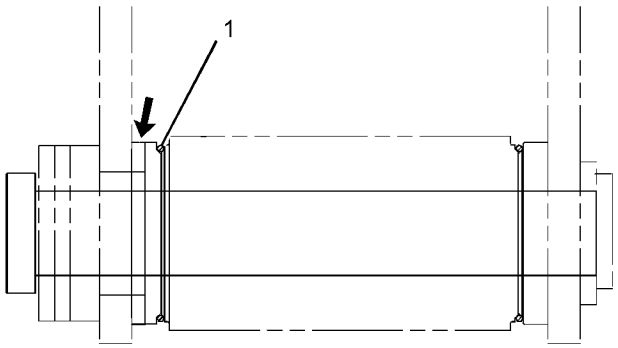


Illustration 300 g01303452

2. Slide O-ring seals (1) off the pin joints and onto the flanges of the bucket.

⚠ WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

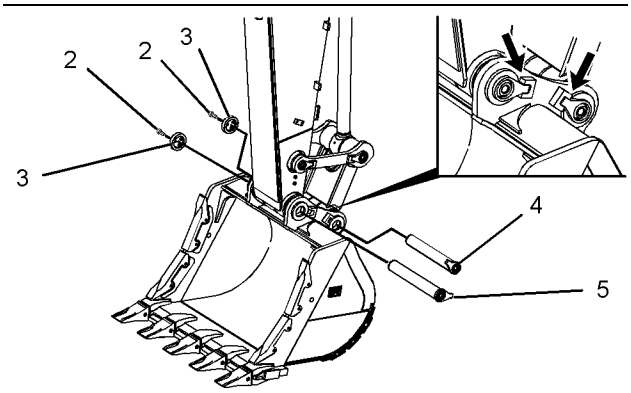


Illustration 301 g01303433

3. Remove bolts (2) and retaining plates (3). Then remove support pin (4) and support pin (5).

4. Start the engine and raise the stick out of the bucket.

5. Remove the O-ring seals (1) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

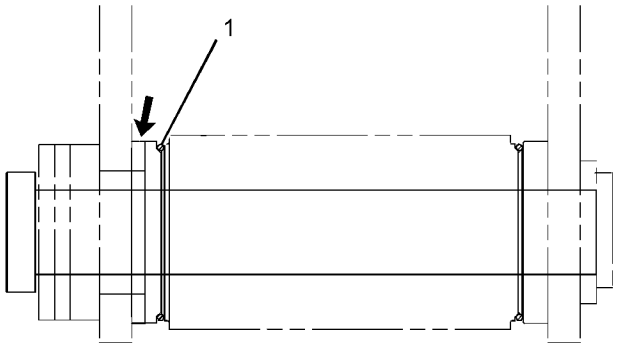


Illustration 302 g01303452

2. Position the O-ring seals (1) onto the flanges of the bucket.

3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

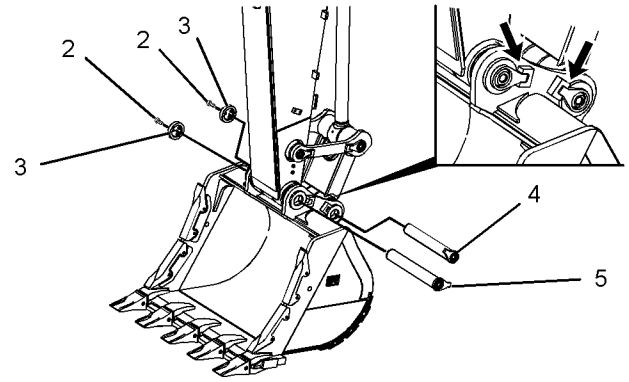


Illustration 303 g01303433

4. Insert support pin (5) into the pin bore. Make sure that the flange of the support pin rest inside the support on the side of the bucket.

5. Refer to Operation and Maintenance Manual, “Bucket Linkage - Inspect/Adjust” in order to adjust the bucket clearance.

6. Install retaining plate (3). Install bolts (2). Tighten bolts (2) evenly.

7. Slide O-ring seals (1) in position over the pin joints between the bucket and the stick.

8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.

9. Insert support pin (4) into the pin bore. Make sure that the flange of the support pin rest inside the support on the side of the bucket.

10. Install retaining plate (3). Install bolts (2). Tighten bolts (2) evenly.

11. Slide the O-ring seals (1) over the pin joints between the bucket and the link assembly.

12. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, “Bucket Linkage - Lubricate” or Operation and Maintenance Manual, “Boom, Stick, and Bucket Linkage - Lubricate”.

Bolted Flag

⚠ WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- **Confirm the verbal communication and the hand signals that will be used during the installation.**
- **Be alert for sudden movement of the front linkage and the work tool.**
- **Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.**

NOTICE
To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

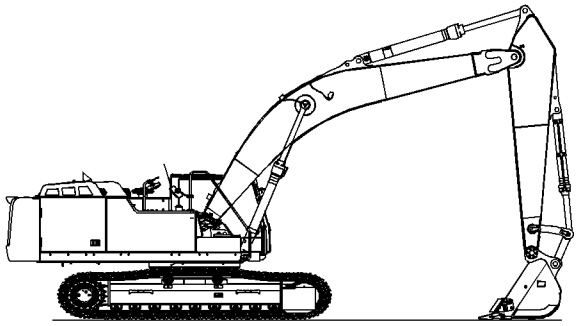


Illustration 304 g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

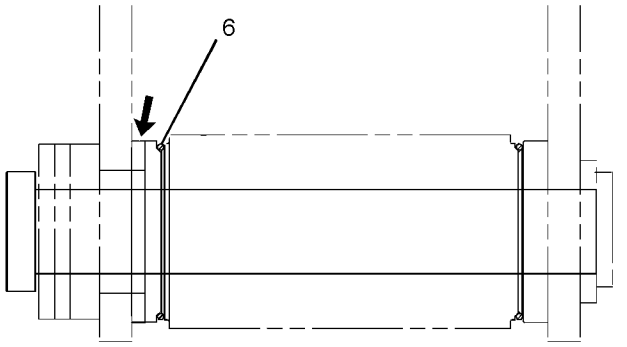


Illustration 305 g01303567

2. Slide O-ring seals (6) off the pin joints and onto the flanges of the bucket.

⚠ WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

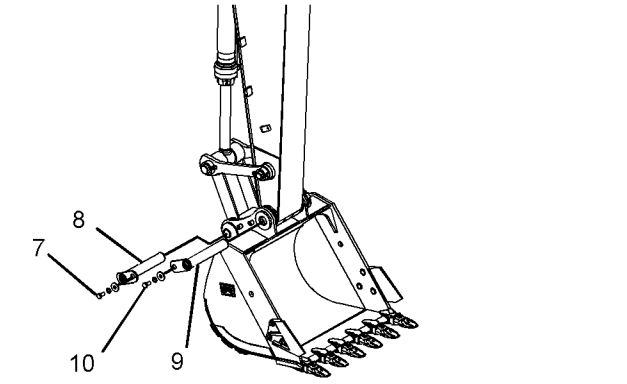


Illustration 306 g01303568

3. Remove bolt (7). Remove support pin (8).

4. Remove bolt (10). Remove support pin (9).

5. Start the engine and raise the stick out of the bucket.

6. Remove the O-ring seals (6) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

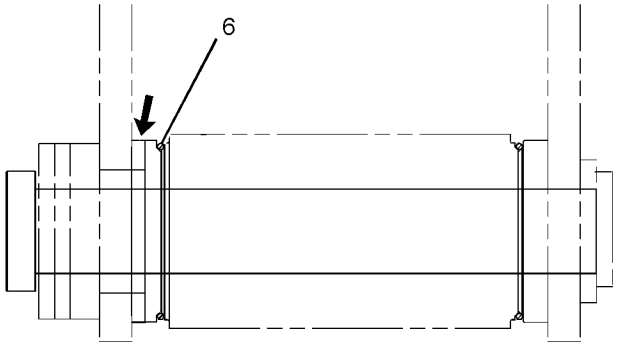


Illustration 307 g01303567

2. Position the O-ring seals (6) onto the flanges of the bucket.

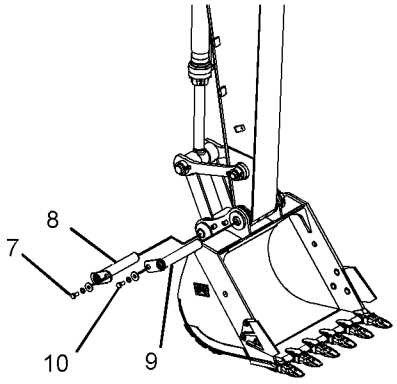


Illustration 308 g01303568

3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

4. Install support pin (9) into the pin bore.

5. Install bolt (10).

6. Refer to Operation and Maintenance Manual, “Bucket Linkage - Inspect/Adjust” in order to adjust the bucket clearance.

7. Slide O-ring seals (6) in position over the pin joints between the bucket and the stick.

8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.

9. Install support pin (8) into the pin bore.

10. Install Bolt (7).

11. Slide the O-ring seals (6) over the pin joints between the bucket and the link assembly.

12. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, “Bucket Linkage - Lubricate” or Operation and Maintenance Manual, “Boom, Stick, and Bucket Linkage - Lubricate”.

Crossbolt

⚠ WARNING

Failure to follow the instruction below for the installation of a work tool may result in personal injury or death. Special care must be taken if more than one person is installing the work tool.

- **Confirm the verbal communication and the hand signals that will be used during the installation.**
- **Be alert for sudden movement of the front linkage and the work tool.**
- **Do not insert fingers into the bores of the support pins when the support pins and the bores are being aligned.**

NOTICE
To facilitate removal of the bucket pins without causing damage to the pins, the bearings, and/or the O-ring seals put the bucket on the floor and the stick in a vertical position, as shown.

Removal Procedure

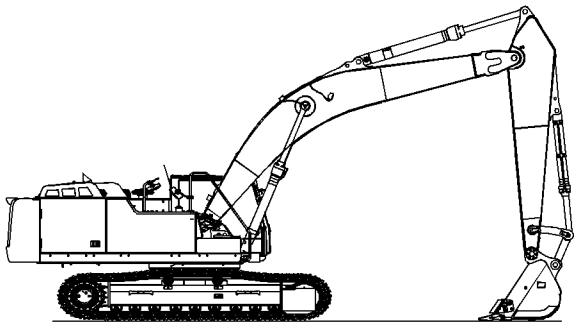


Illustration 309 g02280104

1. Start the engine. Park the machine on a hard, level surface. Position the bucket, the stick, and the bucket control linkage, as shown. Shut off the engine.

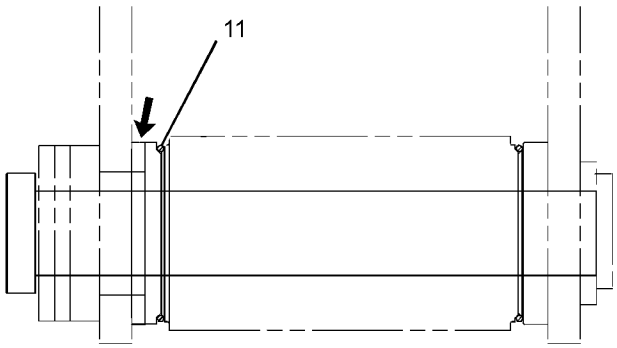


Illustration 310 g01303581

2. Slide O-ring seals (11) off the pin joints and onto the flanges of the bucket.

⚠ WARNING

When the pin assembly is removed, the linkage assembly may swing out of the bucket. To prevent possible personal injury, do not stand in front of the linkage assembly when the pin assembly is being removed.

Note: Removing the support pin may be difficult due to excessive pressure on the support pin. Remove the pressure on the support pin by adjusting the front linkage.

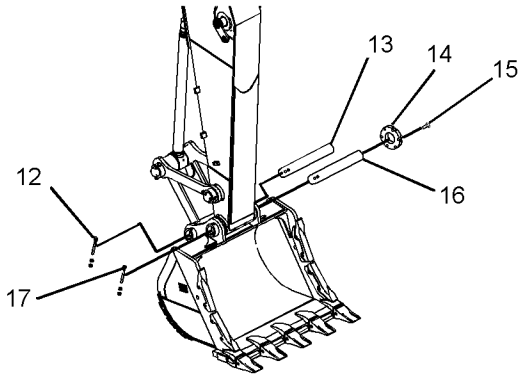


Illustration 311 g01303622

3. Remove nuts and retaining bolt (12) from support pin (13). Remove support pin (13).

4. Remove bolts (15) and adapter plate (14). Remove the shims.

5. Remove nuts and retaining bolt (17) from support pin (16). Remove support pin (16).

6. Start the engine and raise the stick out of the bucket.

7. Remove the O-ring seals (11) from the flanges on the bucket.

Note: After the support pins have been removed, make sure that the support pins do not become contaminated with sand or dirt. Make sure that the seals on the end of the stick and the seals on the end of the link do not become damaged.

Installation Procedure

1. Clean each pin and each pin bore. Lubricate each pin bore with molybdenum grease.

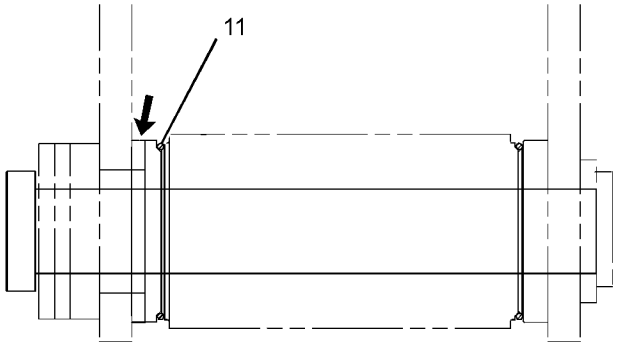


Illustration 312 g01303581

2. Position the O-ring seals (11) onto the flanges of the bucket.

3. Start the engine and lower the stick into the bucket until the pin bores are in alignment with each other. Stop the engine.

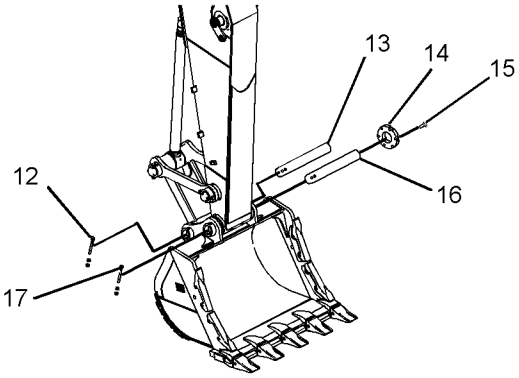


Illustration 313 g01303622

4. Install support pin (16). Put the retaining bolt hole that is in support pin (16) in alignment with the retaining bolt hole that is in the bucket.

5. Install the retaining bolt and nuts (17). Install adapter plate (14) without the shims, and without bolts (15) that hold adapter plate (14).

6. Refer to Operation and Maintenance Manual, “Bucket Linkage - Inspect/Adjust” in order to adjust the bucket clearance.

7. Slide O-ring seals (11) in position over the pin joints between the bucket and the stick.

8. Start the engine and position the bucket linkage into the bucket until the pin bores are in alignment with each other. Stop the engine.

9. Install support pin (13). Put the retaining bolt hole that is in the bucket pin in alignment with the retaining bolt hole that is in the bucket.

10. Install the retaining bolt and nuts (12).

11. Slide the O-ring seals (11) over the pin joints between the bucket and the link assembly.

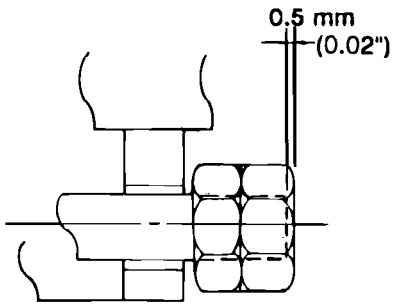


Illustration 314 g00510030

12. Tighten retaining nuts (12) and (17). Position the outside nut even with the end of the retaining bolt or 0.5 mm (0.02 inch) beyond the end of the retaining bolt. Tighten the inside nut against the outside nut.

13. Lubricate the bucket pins. Refer to Operation and Maintenance Manual, “Bucket Linkage - Lubricate” or Operation and Maintenance Manual, “Boom, Stick, and Bucket Linkage - Lubricate”.

i07062223

Work Tool Operation
(If Equipped)

SMCS Code: 6700; 7000

Hammer Operation (If Equipped)

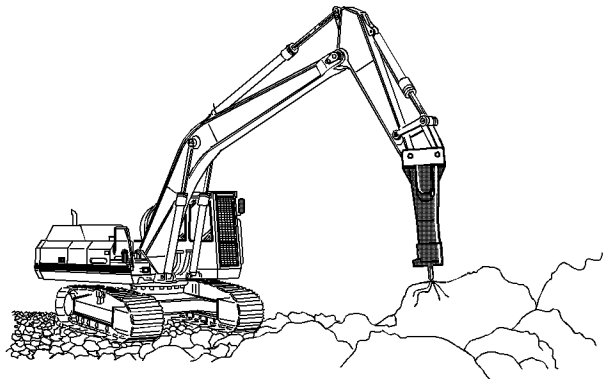


Illustration 315 g01876560

NOTICE
Use only a hydraulic hammer that is recommended by Caterpillar.

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

Consult your Cat dealer for information on recommended hydraulic hammers.

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

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

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

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

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

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

Stop the hydraulic hammer immediately if the jumper lines are pulsating violently. This indicates that the accumulator nitrogen charge is lost. Consult your Caterpillar dealer for the necessary repair.

NOTICE
Do not use the dropping force of the hydraulic hammer to break rocks or other hard objects. This could cause structural damage to the machine.

Do not use the sides or back of the hydraulic hammer to move rocks or other hard objects. Doing this could cause damage not only to the hammer but to stick or boom cylinder.

Do not operate the hydraulic hammer with any of the cylinders fully retracted or extended. Doing this could cause structural damage to the machine, resulting in reduced machine life.

Do not use the hydraulic hammer to lift an object.

Do not operate the hydraulic hammer while the stick is vertical to the ground. This could allow the stick cylinder to vibrate excessively.

Operate the attachment control levers carefully to keep the hydraulic hammer tool from hitting the boom.

Do not operate the hydraulic hammer under water unless the hydraulic hammer is properly equipped. Operating the hydraulic hammer under water could damage the machine hydraulic system. Consult your Caterpillar dealer for information on underwater operation.

Do not operate the hydraulic hammer with the upper structure sideways to the undercarriage. Before you start hydraulic hammer operation, place the upper structure in the recommended positions that are shown in illustration 316 . Any other operating positions could make the machine unstable. Any other operating positions could place excessive loads on the undercarriage.

Refer to the following for any additional questions about the operation and care of your Caterpillar hydraulic hammer: Operation and Maintenance Manual, SEBU7346, “Hydraulic Hammers”, Operation and Maintenance Manual, HEPU9000, “Hydraulic Hammers” and Decal, SMEU7397, “Hammer Operation/Maintenance”.

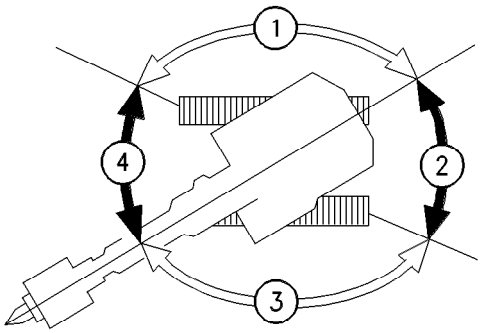


Illustration 316 g00101503

(1) Not Recommended working position
(2) Recommended working position
(3) Not Recommended working position
(4) Recommended working position

Shear Operation (If Equipped)

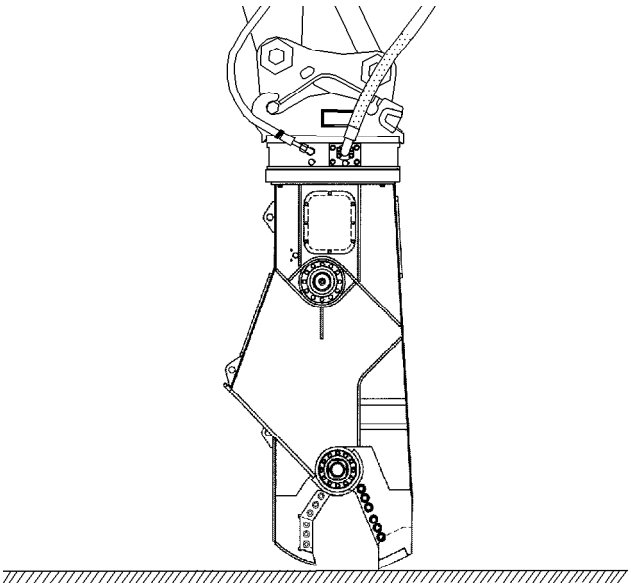


Illustration 317 g00763823

⚠ WARNING

Do not operate or work on this work tool unless you have read and understand the instructions and warnings in the Operation And Maintenance Manual for both the work tool and the host machine.

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

Contact your Caterpillar dealer for replacement manuals. Proper care is your responsibility.

NOTICE
Selection of a hydraulic shear must be done with extra care.

Use of a hydraulic shear not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic shear information.

Be sure that no one is near the work tool to prevent injury. Keep the work tool under control always to prevent injury. When a demolition tool is used, all personnel should maintain a minimum distance of 10 m (33 ft).

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.

⚠ WARNING

Serious injury or death could occur from the demolition of pipes, vessels, tanks or other containers that may contain gas, flammable materials or hazardous chemicals.

Do not perform any demolition work on these items until all of their contents have been removed.

Follow all regulations for the removal and disposal of these materials.

NOTICE
Using the demolition tool to level the work site or push over standing structures may damage the machine or the demolition tool. Use appropriate equipment to do site preparation or maintenance operations.

NOTICE
To avoid structural damage to the machine, do not break road surfaces by placing the cutting edge of the hydraulic shear on the ground and moving the machine.

Crusher Operation (If Equipped)

⚠ WARNING

Improper operation and maintenance of the crusher could cause personal injury or death. Observe the following procedures for safe operation of the crusher.

Consult your Cat dealer for more information on the operation and maintenance of the crusher.

Do not operate the host machine with the work tool unless you have read and understood the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in machine or work tool damage, and/or serious injury or death. Contact your Cat dealer for a replacement manual, if needed.

When the crusher is installed on the host machine, always make sure that the protective guarding is in place.

Using the crusher in an incorrect manner can damage the machine and/or cause personal injury or death.

Always ensure that the work area is clear of ground personnel, due to the potential crush hazards with falling debris and machine movement.

Resting or placing your foot on the work tool pedal could result in unexpected movement of the machine / work tool which could result in personal injury or death. Always lock the crusher when not in use.

NOTICE
Selection of a hydraulic crusher must be done with extra care.

Use of a hydraulic crusher not recommended by Caterpillar could result in structural damage to the host machine.

Consult your Cat dealer for hydraulic crusher information.

Close all windows. Make sure that all required guards are in place. Wear all required protective equipment. Follow the instructions in the Operation and Maintenance Manual for the work tool.

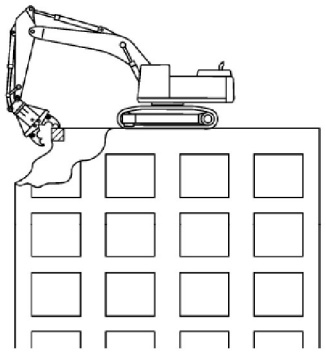


Illustration 318 g02688698

Demolition work on the roof of a building could lead to serious personal injury if the building were to collapse and the excavator turned over or fell off the roof. The demolition work must be started ONLY AFTER surveying the building for its structural integrity.

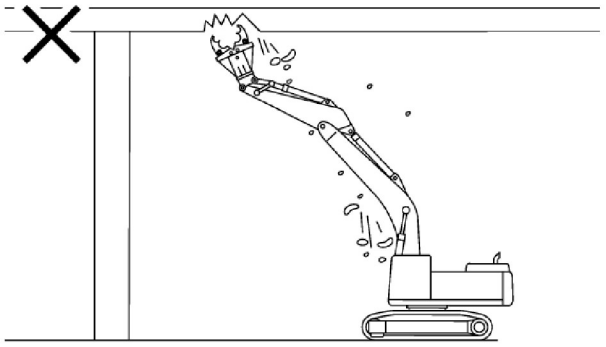


Illustration 319 g02688699

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

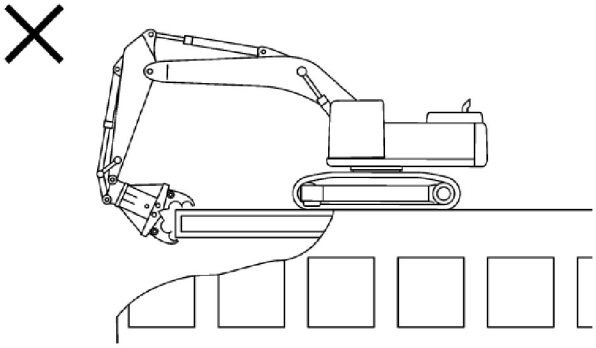


Illustration 320 g02688700

Do not perform demolition work at the base of the machine, because the ground could be unstable and cause the machine to fall.

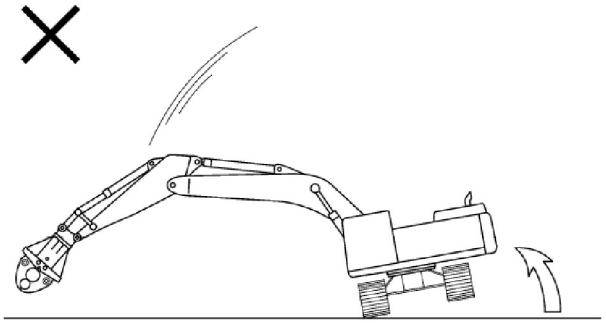


Illustration 321 g02688702

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

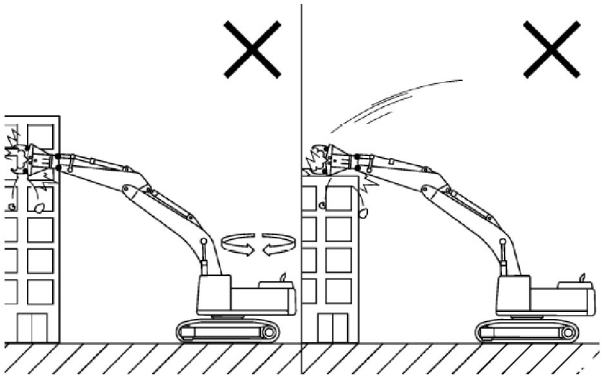


Illustration 322 g02688704

Crushing work using impact, swing, or dropping forces of the excavator could cause damages to the machine and also could lead to personal injury. As such, NEVER perform such an operation.

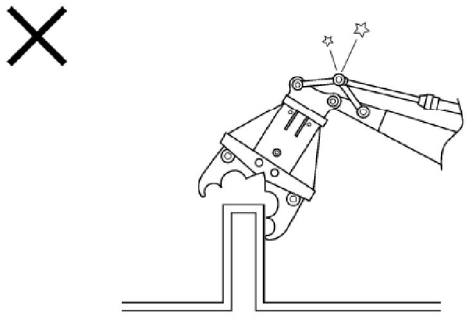


Illustration 323 g02688705

Crushing work with hydraulic cylinder at stroke end position could damage the excavator, resulting in shortening of lifespan. Also, as it could lead to unexpected personal injury due to breakage of the machine, do not perform any work at stroke end.

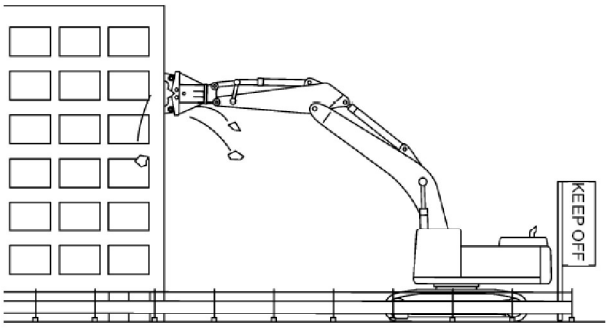


Illustration 324 g02688706

When performing work at elevated positions, always use care for the surroundings and for falling objects to avoid personal injury. Use guide personnel and signs as required.

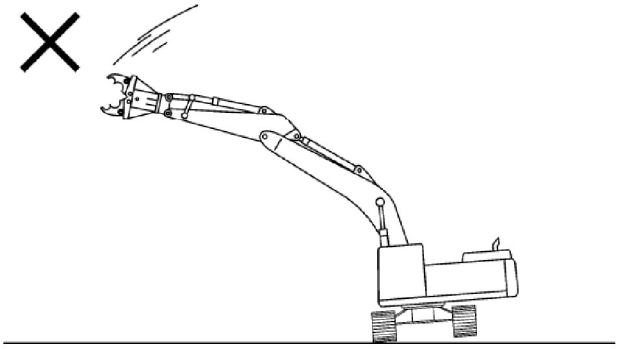


Illustration 325 g02688709

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

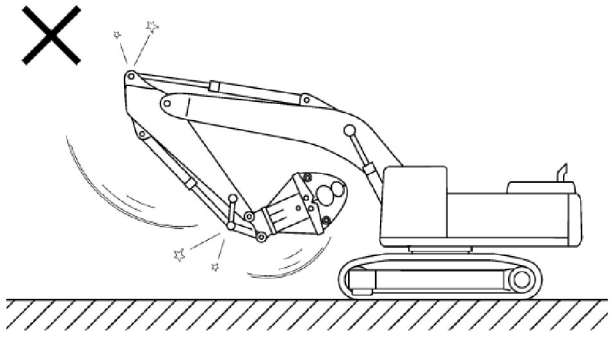


Illustration 326 g02688786

Crushers could interfere with the boom and the cab depending on the type and method of usage. Know the working range of the crusher being used.

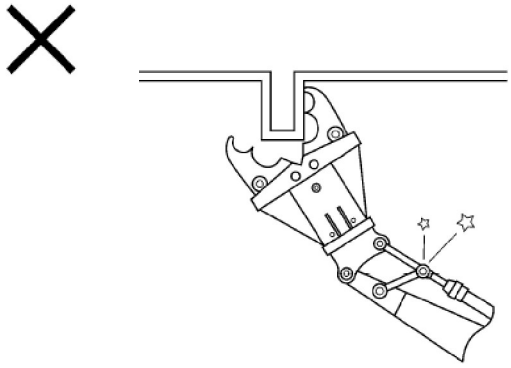


Illustration 327 g02688790

If the tooth of the crusher engages an object at a slant, excessive forces could be applied to the front regions. As such move the crusher to the front.

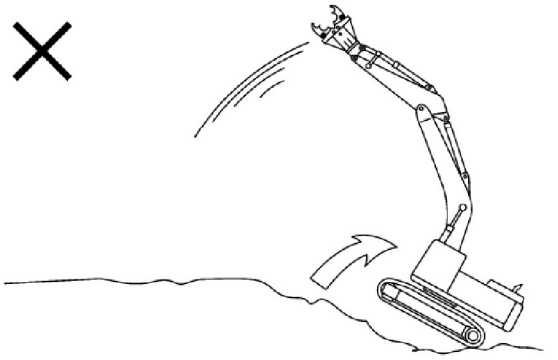


Illustration 328 g02688792

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

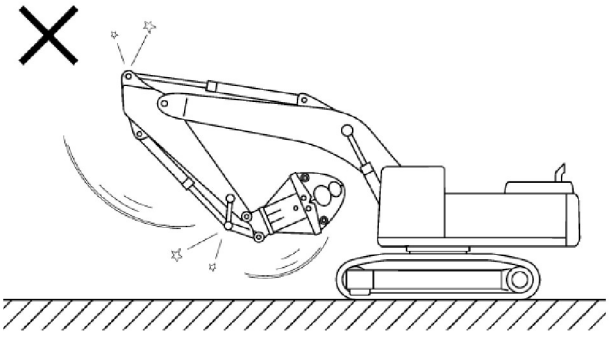


Illustration 329 g02688786

Sudden extension of the bucket cylinder, or sudden extension of the stick cylinder could cause damages at the stroke end position, resulting in personal injury. Operations that cause sudden extension of the cylinders is PROHIBITED!

Parking

i04176310

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 in order to reduce engine speed.

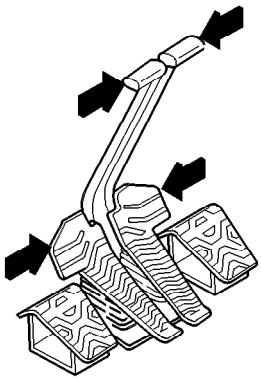


Illustration 330 g00560313

2. Release the travel levers/pedals in order to stop the machine.

3. Lower the work tool to the ground. Apply a slight downward pressure.

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

i01871055

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.

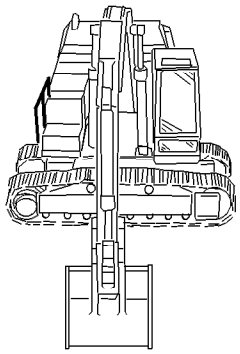


Illustration 331 g00101644

1. Position the boom over one side of the machine.

2. Use boom down pressure in order to lift the track on one side off the ground. Operate the track in the forward direction. Then operate the track in reverse. Continue this procedure until the maximum amount of material is thrown off the track.

3. Lower the track onto the wood planks.

4. Repeat the procedure for the other track.

5. Clean the area around the carrier rollers and around the track rollers.

6. Lower the work tool onto a wood plank in order to prevent the work tool from touching the ground.

i06049800

Stopping the Engine

SMCS Code: 1000; 7000

S/N: BZ21–Up

S/N: KEA1–Up

S/N: WNA1–Up

S/N: HLB1–Up

S/N: NDC1–Up

S/N: HPD1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: KBP1–Up

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

Refer to the following stopping procedure, to allow the engine to cool, and to prevent excessive temperatures in the turbocharger center housing and DEF injector.

NOTICE
Never turn the battery disconnect switch to the OFF position while the engine is running. Serious damage to the electrical system may result.

Positions of the engine key switch are indicated by a film that surrounds the engine key switch.

Your machine may be equipped with a Type 1 film or your machine may be equipped with a Type 2 film. Both the Type 1 film and the Type 2 film are shown below.

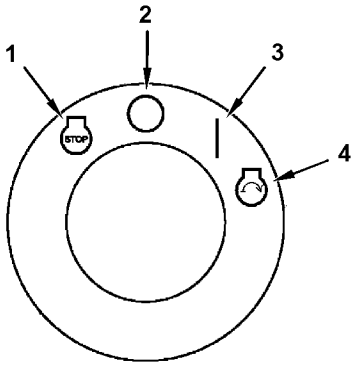


Illustration 332 g03740759

Type 1 engine key switch positions

(1) STOP
(2) OFF
(3) ON
(4) START

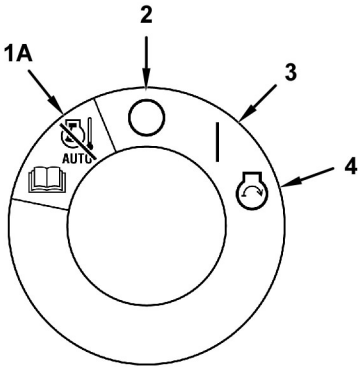


Illustration 333 g03740766

Type 2 engine key switch positions

(1A) DELAYED ENGINE SHUTDOWN OVERRIDE
(2) OFF
(3) ON
(4) START

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.

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.

3. Turn the engine key switch to OFF position (2) and remove the key.

Note: The engine may delay before completely shutting down. Delayed engine shutdowns aid in cooling the engine and after-treatment components.

Delayed Engine Shutdown (If Enabled)

The Delayed Engine Shutdown allows the engine to run for a time after the engine key switch is turned to the OFF position to cool the engine and system components. The key may be removed from the engine key switch.

Note: The DEF purge process will run for 2 minutes once the engine is shut down and must complete. Do not turn off battery disconnect switch during the purge process. Do not turn off the battery power disconnect switch until the “Wait to Disconnect” lamp has turned off. If the purge process does not complete, a diagnostic code will become active.

Note: There may be regulations that define the requirements for the operator and/or support personnel to be present when the engine is running.

⚠ 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: Leaving the engine unattended while running may result in property damage in the event of a malfunction.

Turn the engine start switch to the OFF position.

Delayed Engine Shutdown – The delayed engine shutdown indicator will illuminate or the following text will be displayed, ENGINE COOLDOWN ACTIVE.

Delayed engine shutdown will run whenever the exhaust temperature is above a threshold at engine shutdown. Delayed engine shutdown will continue to run until the engine and system components are cooled.

Note: Only if components are extremely hot, Delayed Engine Shutdown will be initiated.

Note: At any time during a delayed engine shutdown, the engine key switch may be turned to ON position (3). The engine may be placed back into service.

For more information on the engine key switch, refer to Operation and Maintenance Manual, “Operator Controls”.

Immediate Engine Shutdown (Type 1)

When the operator determines that an immediate engine shutdown is necessary, and needs to disable the delayed engine shutdown feature, take the following action. Turn the engine key switch to STOP position (1) and hold the engine key switch in that position for 1 second.

Note: A warning message and/or an audible alarm will be initiated if Delayed Engine Shutdown Override is used. A fault code will be logged for improper engine shutdown if exhaust temperature is above a limit.

Note: If Delayed Engine Shutdown Override is used repeatedly, then there is risk of premature engine and aftertreatment component damage. Use for Emergency Situations only.

For more information on the engine key switch, refer to Operation and Maintenance Manual, “Operator Controls”.

Immediate Engine Shutdown (Type 2)

When the operator determines that an immediate engine shutdown is necessary, and needs to disable the delayed engine shutdown feature, take the following action. Turn the engine key switch to DELAYED ENGINE SHUTDOWN OVERRIDE position (1A) and hold the engine key switch in that position for 1 second.

Note: A warning message and/or an audible alarm will be initiated if Delayed Engine Shutdown Override is used. A fault code will be logged for improper engine shutdown if exhaust temperature is above a limit.

Note: If Delayed Engine Shutdown Override is used repeatedly, then there is risk of premature engine and aftertreatment component damage. Use for Emergency Situations only.

For more information on the engine key switch, refer to Operation and Maintenance Manual, “Operator Controls”.

Engine Stop Control

Turn the engine start switch to the OFF position. If the engine does not stop after a delayed engine shutdown cycle, perform the following procedure.

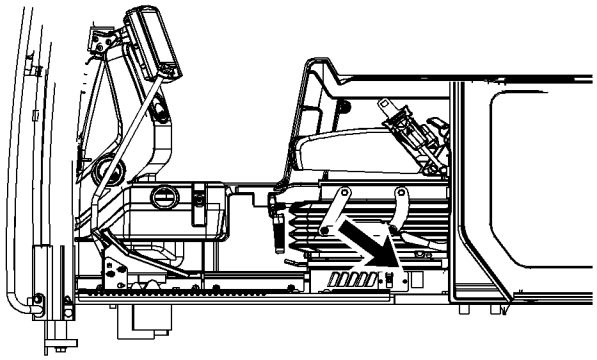


Illustration 334 g02038995

1. The switch is located below the left side of the operator seat.

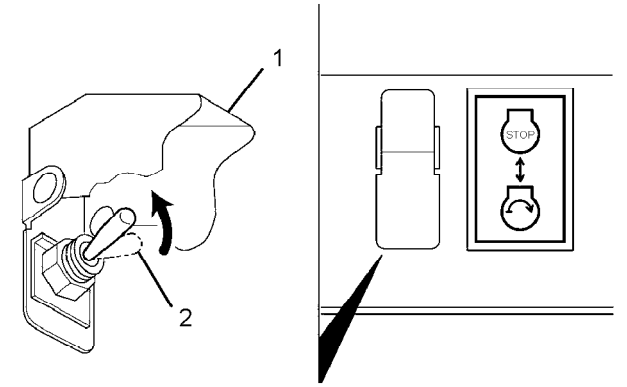


Illustration 335 g01048511

2. Lift cover (1).

3. Push switch (2) upward. This should stop the engine.

Note: Use the engine start switch to stop the engine first. Use the engine stop control as an alternate method to stop the engine.

4. Return the switch to the original position. The engine will be enabled to start.

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

5. Use the method that follows if the previous steps do not stop the engine.

Stop the Engine if an Electrical Malfunction Occurs

Turn the engine start switch to the OFF position. If the engine does not stop after a delayed engine shutdown cycle, perform the following procedure.

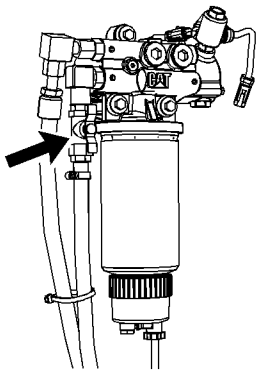


Illustration 336 g02368038

The fuel shutoff valve is located on the water separator.

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

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

i06299353

Leaving the Machine

SMCS Code: 7000

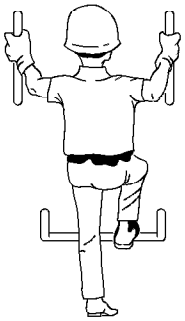


Illustration 337 g00037860

1. Use the steps and the hand holds when you dismount. When you dismount, face the machine and use both hands.

2. Inspect the engine compartment for debris. Clean out any debris in order to avoid a fire hazard.

3. Remove all flammable debris from the front bottom guard through the access doors in order to reduce a fire hazard. Discard the debris properly.

4. Always turn the battery disconnect switch to the OFF position before leaving the machine.

5. If the machine will not be operated for a month or more, remove the battery disconnect switch key.

6. Lock all compartments and all vandalism covers (if equipped).

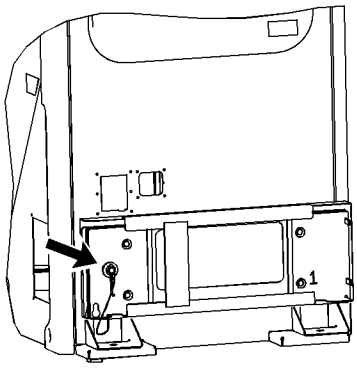


Illustration 338 g02038843

7. Remove the bolt that holds the vandalism guards in place. Remove the vandalism guards from the storage area.

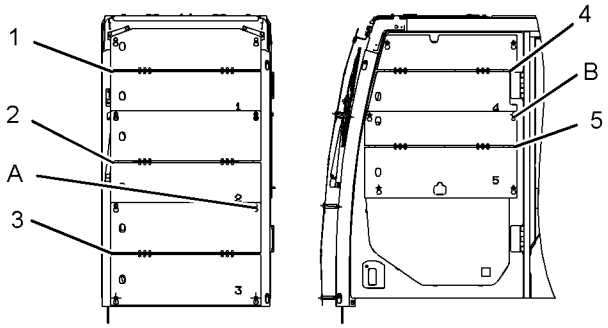


Illustration 339 g02148267

8. Install the vandalism guards on the front window and on the cab door. An identification number is stamped on each of the vandalism guards. Install the vandalism guards in the correct sequence. Use bolts (A) only for vandalism guard (3) and for vandalism guard (5).

Note: When you are storing the vandalism guards, make sure that you place the guards in the storage area in sequential order. The vandalism guards will only fit in the storage area in this manner.

Transportation Information

i08036521

Shipping the Machine

SMCS Code: 7000; 7500

WARNING

Automatic Engine Speed Control (AEC) will increase engine speed automatically when you operate the control levers and/or travel pedals with AEC switch on.

When loading and unloading the machine from the truck or working in close quarters always turn AEC switch off to prevent any possibility of sudden movement of machine, which could result in serious injury or death.

Set the travel speed control switch to LOW before loading the machine. Never operate this switch when loading the machine on a trailer.

Investigate the travel route for overpass clearances. Make sure that there will be adequate clearance for the machine.

Remove ice, snow, or other slippery material from the loading dock and from the truck bed before you load the machine onto the transport machine. Removing ice, snow, or other slippery material will help to prevent the machine from slipping in transit.

Note: Obey all laws that govern the characteristics of a load (height, weight, width, and length). Observe all regulations that govern wide loads. Certain regions may require the removal of door hooks and cab bumpers, if equipped. Consult all local and regional regulations

Choose the flattest ground when you load the machine or when you unload the machine.

1. Before you load the machine, chock the trailer wheels or the rail car wheels.

2. When you use loading ramps, make sure that the loading ramps have adequate length, adequate width, adequate strength, and an adequate slope.

3. Maintain the slope of the loading ramps within 15 degrees of the ground.

4. Position the machine so that the machine can drive straight up the loading ramps. The final drives should be toward the rear of the machine. Do not operate the control levers while the machine is on the loading ramps.

5. When you drive over the loading ramp joint areas, maintain the balance point of the machine.

6. Lower the work tool to the bed or to the floor of the transport machine.

7. To prevent rolling of the machine or sudden movement of the machine, perform the following items:

- Chock both tracks.
- Install sufficient tie-downs at several locations.
- Fasten wire cables.

8. If equipped, remove door hooks, cab bumpers, and fuel tank step as necessary. Refer to local regulations.

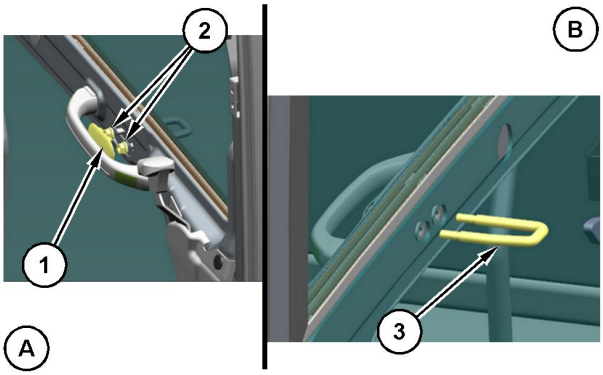


Illustration 340 g06516462

(1) Cover
(2) Nuts
(3) Door Hook
(A) Inside
(B) Outside

a. Remove cover (1) and nuts (2) to remove door hook (3).

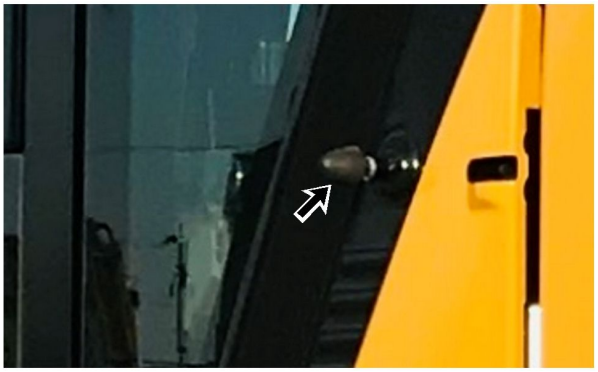


Illustration 341 g06516469

b. Remove any bumpers on your cab.

NOTICE
Do not allow the chrome surface of the bucket cylinder rod to touch any part of the trailer. Damage to the rod can occur from impact with the trailer during transport.

Note: Refer to Operation and Maintenance Manual, “Specifications”.

Shipping a Machine that is not Completely Assembled

If the machine must be shipped when the boom, stick, or counterweight is not assembled on the machine, follow the instructions in Operation and Maintenance Manual, “Operation”.

⚠ WARNING

The ROPS structural certification depends on the support of the boom, stick, and counterweight in the event of a machine tip over or a machine rollover incident.

When the machine needs to be moved without the boom, stick, or counterweight being installed, avoid any machine operations which could affect machine stability as a machine tip over or a machine rollover incident could result in serious injury or death.

The machine should be operated slowly on flat, stable ground or pavement by qualified operators.

i06925326

Securing the Machine

SMCS Code: 7000

Comply with any laws that govern the characteristics of a load (length, width, height, and weight).

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

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

3. Turn the battery disconnect switch to OFF and remove the disconnect switch key.

4. Remove the ether starting aid cylinder. See Operation and Maintenance Manual, “Ether Starting Aid Cylinder - Replace” for the removal procedure.

5. Lock the door and the access covers. Attach any vandalism protection.

6. The Product Link antenna (if equipped) may be repositioned to meet the regulations regarding height of some locations. The Product Link antenna is on top of the cab. Perform the following procedure to move the Product Link antenna to the transport position.

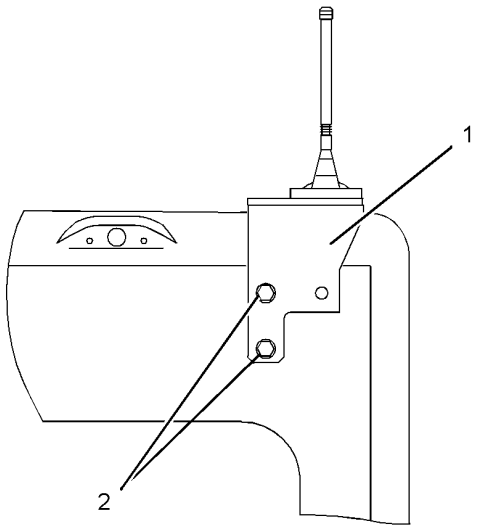


Illustration 342 g02263573
Bracket in normal operating position.

a. Remove bolts (2) from bracket (1).

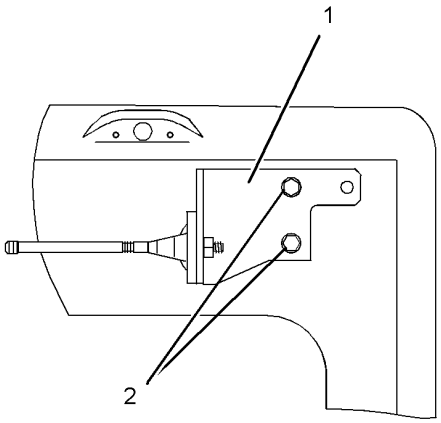


Illustration 343 g02270173
Bracket in position for transport

b. Reinstall bracket (1) with bolts (2) located in the top two holes of the bracket. Refer to Illustration 343 .

Note: The bracket for the Product Link antenna must be placed back into the normal operating position before the machine can be placed back into service.

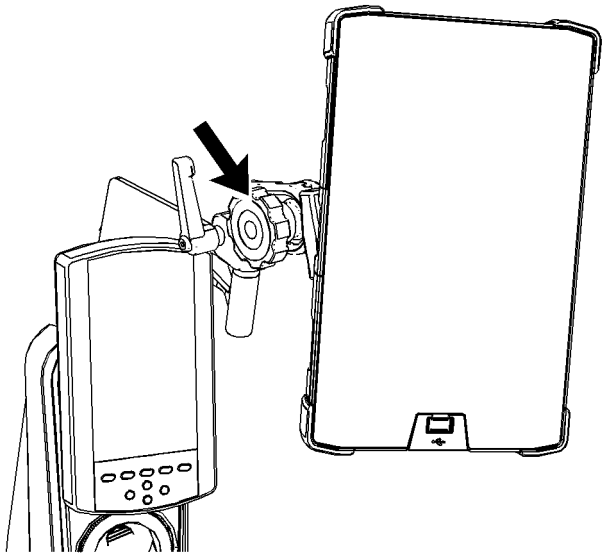


Illustration 344 g06169932

Note: Caterpillar strongly recommends removing the Cat Grade Control monitor (if equipped) before transporting the machine to protect the monitor from damage or theft.

7. Disconnect the wiring harness from the Cat Grade Control monitor. Loosen the knob, and remove the monitor from its pedestal. Remove the monitor from the cab and store in the monitor carrying case.



Illustration 345 g06169987

Note: Caterpillar strongly recommends removing the GPS receivers (if equipped) before transporting the machine to protect the receivers from damage or theft.

8. Disconnect the wiring harness from the GPS receiver. Loosen the clamp, hold the grip, and lift the receiver off the base. Store in the receiver carrying case. Remove the remaining receiver.

9. The side view camera is on top of the fuel tank and it must be repositioned for transport. Perform the following procedure to move the camera to the transport position.

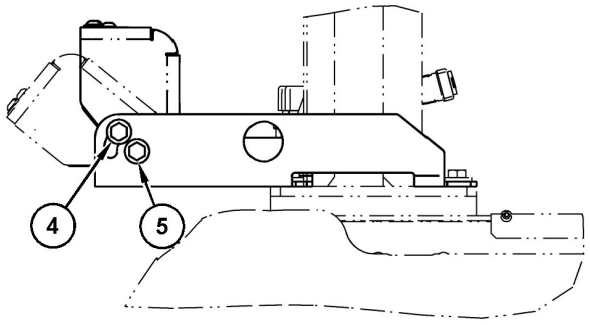


Illustration 346 g06051521

Side view camera in position for transport

a. Loosen bolts (4) and (5) and slide the camera upward to the transport position.

10. Tighten bolts (4) and (5).

Note: The side view camera must be placed back into the normal operating position before the machine can be placed back into service.

11. Cover the exhaust opening.

NOTICE
Do not allow the turbocharger to rotate while the engine is not operating. Damage to the turbocharger can result.

Note: Before you remove the excavator from the transport machine, remove the protective covering from the exhaust opening.

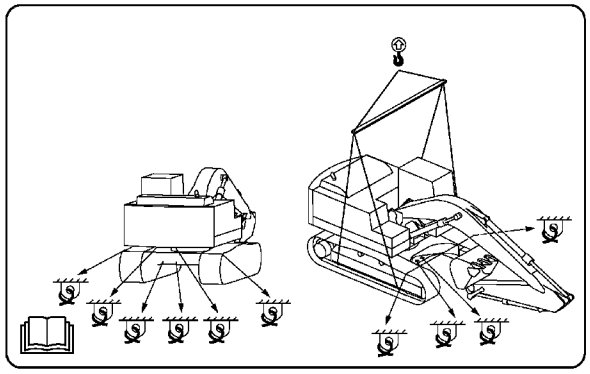


Illustration 347 g02444887

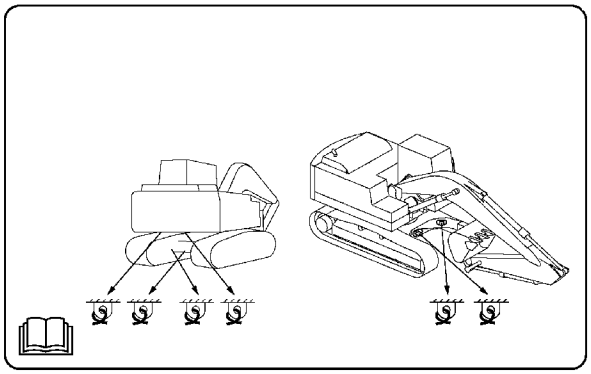


Illustration 348 g02104975

12. Chock the tracks and secure the machine with tie-downs. Make sure that you use the proper rated wire cable.

Use the front towing eyes on the lower frame, the rear towing eyes on the lower frame, and the rear towing eye that is on the upper frame.

Securely fasten all loose parts and all removed parts to the trailer or to the rail car.

When the engine is stopped, the swing parking brake is automatically applied. This prevents the upper structure from swinging.

NOTICE
In freezing weather, protect the cooling system with antifreeze, to the lowest outside expected temperature on the travel route. Or, drain the cooling system completely.

i05097430

Mirror Installation

SMCS Code: 7319

Make sure that the right side mirrors are in the correct position before you operate the machine or transport the machine.

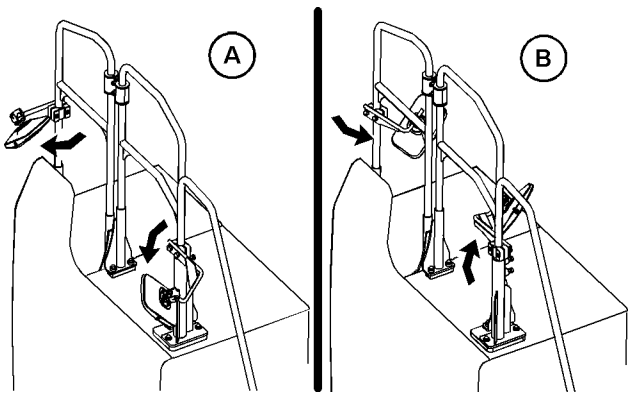


Illustration 349 g02841858

(A) Operating position
(B) Transport position

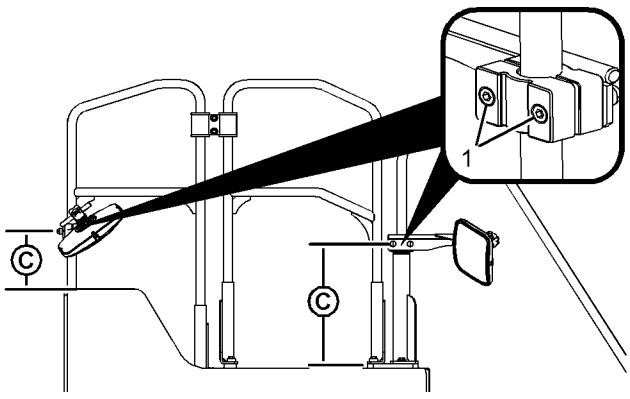


Illustration 350 g02842316

(1) Bolts
(C) Mirror height

Transport Position

In order to transport the machine, move the right side mirrors to transport position (B).

1. Loosen bolts (1) on the mirror support bracket and move the mirror to the transport position
2. Tighten bolts (1) on the mirror support bracket to a torque of 60 ± 12 N·m (44 ± 9 lb ft).

Operating Position

In order to operate the machine, move the right side mirrors to operating position (A).

1. Loosen bolts (1) on the mirror support bracket and return the mirrors to the operating position.
2. Adjust the mirrors to the correct mirror height (C) and tighten bolts (1) on the mirror support bracket to a torque of 60 ± 12 N·m (44 ± 9 lb ft).

Note: The dimensions for correct mirror height (C) are listed in the table below:

Table 66

Mirror Height (C)		
Model	**Front Mirror Height**	**Rear Mirror Height**
336F	454 ± 3 mm (17.9 ± 0.1 inch)	589 ± 3 mm (23.2 ± 0.1 inch)
349F	1564 ± 3 mm (61.6 ± 0.1 inch)	NA

i06241206

Adjustable Gauge Undercarriage Frame

SMCS Code: 4150-VAR

S/N: KEA1–Up

S/N: WNA1–Up

S/N: NDC1–Up

S/N: YEG1–Up

S/N: A9J1–Up

S/N: KBP1–Up

⚠ WARNING

Before extending or retracting the track frames, be sure to keep all other people away from the machine.

Always use two or more people to do this work. Perform machine movements only after getting signals from a signal man.

The automatic engine speed control (AEC) switch must be in the OFF position and the travel speed switch must be in the LOW position.

Never make a sudden movement of the front equipment. When operating the front equipment, slowly activate the controls with extra care.

⚠ WARNING

Do not operate the machine if both track frames are retracted. Do not operate the machine if one track frame is retracted. The machine is unstable if either track frame is retracted. If either track frame is retracted, the machine could rollover, resulting in serious injury or death. If the machine is unstable, damage could occur to bolts connecting the car body and the track frames.

Fully extend the track frames when the machine is operated. Retract the track frames when the machine is unloaded. Retract the track frames when the machine is loaded.

Do not operate the machine if both track frames are retracted. Do not operate the machine if one track frame is retracted. The machine is unstable if either track frame is retracted.

NOTICE
Before starting adjustment of the track frames, clean the contacting areas of the car body and track frames, and their mounting bolts. Prior to installing the bolts, apply 9M-3710 Anti-Seize Compound to the underside of the head and to the threads of the bolts.

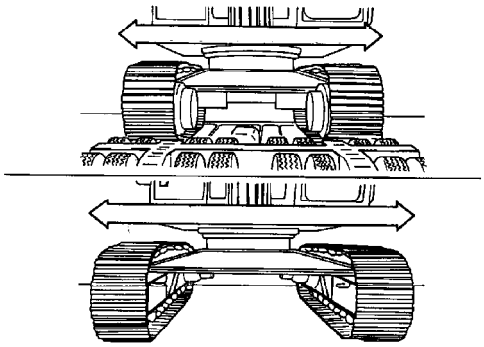


Illustration 351 g00285692

This machine has adjustable track frames that are held in place with bolts. Completely widen the track frames when the machine is being operated.

Retracting

Park the machine on a hard, level surface.

Retract the track frames one at a time.

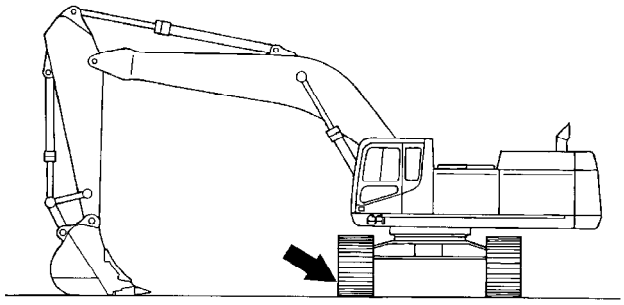


Illustration 352 g00581851

1. Position the machine with the front at a right angle to the track frame that is being retracted, as shown.

2. Stop the engine.

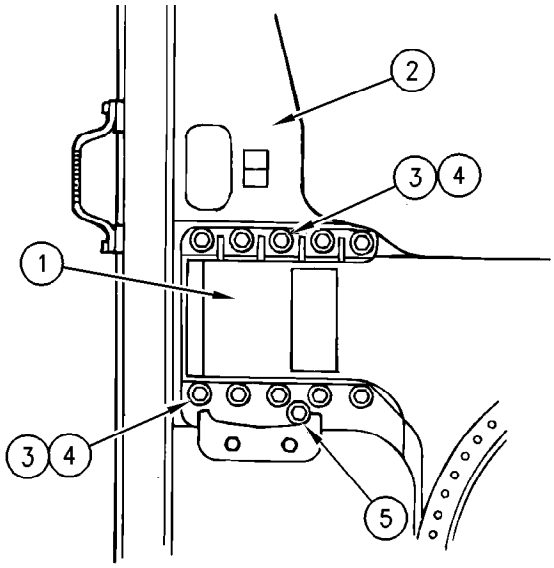


Illustration 353 g00697382

(1) Carbody
(2) Track frame
(3) Bolts
(4) Spacers
(5) Bolts

3. Remove 19 bolts (3) and 19 spacers (4). The bolts hold track frame (2) to carbody (1).

Note: When you move track frame (2) in order to retract the overall width, do not loosen two bolts (5) that are for the guide.

Note: Ten bolts (3) and spacers (4) are installed on the side with the idler. Nine bolts (3) and spacers (4) are installed on the side with the final drive .

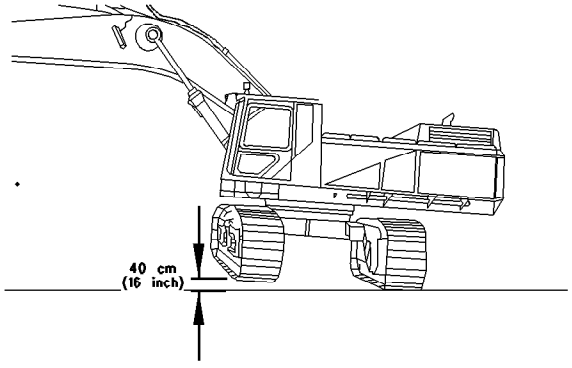


Illustration 354 g00697383

4. Start the engine. Apply downward pressure with the boom in order to raise the track approximately 40 cm (16 inch) above ground level.

5. Slowly run the raised track at a low idle. This will cause the raised track to slide toward the center of the machine. The full sliding distance should be 250 mm (10 inch).

6. After the raised track frame has been correctly retracted, lower the track frame to the ground.

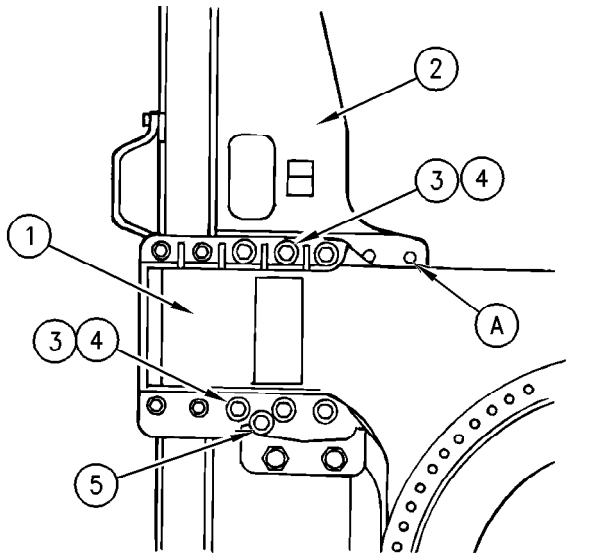


Illustration 355 g00697384

(1) Carbody
(2) Track frame
(3) Bolts
(4) Spacers
(5) Bolts

7. Align the bolt holes of carbody (1) and track frame (2). Install 11 bolts (3) and 11 spacers (4). If necessary, slowly operate the machine back and forth until the bolt holes are aligned. Tighten the bolts to a torque of 2800 ± 350 N·m (2065 ± 258 lb ft).

Note: To protect the bolt holes that are in the track frame from debris and mud, insert corks into 8 bolt holes (A).

8. Repeat Steps 1 through 7 for the other track frame.

Note: Store the 16 bolts (3) and 16 spacers (4) that were removed in this procedure in the tool box.

Extending

NOTICE
Damage to the car body guide on the track roller frame can result if the track is raised more than 60 mm (2.4 inch) off the ground, with the car body bolts removed.

Park the machine on a hard, level surface.

Extend the track frames one at a time.

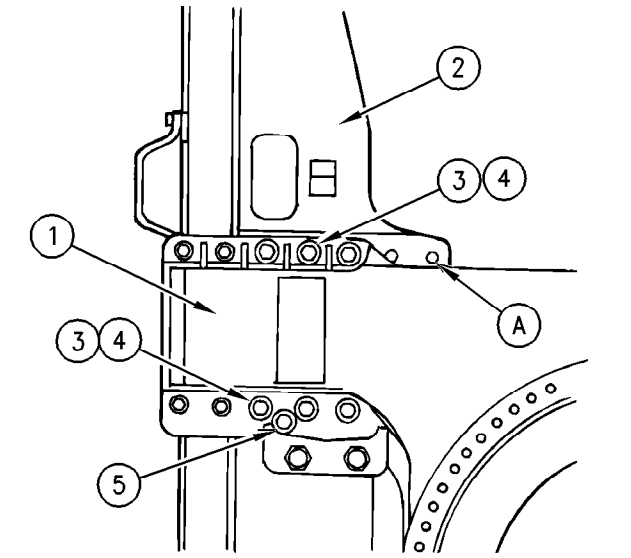


Illustration 356 g00697384

(1) Carbody
(2) Track frame
(3) Bolts
(4) Spacers
(5) Bolts

1. Remove the 8 corks that are in bolt holes (A).

2. Remove 11 bolts (3) and 11 spacers (4). The bolts hold track frame (2) to carbody (1).

Note: When you move track frame (2) in order to extend the overall width, do not loosen two bolts (5) that are for the guide.

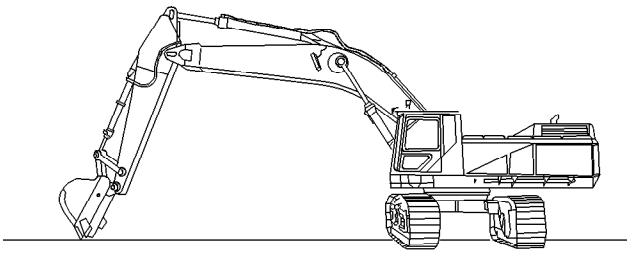


Illustration 357 g00286687

3. Position the boom over the opposite track frame with the stick at an approximate 80 degree angle to the ground. Place the bucket teeth into the ground, as shown. This machine position provides the best stability for extending the track frames.

4. Apply a downward pressure with the boom in order to slightly raise the track.

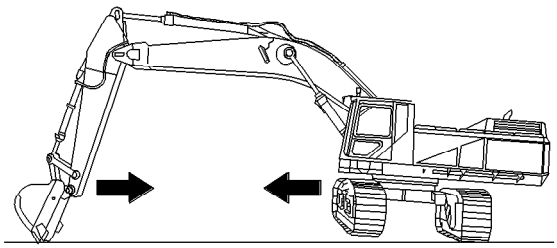


Illustration 358 g00286117

5. Use the STICK IN position to extend the track frame by moving the carbody away from the track.

6. After the track frame has been correctly extended, lower the raised track frame to the ground.

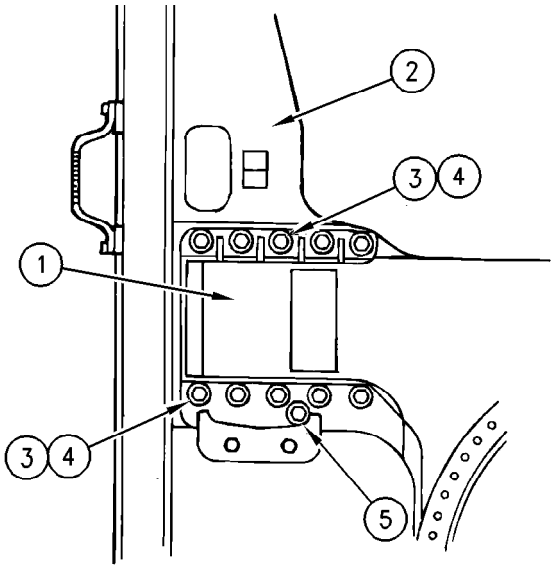


Illustration 359 g00697382

(1) Carbody
(2) Track frame
(3) Bolts
(4) Spacers
(5) Bolts

7. Align the bolt holes of carbody (1) and track frame (2). Install 19 bolts (3) and 19 spacers (4). If necessary, slowly operate the machine back and forth until the bolt holes are aligned. Tighten the bolts to a torque of 2800 ± 350 N·m (2065 ± 258 lb ft).

8. Repeat Steps 1 through 7 for the other track frame.

i04236789

Camera Harness - Disconnect and Connect

SMCS Code: 1408; 7348

⚠ WARNING

Working on the wiring harness for the rear camera during the removal and installation of the counterweight could result in a crushing hazard. The counterweight could fall, and the falling of the counterweight could cause personal injury or death. Disconnect the wiring harness to the rear camera before the you remove the counterweight. Reconnect the wiring harness to the rear camera after you install the counterweight.

⚠ 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.

1. Park the machine on level ground.

2. Lower the work tool to the ground.

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

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

5. Turn the battery disconnect switch to OFF and remove the disconnect switch key.

Disconnection of the Harness for the Rear View Camera

Disconnect the harness for the rear view camera before removing the counterweight. Access to the harness for the rear view camera is underneath the counterweight.

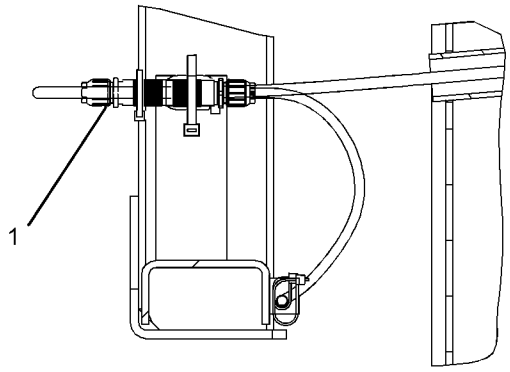


Illustration 360 g02410764

Located near the top of the machine if not equipped with the counterweight removal system.

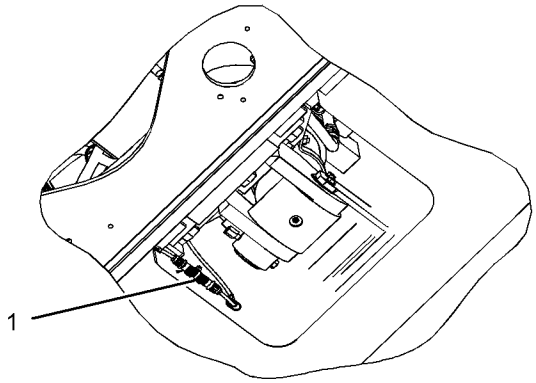


Illustration 361 g02104674

Located underneath the machine if equipped with the counterweight removal system.

1. Turn plug (1) and pull apart.

Connection of the Harness for the Rear View Camera

After the counterweight has been installed on the machine, reconnect the harness for the rear view camera.

i08062411

Counterweight Removal and Installation

SMCS Code: 7056

Counterweight Removal and Installation for Standard Machines

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.

WARNING

Personal injury or death can occur from a counterweight falling during removal or installation.

Do not allow personnel under or around the counterweight during removal or installation.

Make sure that the lifting device is in good condition and is capable of handling the weight of the counterweight.

WARNING

Make certain personnel are clear of cable when there is a load on it. Cable can break and cause personal injury.

WARNING

Personal injury or death can occur from a counterweight falling during removal or installation. Before you begin the Removal Procedure, make sure that the support blocks are installed and tightened properly.

⚠ WARNING

Crush Hazard. Read and Understand the Operation and Maintenance Manual before performing maintenance on equipment. Could cause serious injury or death.

⚠ WARNING

Unexpected machine damage and personal injury or death can occur from any machine operation without counterweight bolt tightened properly.

Make sure to tighten the counterweight mounting bolts when the counterweight is installed.

⚠ WARNING

Make certain personnel are clear of cable when there is a load on it. Cable can break and cause personal injury.

Machines Equipped with Standard Counterweight

Counterweight Removal

Reference: Refer to Operation and Maintenance Manual, “Specifications” for specific weight information.

Note: Before you remove the counterweight, disconnect the wiring for the rear view camera. Refer to Operation and Maintenance Manual, “Camera Harness - Disconnect and Connect” for more information.

1. Position the machine on a surface that is hard and level. Lower the work tool to the ground.

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



Illustration 362 g02809156

3. Fasten a proper rated cable with shackles to the links. Use an appropriate lifting device to tension the cable.

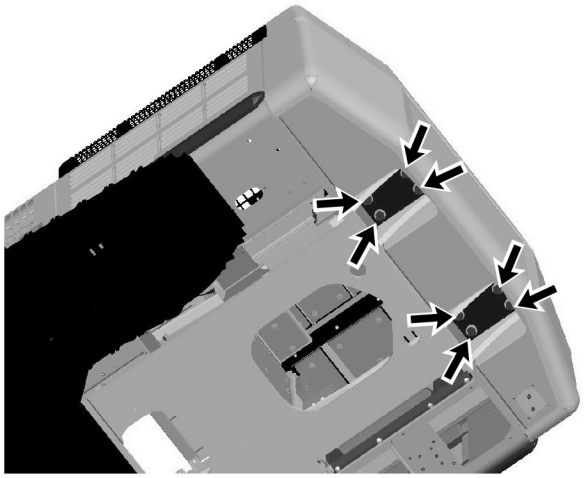


Illustration 363 g02809157

4. The counterweight mounting bolts are on the bottom of the counterweight. Remove the eight counterweight mounting bolts and eight washers.

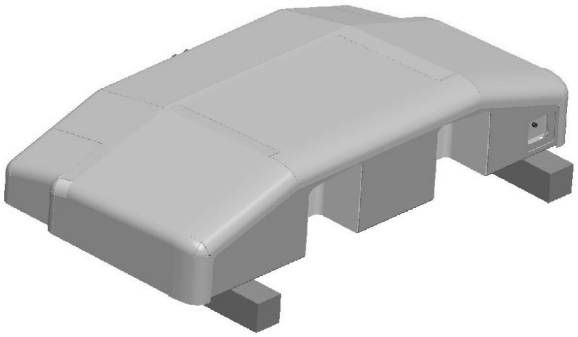


Illustration 364 g02809158

5. Separate the counterweight from the machine. Lower the counterweight onto suitable supports.

Counterweight Installation

Perform the installation procedure in reverse order.

Note: Temporarily tighten the eight counterweight mounting bolts. Decrease the tension on the lifting cable. Make sure that the counterweight is correctly positioned on the retaining plates. Tighten the counterweight mounting bolts vertical to a torque of 2800 ± 350 N·m (2065 ± 258 lb ft).

Note: After the counterweight has been installed, reconnect the wiring for the rear view camera. Refer to Operation and Maintenance Manual, “Camera Harness - Disconnect and Connect” for more information.

Machines Equipped with Counterweight Removal System

⚠ WARNING

IMPROPER OPERATION OF THE COUNTERWEIGHT REMOVAL SYSTEM CAN RESULT IN SERIOUS INJURY OR DEATH. DO NOT OPERATE THIS SYSTEM UNLESS YOU HAVE READ AND UNDERSTAND THE INSTRUCTIONS AND WARNINGS IN THE OPERATION AND MAINTENANCE MANUAL.

⚠ WARNING

Before you remove the counterweight, check for signs of hydraulic oil leaking from the Counterweight Removal System. An oil leak may be a sign of a potential system failure and needs to be corrected before removing the counterweight mounting bolts. A hydraulic leak, along with other factors, can result in personal injury or death.

⚠ WARNING

When the removal cylinder is used to lower the counterweight, the counterweight can wedge against the machine frame which stops the downward movement of the counterweight. Since the removal cylinder continues to retract and the counterweight stopped, slack in the chain for the removal cylinder occurs.

The counterweight can suddenly fall due to the slack in the chain which could result in personal injury or death.

Monitor the lowering of the counterweight when the counterweight is being lowered with the removal cylinder. If the removal cylinder is retracted and the downward movement of the counterweight stops, stop the lowering procedure and correct the wedging of the counterweight against the machine frame.

Counterweight Removal

Reference: Refer to Operation and Maintenance Manual, “Specifications” for specific weight information.

Note: Before you remove the counterweight, disconnect the wiring for the rear view camera. Refer to Operation and Maintenance Manual, “Camera Harness - Disconnect and Connect” for more information.

1. Position the machine on a surface that is hard and level.

2. Position the upper structure parallel to the tracks. Lower the work tool to the ground.

3. Start the engine. Adjust the engine speed to one-third of full throttle engine speed.



Illustration 365 g00104545

4. Move the hydraulic lockout control to the LOCKED position. Attach a “Do Not Operate” warning tag or a similar warning tag to the start switch or to the controls.

5. Open the rear access door on the right side of the machine.

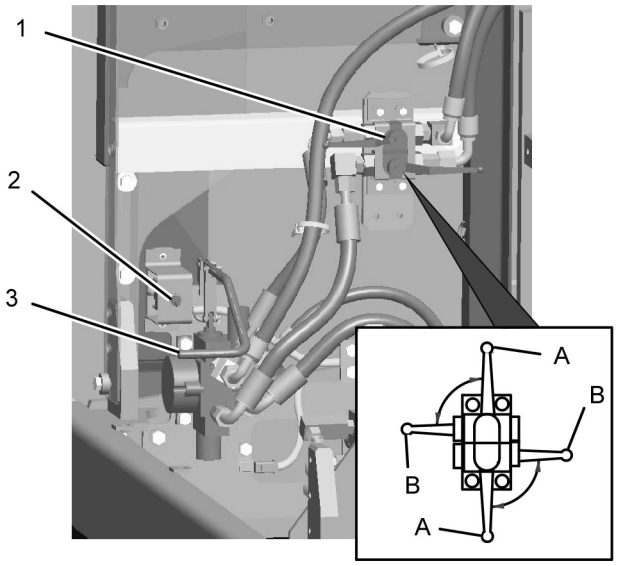


Illustration 366 g01430969

(1) Stop Valves
(2) Switch
(3) Control Lever
(A) CLOSED position
(B) OPEN position

6. Move switch (2) to the ON position.

7. Move both stop valves (1) to the OPEN position.

8. Move control lever (3) upward to support the counterweight and relieve the weight on the counterweight mounting bolts. This will keep the counterweight from possibly sliding off when the counterweight mounting bolts are removed.

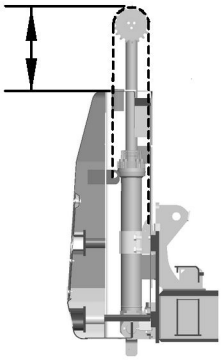


Illustration 367 g06510567

9. There should be a slight tension on the chains. Inspect both chains to verify condition and that the chains are not seized or binding. Monitor chain tension for 5 minutes to verify no leaks and no excessive drift is present indicating service is required before system use. Contact your Caterpillar dealer if service is required.

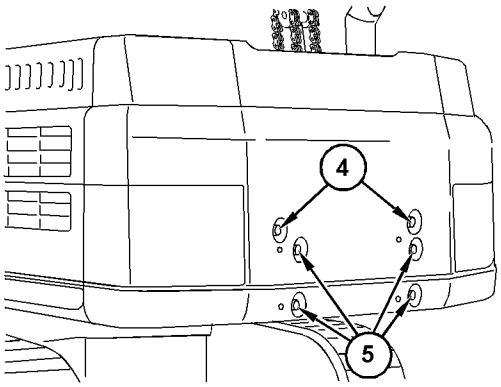


Illustration 368 g06554646

10. Remove bolts (4) from the counterweight.

11. Reinstall bolts (4) and tighten by hand until the bolts are fully engaged.

Note: Do not use tools to reinstall bolts (4).

12. Loosen bolts (4) two full revolutions.

Note: Do not remove bolts (4) from the counterweight.

13. Remove remaining bolts (5).

14. Remove bolts (4) by hand**.**

Note: Do not use tools to remove bolts (4).

Note: If unable to remove bolts (4) by hand, the counterweight removal system may not be appropriately supporting the weight of the counterweight. Adjustment of the linkage, or additional support, may be required to safely remove the final two bolts.

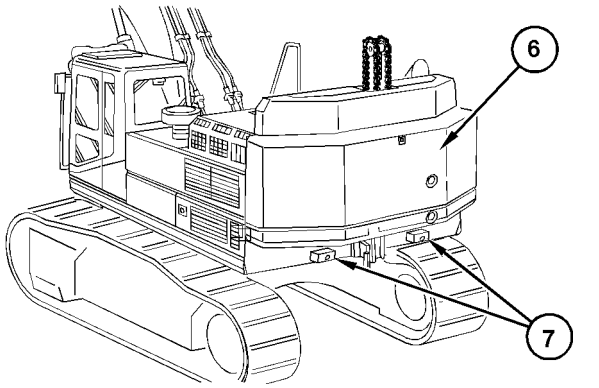


Illustration 369 g06554679

(6) Counterweight
(7) Retaining Pin

15. Move control lever (3) upward to raise the counterweight (6) until access to the retaining pins (7) can be gained.

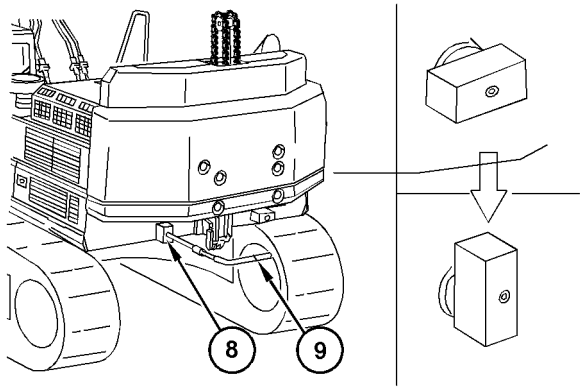


Illustration 370 g06554693

(5) Retaining Pin
(6) Extension

16. Use a ratchet wrench and an extension (9) to rotate each retaining pin (8). Retaining pins (8) require 90 degrees of rotation. The retaining pins are now in the UNLOCKED position.

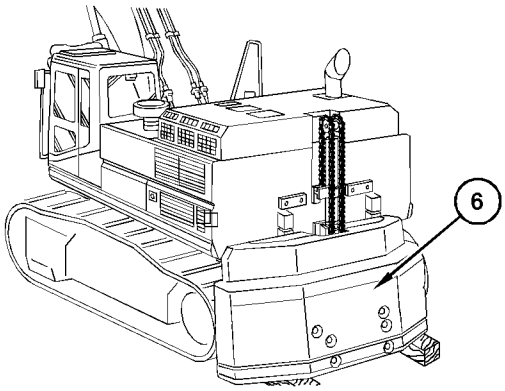


Illustration 371 g06554749

(6) Counterweight.

17. Move control lever (3) downward to lower counterweight (6) onto supports on the ground.

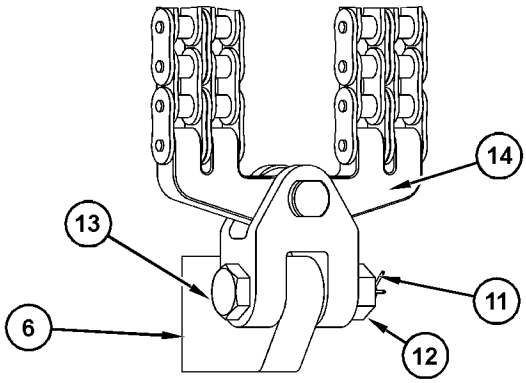


Illustration 372 g06554797

(6) Counterweight
(11) Cotter Pin
(12) Nut
(13) Pin
(14) Chain Bracket

18. Remove cotter pin (11). Loosen nut (12). Remove pin (13) to disconnect chain bracket (14) from counterweight (6).

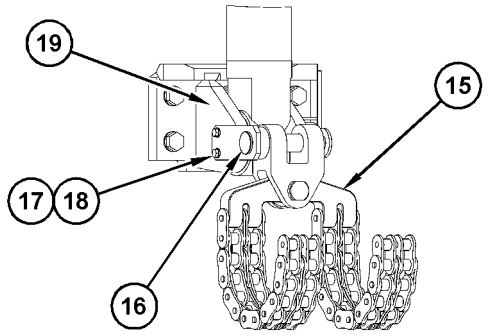


Illustration 373 g06554855

(15) Chain Bracket
(16) Pin
(17) Bolt
(18) Washer
(19) Plate

19. Pin (16) should be located in one of the storage boxes. Remove pin (16) from the storage box.

20. Install pin (16) into chain bracket (15).

21. Install bolts (17) and washers (18) to attach pin (16) to plate (19).

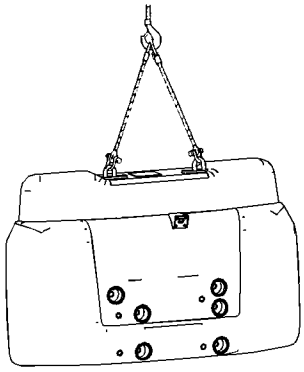


Illustration 374 g02097577

22. Fasten a proper rated cable with shackles to the lifting eyes on the counterweight.

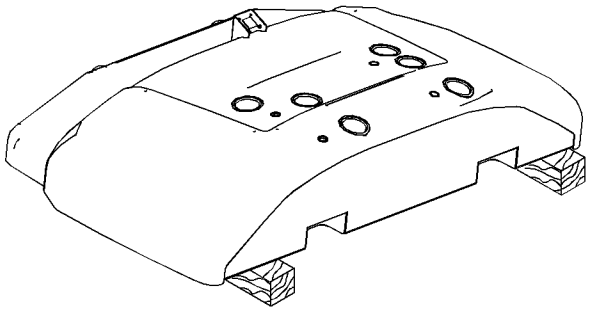


Illustration 375 g02102179

23. Use an appropriate lifting device to put the counterweight on suitable supports.

Counterweight Installation

Perform the installation procedure in reverse order.

Note: Make sure that you remove pin (16), bolt (17), and washer (18). Return these parts to the storage box.

Note: Before you install the counterweight mounting bolts, make sure that the retaining pins are in the LOCKED position and that the counterweight is securely held on the retaining pins. There should be a slight amount of slack on the chains.

Tighten the counterweight mounting bolts horizontal to a torque of 2800 ± 350 N·m (2065 ± 258 lb ft).

Note: After the counterweight has been installed, reconnect the wiring for the rear view camera. Refer to Operation and Maintenance Manual, “Camera Harness - Disconnect and Connect” for more information.

i08119264

Lifting and Tying Down the Machine

SMCS Code: 7000; 7500

WARNING

Improper lifting and improper tie-downs can allow the load to shift or fail and cause injury or damage. Use only properly rated cables and slings with lift and tie down points provided.

Follow the instructions in Operation and Maintenance Manual, “Lifting and Tying Down the Machine” for the proper technique for securing the machine. Refer to Operation and Maintenance Manual, “Specifications” for specific weight information.

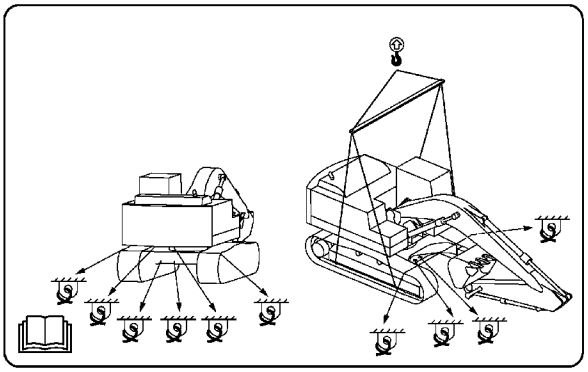


Illustration 376 g02444887

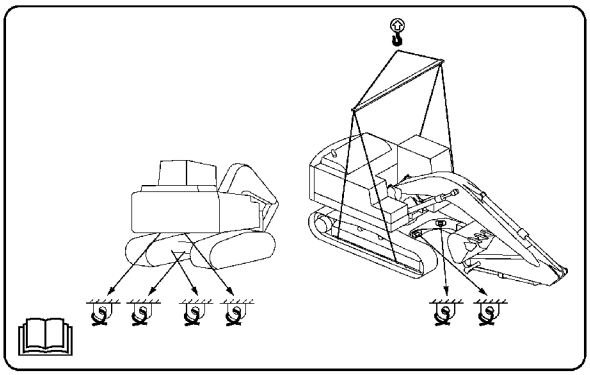


Illustration 377 g02097575

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

Lifting the machine

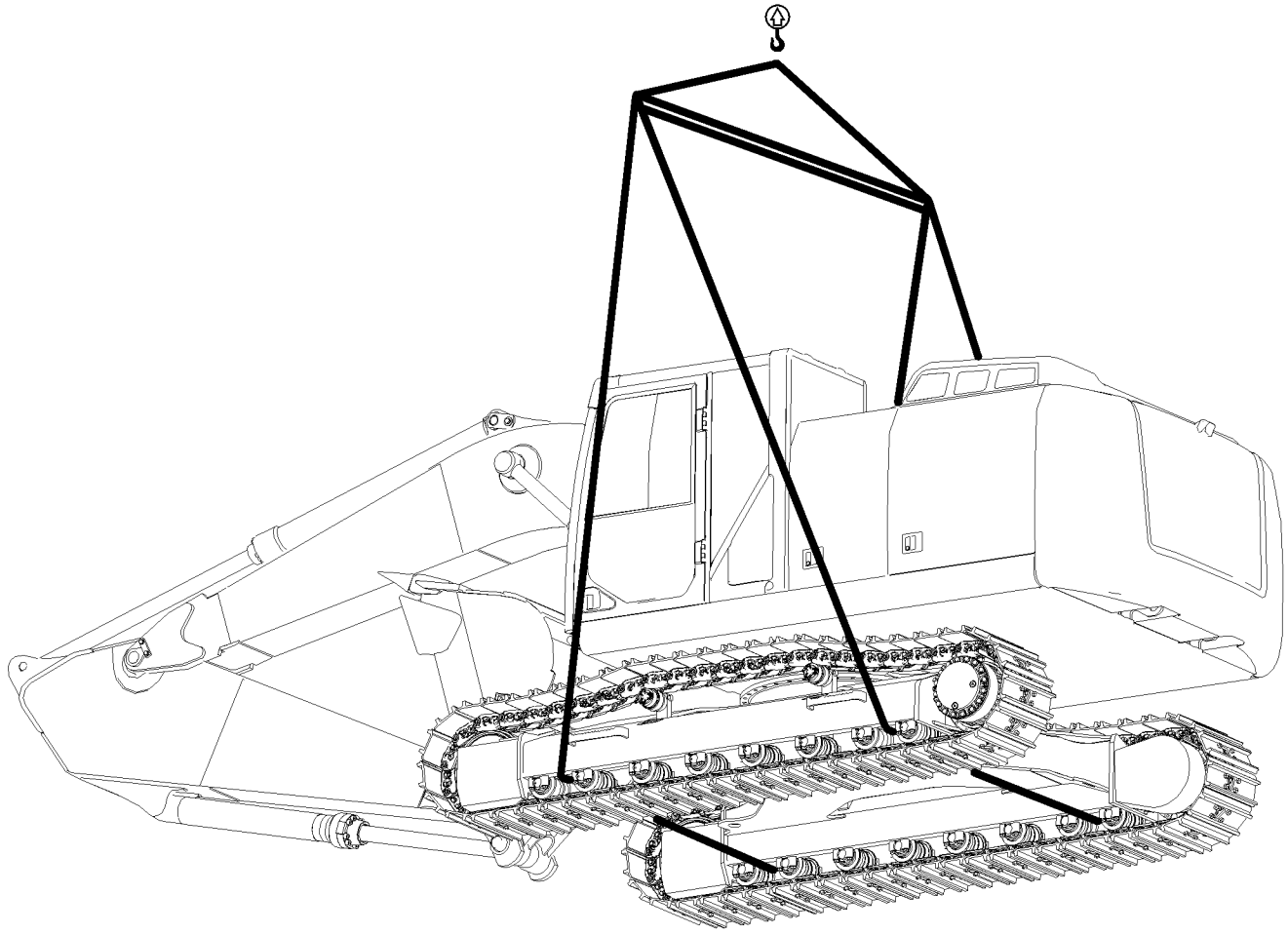


Illustration 378 g02793463

The machine center of gravity is at the center of the swing gear.

Lifting Point – To lift the machine, attach the lifting devices to the lifting points.

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

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

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

1. Use proper rated cables and slings for lifting. The crane should be positioned so that the machine is lifted parallel to the ground.
2. To prevent contact with the machine, lifting cables should have sufficient length.
3. Move the hydraulic lockout control to the LOCKED position.
4. Thread the cable between the first and second rollers at each end of the track.
5. Do not use the foot step as a lifting point.
6. If the full length roller guard is equipped,
   a. (Option 1) remove the guard and thread the lifting cables between the first and second rollers at each end of the track.
   b. (Option 2) pass the cables under the track making sure that the lifting cables are between the track grousers.

Note: if the machine weight is heavier than 54650 kg (120482 lb), use (Option 1) to prevent a potential risk of track bending or damage.

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.

Preferred Method

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

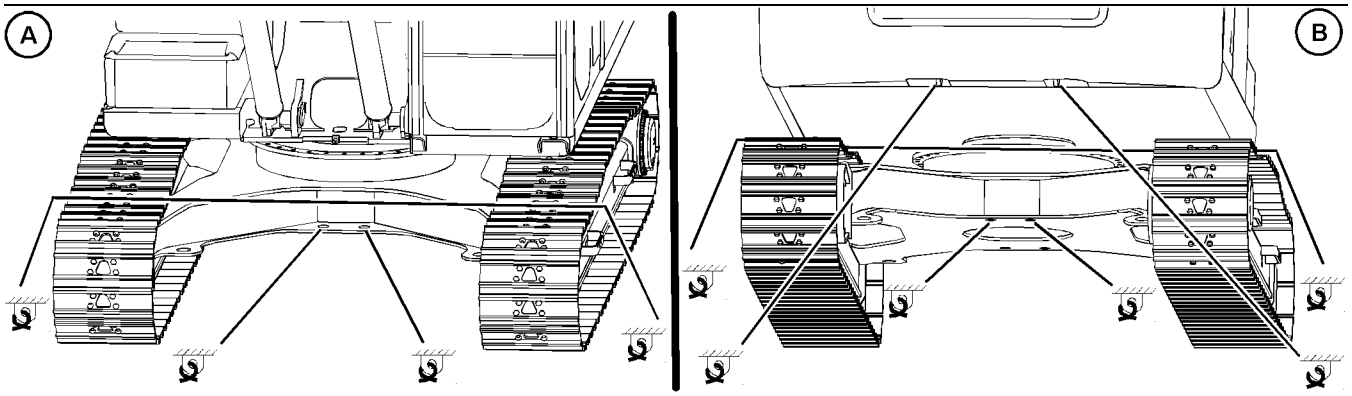


Illustration 379 g02793465

Frictional and direct lashing

(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.

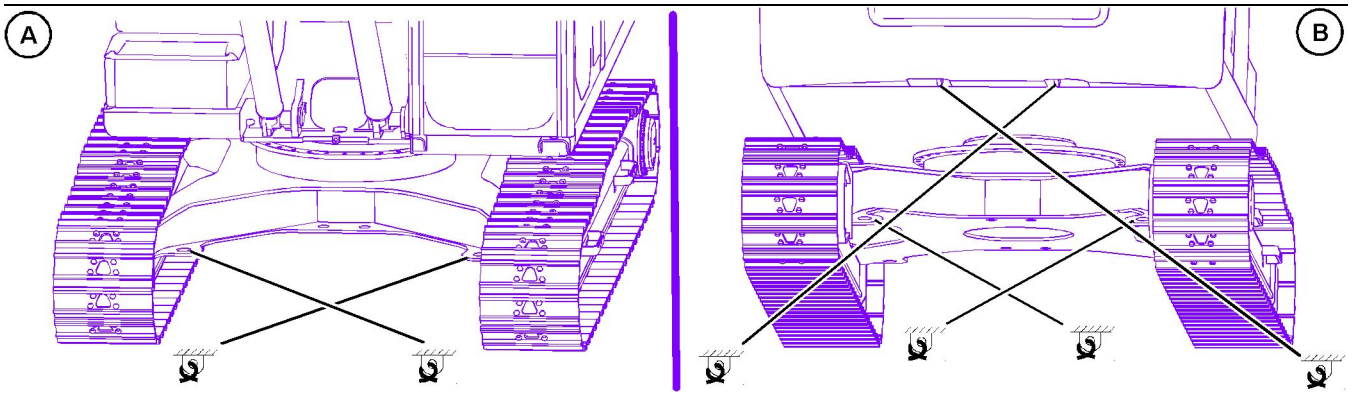


Illustration 380 g06553236

(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.

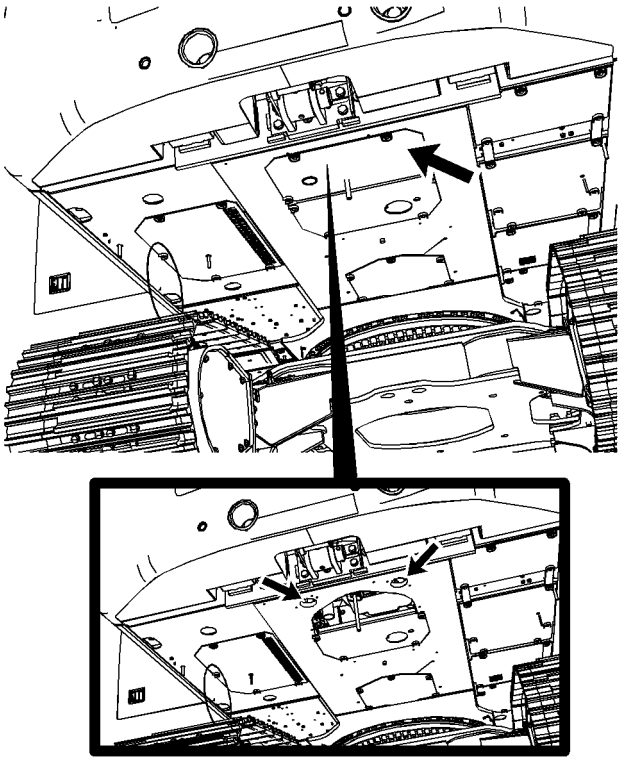


Illustration 381 g06011484

3. Two rear eyes on the upper frame are hidden by a bottom guard. Remove the bottom guard to access the two rear eyes on the upper frame. The approximate weight of the bottom guard is 16 kg (35 lb).

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

5. If there is a requirement of diagonal lashing for tying down, use the proper tie-down point on the lower frame. Set the lashing angle which is on the longitudinal axis of the machine and the cable, at 30 degrees to 50 degrees.

Lifting the Machine Segments

Bucket

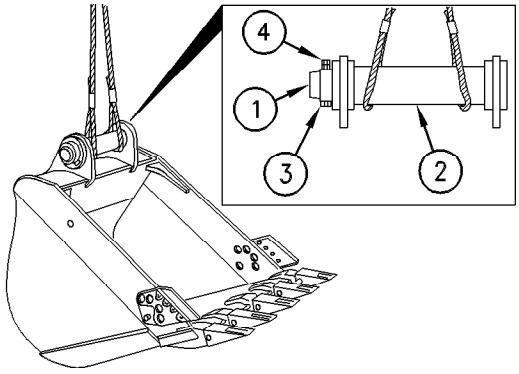


Illustration 382 g00115251

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

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

Counterweight

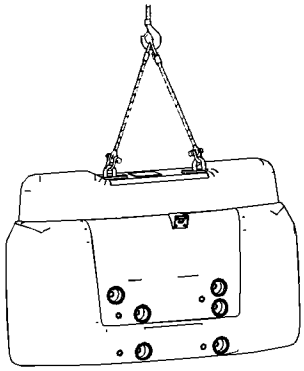


Illustration 383 g02097577

Refer to the Operation and Maintenance, “Counterweight Removal and Installation” for specific information.

Towing Information

i05767775

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. 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 towing machine. This requirement is for a disabled machine that is stuck in the mud and for towing on a grade.

Attach the cable to the towing eye on the front of the machine if you are towing the machine forward. Attach the cable to the drawbar pin on the rear of the machine if you are towing the machine backward.

Do not use a chain for pulling a disabled machine. A chain link can break. This may cause personal injury. Use a wire cable with ends that have loops or rings. Put an observer at an adequate distance from the machines in order to watch the pulling procedure. The observer can stop the procedure if the wire cable starts to break. Stop pulling whenever the towing machine moves without moving the towed machine.

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

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

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.

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. On inclines in poor condition or on surfaces in poor condition, maximum towing machine capacity is required.

Do not tow a loaded machine.

Consult your Cat dealer for the equipment that is necessary for towing a disabled machine.

Parking Brake Release

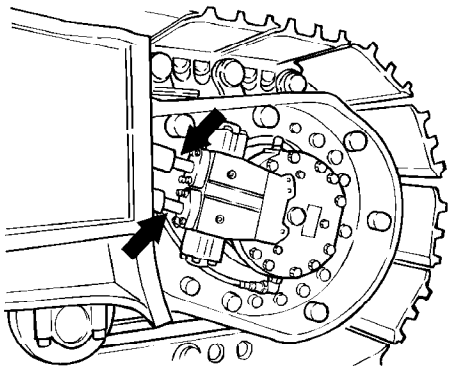


Illustration 384 g00692529

1. Remove the travel drive covers from the base frame.

2. Clean the travel motors, travel brake valves, and nearby areas.

3. Disconnect the hydraulic lines from the brake valve. Plug the disconnected line.

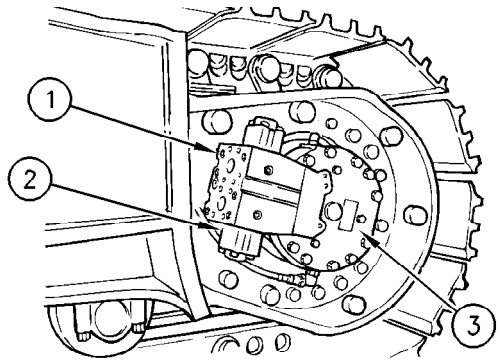


Illustration 385 g00692530

4. Loosen bolts (1). Remove brake valve (2) from travel motor (3).

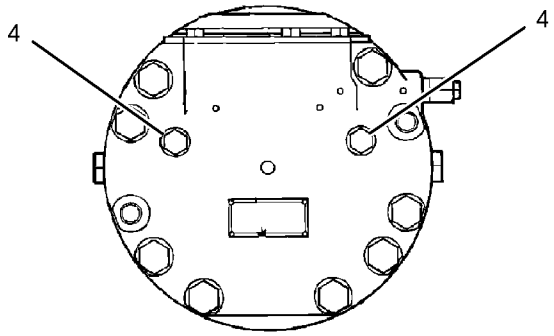


Illustration 386 g02409157

5. Remove plugs (4).

Table 67

Washer Dimensions			
Callout	Inner diameter (I.D.)	Outer Diameter (O.D.)	Thickness
(5)	11 mm (0.43 inch)	25 mm (0.98 inch)	3 mm (0.12 inch)
(6)	11 mm (0.43 inch)	19 mm (0.75 inch)	6 mm (0.24 inch)
Bolt			
(7)	M8 x 1.25 x 90 mm		

6. Install one washer (5) in each hole.

7. Install one washer (6) on top of each washer (5).

8. Insert one M8 x1.25 x 90 mm bolt (7) into each hole and tighten until snug against the washers and travel motor head.

9. Alternately turn each bolt one half turn until each bolt has been rotated two turns.

Note: If longer bolts are used, install the appropriate thicker washers in order to maintain required spacing.

⚠ WARNING

Brake valve cover (9) is forced by spring (11). It can fly apart suddenly when the mounting bolts are removed. Take extra care when removing cover (9).

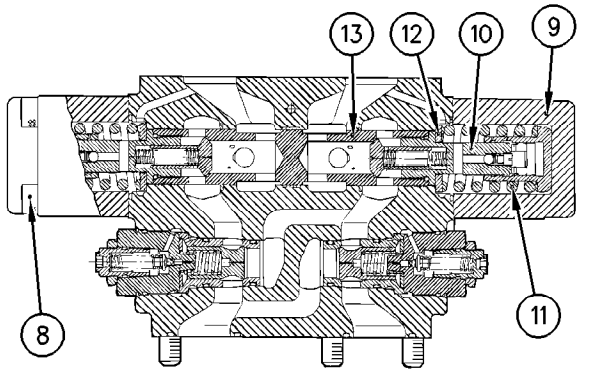


Illustration 387 g00692532

10. Remove bolts (8) in order to remove cover (9) of brake valve (2). To remove bolts (8), remove the two bolts that are separated by 180 degrees. Install two replacement M12 bolts in the removed bolt holes. Tighten the bolts.

11. Remove the remaining two bolts (8). Slowly remove the replacement M12 bolts.

12. Remove bushing (10), spring (11), washer (12) and spool (13) from the brake valve.

13. Install cover (9) to the valve body. Tighten bolts (8).

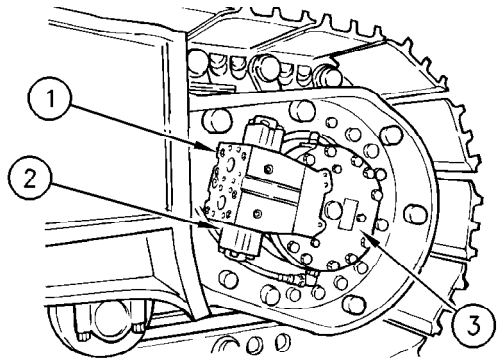


Illustration 388 g00692530

14. Install brake valve (2) to motor (3) with bolts (1). Reconnect the two lines to brake valve (2).

15. Repeat Steps 1 through 14 for the other travel motor.

Note: The parking brake has now been released. The machine is ready for towing.

16. After the machine has been towed, return the brake and the brake valve to the original condition. Verify that the brake and the brake valve activate correctly.

Table 68

Item Number	Part	Recommended Torque	
		N·m	lb ft
(1)	Bolt	100 ± 20	74 ± 10

(continued)

(Table 68, contd)

Item Number	Part	Recommended Torque	
		N·m	lb ft
(8)			

Retrieval of Machine

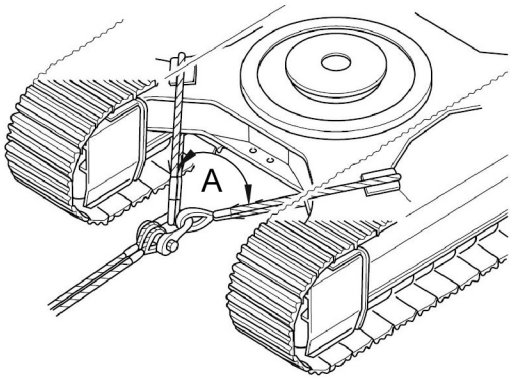


Illustration 389 g02533437

Note: Shackles must be used for towing the machine. The wire rope should be horizontal and straight to the track frame.

Install a properly rated wire rope to the lower frame of the towing machine and the lower frame of the towed machine. The permissible force for the lower frame is 100 percent of the gross weight of the towed machine.

Note: In order to prevent damage to the wire rope or the lower frame of the machines, use protective sleeves on the corners of the lower frame.

Retrieve the disabled machine carefully. The applied load for each wire rope should be equal. The angle (A) between each wire rope should be 60 degree maximum. Operate the machine at a low speed.

Lightweight Towing

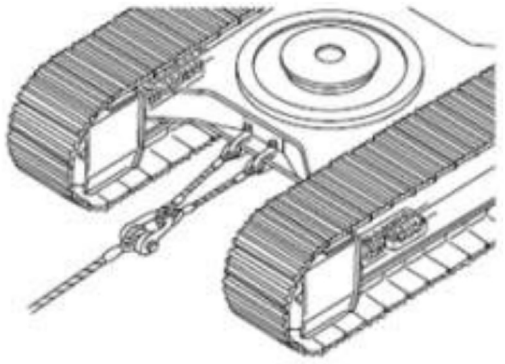


Illustration 390 g03204763

The maximum load for lightweight towing is 167000 N (123173 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.

Engine Starting (Alternate Methods)

i05974849

Engine Starting with Jump Start Cables
(If Equipped)

SMCS Code: 1000; 7000

⚠ WARNING

Failure to properly service the batteries may cause peronal injury.

Prevent sparks near the batteries. They could cause vapors to explode. Do not allow the jump start cable ends to contact each other or the machine.

Do not smoke when checking battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear eye protection when starting a machine with jump start cables.

Improper jump start procedures can cause an explosion resulting in personal injury.

Always connect the battery positive (+) to battery positive (+) and the battery negative (−) to battery negative (−).

Jump start only with an energy source with the same voltage as the stalled machine.

Turn off all lights and accessories on the stalled machine. Otherwise, they will operate when the energy source is connected.

NOTICE
To prevent damage to engine bearings and to electrical circuits when you jump-start a machine, do not allow the stalled machine to touch the machine that is used as the electrical source.

Turn on (close) the battery disconnect switch prior to the boost connection to prevent damage to electrical components on the stalled machine.

Use only equal voltage for starting. Check the battery and starter voltage rating of your machine. Use only the same voltage for jump starting. Use of a welder or higher voltage will damage the electrical system.

Severely discharged maintenance free batteries do not fully recharge from the alternator after jump starting. The batteries must be charged to proper voltage with a battery charger. Many batteries thought to be unusable are still rechargeable.

Refer to Special Instruction, SEHS7633, “Battery Test Procedure” for complete testing and charging information. This publication is available from your Cat dealer.

When the auxiliary start receptacles are not available, use the following procedure.

1. Lower the equipment to the ground. Move all controls to the HOLD position. Move the hydraulic lockout control to the LOCKED position.
2. Turn the start switch on the stalled machine to the OFF position. Turn off all accessories.
3. Turn the battery disconnect switch on the stalled machine to the ON position.
4. Move the machine that is being used as an electrical source near the stalled machine so that the jump-start cables reach the stalled machine. **Do not allow the machines to contact each other.**
5. Stop the engine of the machine that is being used as an electrical source. If you are using an auxiliary power source, turn off the charging system.
6. Ensure that battery caps on both machines are tight and correctly placed. Ensure that batteries in the stalled machine are not frozen. Make sure that the batteries have enough electrolyte.

Note: The positive terminal of the 24 V system of the source and the negative terminal of the 24 V system of the source must be identified correctly before the jumper cables are connected. The positive terminal of the 24 V system of the discharged battery must be identified correctly before the jumper cables are connected.

7. The positive ends of the jump-start cable are red. Connect one positive end of the jump-start cable to the positive cable terminal of the discharged battery. Some machines have battery sets.

Note: Batteries that are in series may be in separate compartments. Use the terminal that is connected to the starter solenoid. This battery or battery set is normally on the same side of the machine as the starter.

Do not allow the positive cable clamps to contact any metal except for the battery terminals.

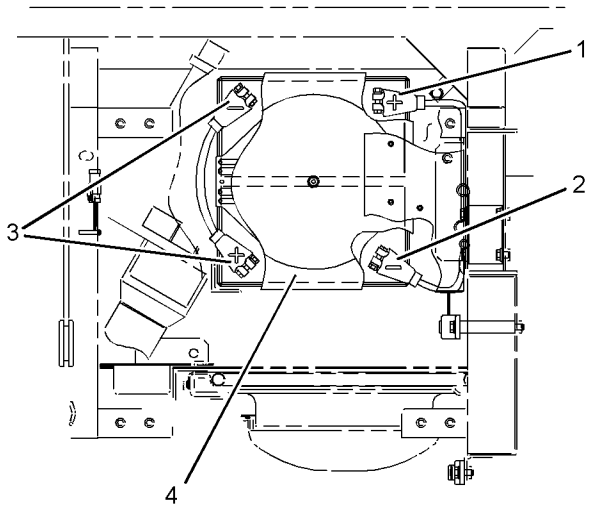


Illustration 391 g01226420

Typical example of the location of the batteries in an excavator

(1) Red positive post to starter
(2) The black negative post connects to the battery disconnect switch.
(3) Do not use these two connections for jump starting. The red positive post is connected in series to the black negative post.
(4) Cover

8. Connect the other positive end of the jump-start cable to the positive cable terminal of the electrical source.

9. Connect one negative end of the jump-start cable to the negative cable terminal of the electrical source.

10. Finally, connect the other negative end of the jump-start cable to the frame of the stalled machine. Do not connect the jump-start cable to the battery post. Do not allow the jump-start cables to contact the battery cables, the fuel lines, the hydraulic lines, or any moving parts.

11. Start the engine of the machine that is being used as an electrical source or energize the charging system on the auxiliary power source.

12. Wait at least two minutes before you attempt to start the stalled machine. This will allow the batteries in the stalled machine to partially charge.

13. Attempt to start the stalled engine. See Operation and Maintenance Manual, “Engine Starting” for the correct starting procedure.

14. Immediately after you start the stalled engine, disconnect the jump-start cables in reverse order.

i06698125

Engine Starting with Auxiliary Start Receptacle
(If Equipped)

SMCS Code: 1000; 7000

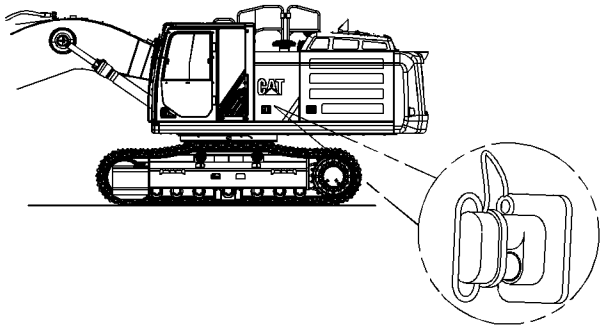


Illustration 392 g02027058

Typical location

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

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

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

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

2. Move the transmission direction control lever on the stalled machine to NEUTRAL. 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 two 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

i06954982

Access Door and Cover Locations

SMCS Code: 726A-CH

Engine Hood

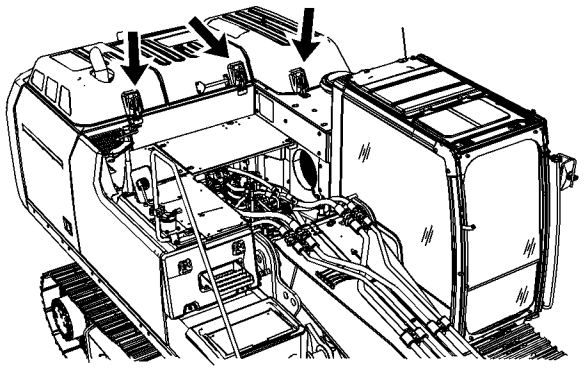


Illustration 393 g02016615

Allows access to the engine and coolant tank.

1. Unlatch the engine hood.

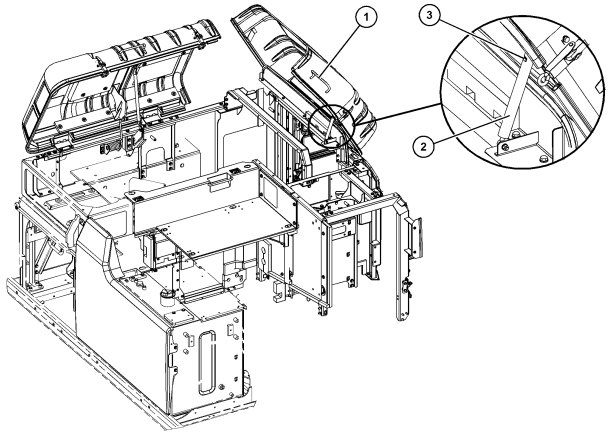


Illustration 394 g06175095

2. Use handle (1) to open the engine hood.

3. Fully open engine hood. Gas spring (2) 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.

4. To close the engine hood, support the engine hood with handle (1). Press the push-button release (3) to unlock gas spring (2). Release the push button and slowly close the engine hood.

5. Latch the engine hood.

Left Rear Access Door

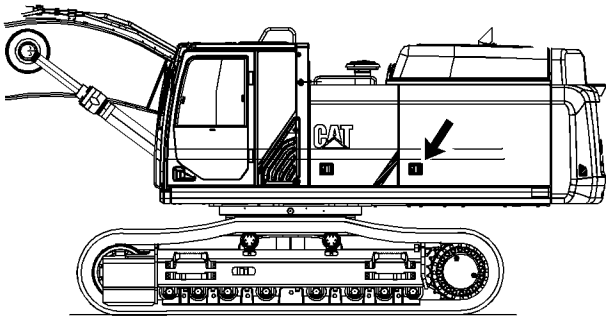


Illustration 395 g02108657

Left Front Access Door

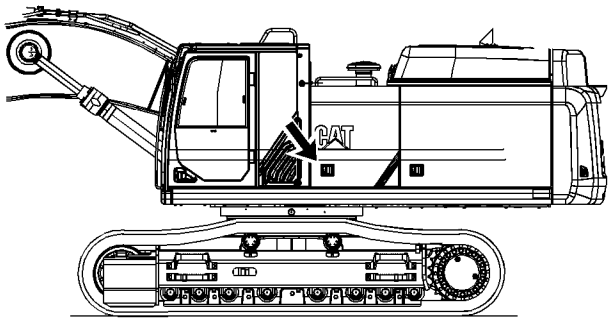


Illustration 396 g02108659

Right Access Door

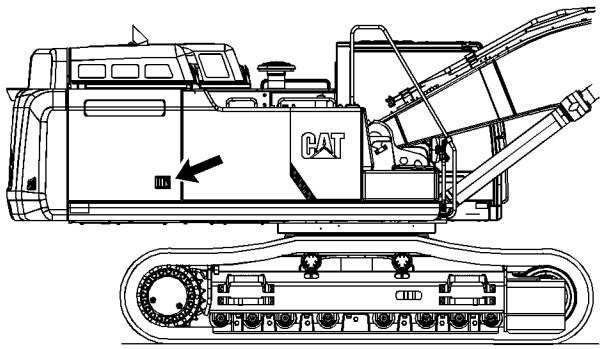


Illustration 397 g02108660

Lubricant Viscosities and Refill Capacities

i07419350

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 7581

General Information for Lubricants

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

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

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

Selecting the Viscosity

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

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

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

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

Engine Oil

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

Cat DEO-ULS or oils that meet the Cat ECF-3 specification, API CJ-4, and the newer API CK-4, are required for use in the applications listed below. Cat DEO-ULS and oils meeting Cat ECF-3 specification, API CJ-4, the newer API CK-4, and ACEA E9 oil categories have been developed with limited sulfated ash, phosphorus, and sulfur. These chemical limits are designed to maintain the expected aftertreatment devices life, performance, and service interval. If oils meeting the Cat ECF-3 specification, API CJ-4, the newer API CK-4 specifications are not available, oils meeting ACEA E9 may be used. ACEA E9 oils meet the chemical limits designed to maintain aftertreatment device life. ACEA E9 oils are validated using some but not all ECF-3 and API CJ-4 standard engine performance tests. Consult your oil supplier when considering use of an oil that is not Cat ECF-3, API CJ-4, or the newer API CK-4 qualified.

Failure to meet the listed requirements will damage aftertreatment-equipped engines and can negatively impact the performance of the aftertreatment devices. The Diesel Particulate Filter (DPF) if equipped, will plug sooner and require more frequent DPF ash service intervals.

Typical aftertreatment systems may include the following:

- Diesel Particulate Filters (DPF)
- Diesel Oxidation Catalysts (DOC)
- Selective Catalytic Reduction (SCR)
- Lean NOx Traps (LNT)

Other systems may apply.

Oils that are per API CI-4 or prior categories are not allowed. These oils have high ash and are not appropriate for use in engines with aftertreatment devices.

Table 69

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase for all Machines	Cat DEO-ULS Cold Weather	SAE 0W-40	−40	40	−40	104
	Cat DEO-ULS SYN	SAE 5W-40	−30	50	−22	122
	Cat DEO-ULS	SAE 10W-30	−18	40	0	104
		SAE 15W-40	−10	50	14	122
Pump Coupling (If Equipped)	Cat DEO-ULS	SAE 10W-30	−18	40	0	104

Hydraulic Systems

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

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

- Cat HYDO Advanced 10 SAE 10W
- Cat HYDO Advanced 20 SAE 20W
- Cat HYDO Advanced 30 SAE 30
- Cat BIO HYDO Advanced, Multigrade

Cat HYDO Advanced oils allow 6000 hours or higher oil drain intervals for most applications. S·O·S Services oil analysis is recommended when the oil drain interval is increased to 6000 hours or higher. In comparison, non-Cat commercial hydraulic oils (second choice oils) allow 2000 hours oil drain interval. Itis recommended to followthe maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular machine. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

Second choice oils are listed below.

- Cat MTO
- Cat DEO
- Cat DEO-ULS
- Cat TDTO
- Cat TDTO Cold Weather
- Cat TDTO-TMS
- Cat DEO-ULS Cold Weather

Note: Oil drain intervals of the oils listed above are less than those of Cat HYDO Advanced oils. The oil drain interval of these oils is typically 2000 hours and up to a maximum of 4000 hours. An exception is Cat TDTO Cold Weather oil which allows 6000 hours or higher oil drain interval. S·O·S Services oil analysis is required when the oils listed above are used in Cat hydraulic system components and hydrostatic transmissions.

Table 70

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	**Oil Type and Performance Requirements**	**Oil Viscosities**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
Hydraulic System	**Cat HYDO Advanced 10** Cat TDTO	SAE 10W	−20	40	−4	104
	Cat HYDO Advanced 20 Cat TDTO	SAE 20W	–5	45	23	113
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	10	50	50	122
	Cat BIO HYDO Advanced	“ISO 46” Multi-Grade	−30	50	−22	122
	Cat MTO Cat DEO-ULS Cat DEO	SAE10W-30	−20	40	−4	104
	Cat DEO-ULS Cat DEO	SAE15W-40	−15	50	5	122
	Cat TDTO-TMS	Multi-Grade	−15	50	5	122
	Cat DEO-ULS SYN	SAE 5W-40	−25	40	−13	104
	Cat DEO-ULS Cold Weather	SAE0W-40	−40	40	−40	104
	Cat TDTO Cold Weather	SAE 0W-20	−40	40	−40	104

For applications requiring the use of fire-resistant hydraulic fluids, Caterpillar recommends the use of EcoSafe FR-46. This product is a fully synthetic, non-aqueous hydraulic fluid. Water based and glycol-based hydraulic products are not recommended for use in Cat machine hydraulic systems. EcoSafe FR-46 is an ISO 46 multi-grade product. For more information refer to the product information provided by the manufacturer of EcoSafe hydraulic oil. Refer to your Cat dealer for availability.

Other Fluid Applications

Table 71

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	**Oil Type and Performance Requirements**	**Oil Viscosity Grade**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
Final Drives and Swing Drives	**Cat TDTO Cold Weather**	SAE 0W-20	-40	0	-40	32
	Cat TDTO	SAE 10W	−30	0	-22	32
		SAE 30(1)	−30	35	−22	95
		SAE 50	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	−25	25	−13	77
Track Roller Frame Recoil Spring and Pivot Shaft Bearings	**Cat TDTO Cold Weather**	SAE 0W-20	−40	0	−40	32
	Cat TDTO	SAE 10W	−30	0	−22	32
		SAE 30(1)	−20	25	−4	77

(continued)

(Table 71, contd)

Excavators, Front Shovels, Mass Excavators, Demolition Excavators, and Track Material Handlers Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosity Grade	°C		°F	
			Min	Max	Min	Max
		SAE 50	0	50	32	122
	Cat TDTO-TMS	Multi-Grade	−25	25	−13	77
Track Idlers and Track Rollers	Cat DEO-ULS Cat DEO	SAE 15W-40(1)	-10	50	14	122
	Cat DEO Cold Weather	SAE 0W-40	−40	40	−40	104
	Cat DEO-ULS SYN	SAE 5W-40	−35	40	−31	104
	Cat FDAO SYN	Multi-Grade	-30	50	-22	122

(1) Factory fill oil for standard configuration machines.

Special Lubricants

Grease

To use a non-Cat grease, the supplier must certify that the lubricant is compatible with Cat grease.

Each pin joint should be flushed with the new grease. Ensure that all old grease is removed. Failure to meet this requirement may lead to failure of a pin joint.

Table 72

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
			Min	Max	Min	Max
External Lubrication Points	Cat Prime Application Grease	NLGI Grade 2	−20	140	−4	284
	Cat Extreme Application Grease	NLGI Grade 1	−20	140	−4	284
		NLGI Grade 2	−15	140	+5	284
	Cat Extreme Application Grease-Artic	NLGI Grade 0.5	-50	130	-58	266
	Cat Extreme Application Grease-Desert	NLGI Grade 2	−10	140	+14	284
	Cat Utility Grease	NLGI Grade 2	−20	140	−4	284
	Cat Ball Bearing Grease	NLGI Grade 2	−20	160	−4	320

Diesel Fuel Recommendations

Diesel fuel must meet Caterpillar Specification for Distillate Fuel and the latest revisions of “ASTM D975” and “EN 590” to ensure optimum engine performance. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for the latest fuel information and for Cat fuel specification. This manual may be found on the Web at Safety.Cat.com.

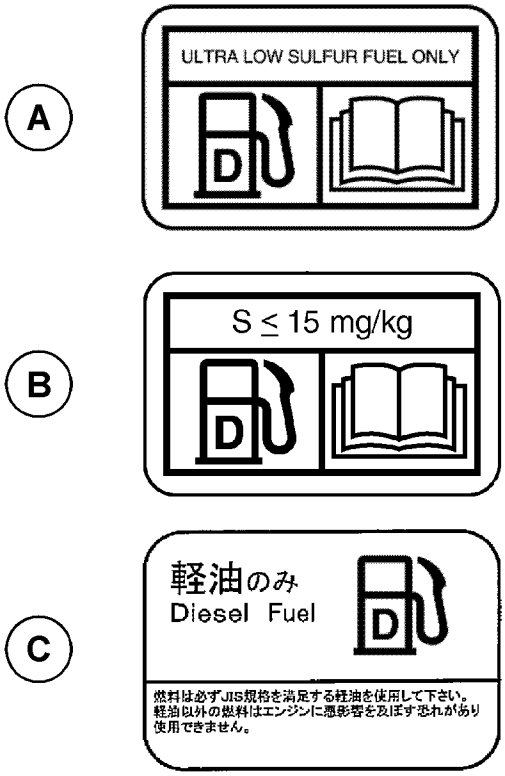


Illustration 398 g03218956

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

NOTICE

Ultra Low Sulfur Diesel (ULSD) fuel 0.0015 percent (≤15 ppm (mg/kg)) sulfur is required by regulation for use in engines certified to nonroad Tier 4 standards (U. S. EPA Tier 4 certified) and that are equipped with exhaust aftertreatment systems.

European ULSD 0.0010 percent (≤10ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European Stage V type-approved nonroad engines. Additionally, the Cetane number should not be less than 45, and the biodiesel content should not be greater than 20% volume/volume.

Misfueling with fuels of higher sulfur level can have the following negative effects:

- **Shorten the time interval between aftertreatment device service intervals (cause the need for more frequent service intervals)**
- **Adversely impact the performance and life of aftertreatment devices (cause loss of performance)**
- **Reduce regeneration intervals of aftertreatment devices**
- Reduce engine efficiency and durability.
- Increase the wear.
- Increase the corrosion.
- Increase the deposits.
- Lower fuel economy
- Shorten the time period between oil drain intervals (more frequent oil drain intervals).
- Increase overall operating costs.

Failures that result for the use of improper fuels are not Caterpillar factory defects. Therefore, the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in nonroad and machine applications that are not Tier 4/ Stage V certified engines and are not equipped with aftertreatment devices. For Tier 4/Stage V certified engines, always follow operating instructions to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more details about fuels, lubricants, and Tier 4/Stage V requirements. This manual may be found on the web at Safety.Cat.com.

Diesel Exhaust Fluid

General Information

Diesel Exhaust Fluid (DEF) is a liquid that is injected into the exhaust system of engines equipped with Selective Catalytic Reduction (SCR) systems. SCR reduces emissions of nitrogen oxides (NOx) in diesel engine exhaust.

Diesel Exhaust Fluid (DEF) is also known under other names including Aqueous Urea Solution (AUS) 32, AdBlue, or generically referred to as urea.

In engines equipped with SCR emissions reduction system, DEF is injected in controlled amounts into the engine exhaust stream. At the elevated exhaust temperature, urea in DEF is converted to ammonia. The ammonia chemically reacts with NOx in diesel exhaust in the presence of the SCR catalyst. The reaction converts NOx into harmless nitrogen (N2) and water (H2O).

DEF Recommendations

For use in Cat engines, DEF must meet all the requirements defined by “ISO 22241-1” Requirements.

Caterpillar recommends the use of DEF available through the Cat parts ordering system for use in Cat engines equipped with SCR systems.

In North America, commercial DEF that is API approved and meets all the requirements defined in “ISO 22241-1” may be used in Cat engines that are equipped with SCR systems.

Outside of North America, commercial DEF that meets all requirements defined in “ISO 22241-1” may be used in Cat engines that are equipped with SCR systems.

The supplier should provide documentation to prove that the DEF is compliant with the requirements of “ISO 22241-1”.

NOTICE
Cat does not warrant the quality or performance of non-Cat fluids.

NOTICE
Do not use agriculture grade urea solutions. Do not use any fluids that do not meet “ISO 22241-1” Requirements in SCR emissions reduction systems. Use of these fluids can result in numerous problems including damage to SCR equipment and a reduction in NOx conversion efficiency.

DEF is a solution of solid urea that is dissolved in demineralized water to produce a final concentration of 32.5% urea. DEF concentration of 32.5% is optimal for use in SCR systems. DEF solution of 32.5% urea has the lowest attainable freeze point of −11.5° C (11.3° F). DEF concentrations that are higher or lower than 32.5% have higher freeze points. DEF dosing systems and “ISO 22241-1” specifications are designed for a solution that is approximately 32.5%.

Caterpillar offers a refractometer, Cat part number 360-0774, that can be used to measure DEF concentration. Follow the instructions provided with the instrument. Appropriate commercial portable refractometers can be used to determine urea concentration. Follow the instructions from the manufacturer.

DEF Guidelines

DEF solution is typically colorless and clear. Changes to color or clarity are indicators of quality issues. Quality of DEF can degrade when stored and handled inappropriately or if DEF is not protected from contamination. Details are provided below.

If quality issues are suspected, testing of DEF should focus on urea percentage, alkalinity as NH3 and biuret content. DEF that does not pass all these tests or that is no longer clear should not be used.

Materials compatibility

DEF is corrosive. Due to the corrosion caused, DEF must be stored in tanks constructed of approved materials. Recommended storage materials:

Stainless Steels:

- 304 (S30400)
- 304L (S30403)
- 316 (S31600)
- 316L (S31603)

Alloys and metals:

- Chromium Nickel (CrNi)
- Chromium Nickel Molybdenum (CrNiMo)
- Titanium

Non-metallic materials:

- Polyethylene
- Polypropylene
- Polyisobutylene
- Teflon (PFA)
- Polyfluoroethylene (PFE)
- Polyvinylidene fluoride (PVDF)
- Polytetrafluoroethylene (PTFE)

Materials NOT compatible with DEF solutions include Aluminum, Magnesium, Zinc, Nickel coatings, Silver and Carbon steel, and Solders containing any of the above. Unexpected reactions may occur if DEF solutions come in contact with any non-compatible material or unknown materials.

Bulk storage

Follow all local regulations covering bulk storage tanks. Follow proper tank construction guidelines. Tank volume typically should be 110% of planned capacity. Appropriately vent indoor tanks. Plan for control of overflow of the tank. Heat tanks that dispense DEF in cold climates.

Bulk tank breathers should be fitted with filtration to keep airborne debris from entering the tank. Desiccant breathers should not be used because water will be absorbed, which potentially can alter DEF concentration.

Handling

Follow all local regulations covering transport and handling. DEF transport temperature is recommended to be −5° C (23° F) to 25° C (77° F). All transfer equipment and intermediate containers should be used exclusively for DEF. Containers should not be reused for any other fluids. Ensure that transfer equipment is made from DEF-compatible materials. Recommended material for hoses and other non-metallic transfer equipment includes:

- Nitrile Rubber (NBR)
- Fluoroelastomer (FKM)
- Ethylene Propylene Diene Monomer (EPDM)

The condition of hoses and other nonmetallics that are used with DEF should be monitored for signs of degradation. DEF leaks are easily recognizable by white urea crystals that accumulate at the site of the leak. Solid urea can be corrosive to galvanized or unalloyed steel, aluminum, copper, and brass. Leaks should be repaired immediately to avoid damage to surrounding hardware.

Cleanliness

Contaminants can degrade the quality and life of DEF. Filtering DEF is recommended when dispensed into the DEF tank. Filters should be compatible with DEF and should be used exclusively with DEF. Check with the filter supplier to confirm compatibility with DEF before using. Mesh-type filters using compatible metals, such as stainless steel, are recommended. Paper (cellulose) media and some synthetic filter media are not recommended because of degradation during use.

Care should be taken when dispensing DEF. Spills should be cleaned immediately. Machine or engine surfaces should be wiped clean and rinsed with water. Caution should be used when dispensing DEF near an engine that has recently been running. Spilling DEF onto hot components will cause harmful vapors.

Stability

NOTICE
Storing Diesel Exhaust Fluid in high heat areas is not recommended. Do not store DEF in high heat generating areas on the machine, such as the pump compartment or the engine compartment. The quality of the DEF can degrade when exposed to high temperatures.

DEF fluid is stable when stored and handled properly. The quality of DEF rapidly degrades when stored at high temperatures. The ideal storage temperature for DEF is between −9° C (15.8° F) and 25° C (77° F). DEF that is stored above 35° C (95° F) for longer than 1 month must be tested before use. Testing should evaluate Urea Percentage, Alkalinity as NH3 and Biuret content.

The length of storage of DEF is listed in the following table:

Table 73

Storage Temperature	Expected DEF Life
Below 25° C (77° F)	18 months
25° C (77° F) to 30° C (86° F)	12 months
30° C (86° F) to 35° C (95° F)	6 months
Above 35° C (95° F)	test quality before use

Refer to “ISO 22241” document series for more information about DEF quality control.

Note: Dispose of all fluids according to applicable regulations and mandates.

Fuel Additives

Cat Diesel Fuel Conditioner and Cat Fuel System Cleaner are available for use when needed. These products are applicable to diesel and biodiesel fuels. Consult your Cat dealer for availability.

Biodiesel

Biodiesel is a fuel that can be made from various renewable resources that include vegetable oils, animal fat, and waste cooking oil. Soybean oil and rapeseed oil are the primary vegetable oil sources. To use any of these oils or fats as fuel, the oils, or fats are chemically processed (esterified). The water and contaminants are removed.

U.S. distillate diesel fuel specification “ASTM D7467” includes up to B20 (20 percent) biodiesel. Any diesel fuel in the U.S. may contain up to B20 biodiesel fuel.

European distillate diesel fuel specification “EN16709:2015” includes up to B20 (20 percent) biodiesel. Any diesel fuel in Europe may contain up to B20.

Note: The diesel portion used in the biodiesel blend must be Ultra Low Sulfur Diesel (15 ppm sulfur or less, per “ASTM D975”). In Europe the diesel fuel portion used in the biodiesel blend must be sulfur free diesel (10 ppm sulfur or less, per “EN 590”). The final blend must have 15 ppm sulfur or less.

When biodiesel fuel is used, certain guidelines must be followed. Biodiesel fuel can influence the engine oil, aftertreatment devices, non-metallic, fuel system components, and others. Biodiesel fuel has limited storage life and has limited oxidation stability. Follow the guidelines and requirements for engines that are seasonally operated.

To reduce the risks associated with the use of biodiesel, the final biodiesel blend and the biodiesel fuel used must meet specific blending requirements.

All the guidelines and requirements are provided in the latest revision of Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”. This manual may be found on the web at Safety.Cat.com.

Coolant Information

The information provided in this “Coolant Recommendation” section should be used with the “Lubricants Information” provided in the latest revision of Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”. This manual may be found on the web at Safety.Cat.com.

The following two types of coolants may be used in Cat diesel engines:

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/ Coolant)

NOTICE
Never use water alone as a coolant. Water alone is corrosive at engine operating temperatures. In addition, water alone does not provide adequate protection against boiling or freezing.

Table 74

Recommendations for Finished Coolants for use in Cat engines				
Coolant Type	**Recommendations**	**Product**	**Service hours (1)(2)**	**Required Maintenance(3)**
Cat ELC, Cat ELI, or commercial coolant that meets Cat EC-1	Preferred	Cat ELC	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life
		Cat ELI (water based) (4)	12000 hours or 6 years	Add Cat ELC Extender at 6000 service hours or one half of service life
	Min requirements	Cat EC-1 specification and “ASTM D6210” and Organic Additive Technology (OAT) based on a combination of a monocarboxylic acid and a dicarboxylic acid. Free of phosphate, borate, and silicate. Tolyltriazole: minimum typical concentration of 900 ppm Nitrite: minimum typical concentration of 500 ppm in new coolants	6000 hours or 6 years	Add Extender at 3000 service hours or one half of service life
Cat DEAC, Cat SCA, conventional coolants, and commercial extended life coolants that do not meet EC-1	Acceptable	Cat DEAC	3000 hours or 3 years	SCA at maintenance intervals
		Cat SCA (water based) (4)	3000 hours or 2 years	SCA at maintenance intervals

(continued)

(Table 74, contd)

Recommendations for Finished Coolants for use in Cat engines				
	Min requirements for fully formulated Heavy-Duty Commercial coolants	"ASTM D6210" and Nitrite (as NO2) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 2 years	SCA at maintenance intervals
	Min requirements for SCA and water (4) (5)	Commercial supplemental coolant additive and water having Nitrite (as NO2) concentration: Minimum of 1200 ppm (70 grains/US gal) and maximum of 2400 ppm (140 grains/US gal) Silicon concentration: minimum of 100 ppm and maximum of 275 ppm	3000 hours or 1 year	Per manufacturer recommendations

(1) New Coolants at 50 volume percent diluted. Coolants that are prediluted at the coolant manufacturer must be diluted with water that meets Reagent 4 "ASTM D1193" requirements.
(2) Maintain the in-service coolant at the given limits.
(3) For appropriate maintenance procedures, refer to the details given in this Chapter. For applications that allow the use of Cat ELI in water, a minimum of 7.5 percent of Cat ELI is recommended. For applications that allow the use of SCA and water, a minimum of 6 percent to a maximum of 8 percent concentration of Cat SCA are recommended.
(4) Water-based coolants are not allowed for use in machines that has NOx reduction aftertreatment devices, in engines that has AATAC and in Marine engines that have SWAC
(5) There are currently no industry standards to define the quality of water-based conventional coolants. To control the quality of SCA and water coolants, the commercial SCA additive package should pass ASTM D6210 when this package is used in a glycol-based coolant. Do not use a commercial SCA additive package that only meets the ASTM D3306 or equivalent specification when used in a glycol-based coolant.

i06230950

Capacities (Refill)

SMCS Code: 1000; 7000

Table 75

Approximate Refill Capacities			
Component or System	**Liters**	**US gal**	**Recommended Type**
Fuel Tank	720	190	Refer to Operation and Maintenance Manual, "Lubricant Viscosities".
Cooling System	52	13.7	
Engine Crankcase with Filter	38	10	
Hydraulic System(1)	257	67.9	
Diesel Exhaust Fluid Tank	41	10.8	
Each Swing Drive	10	2.6	
Swing Gear	40	10.5	
Each Final Drive	15	4	
Pump Coupling	0.6	0.16	SAE 10W-30 Engine Oil

(continued)

(Table 75, contd)

Approximate Refill Capacities			
Component or System	**Liters**	**US gal**	**Recommended Type**
	kg	**lbs**	
Refrigerant(2)	1	2.2	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

i05733653

Service Interval Chart

SMCS Code: 7000

The service interval chart is located inside the cab and on the window.

Refer to this Operation and Maintenance Manual, “Maintenance Interval Schedule” for the correct maintenance intervals and procedures that are specific to your machine.

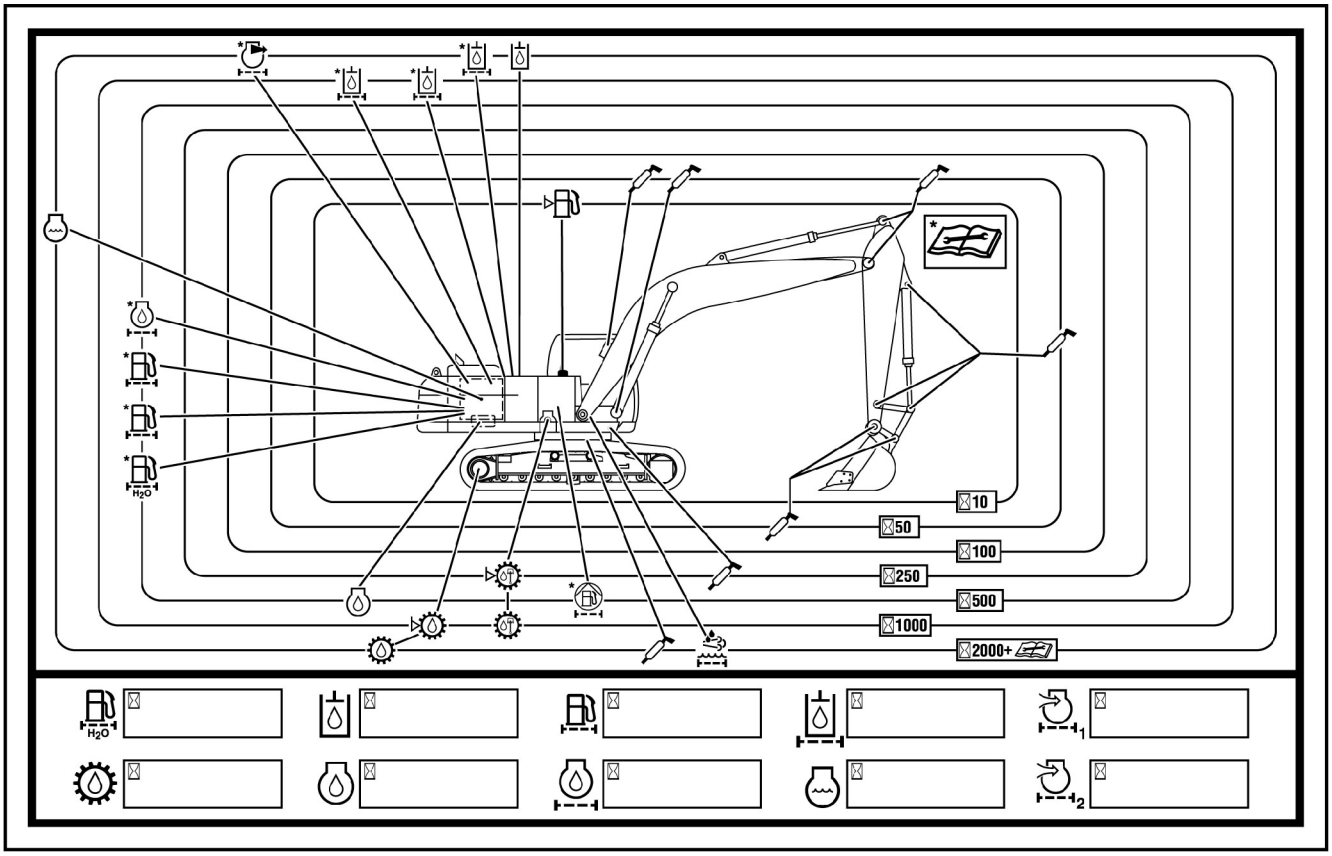


Illustration 399 g03244778

Service hour interval – Hourly interval in which a maintenance procedure should be performed.

Coolant level – Check the coolant level.

Cooling system coolant – Change the ELC (Extended Life Coolant) .

Engine air filter primary element – Clean or replace the primary air filter element.

Engine air filter secondary element – Replace the secondary air filter element.

Engine oil level – Check the engine oil level.



Engine oil – Change the engine oil.



Engine oil filter – Change the engine oil filter.



Final drive oil level – Check the final drive oil level.



Final drive oil – Change the final drive oil.



Fuel level – Check the fuel level.



Fuel system filter – Replace the fuel system filters.



Fuel system water separator – Drain the water separator.



Fuel system water separator element – Replace the fuel system water separator element.



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.

i07327201

System Pressure Release

SMCS Code: 1250-553-PX; 1300-553-PX; 1350-553-PX; 3000-553-PX; 4250-553-PX; 5050-553-PX; 6700-553-PX; 7540-553-PX

⚠ WARNING

Personal injury or death can result from sudden machine movement.

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

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

Coolant System

⚠ WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

To relieve the pressure from the coolant system, turn off the machine. Allow the cooling system pressure cap to cool. Remove the cooling system pressure cap slowly to relieve pressure.

Hydraulic System

The release of hydraulic pressure in a hydraulic circuit is required before service is performed to that hydraulic circuit. Release the pressure in the following hydraulic circuits before any service associated with that hydraulic circuit is performed.

- Boom hydraulic circuit
- Stick hydraulic circuit
- Bucket hydraulic circuit
- Swing hydraulic circuit
- Travel hydraulic circuit
- Attachment hydraulic circuits (if equipped)
- Pilot hydraulic circuit
- Return hydraulic circuit

Note: Refer to the Disassembly and Assembly Manual for additional information concerning service of the components of specific hydraulic circuits.

Release of Hydraulic Pressure from the Main Hydraulic System

⚠ WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before performing any service. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat ® products.

Dispose of all fluids according to local regulations and mandates.

Perform the following steps to release the hydraulic system pressure from the main hydraulic system. For information on any fluids and capacities, refer to this Operation and Maintenance Manual, "Lubricant Viscosities" and "Capacities (Refill)" for more information.

Note: For additional safety, wrap hydraulic joint with material that could absorb/reduce any residual pressure of oil when released. Loosen the joint slowly, pause, and carefully check hydraulic joint for tensions indicating presence of pressure or spring force in lines or components.

1. Position the machine on level ground.

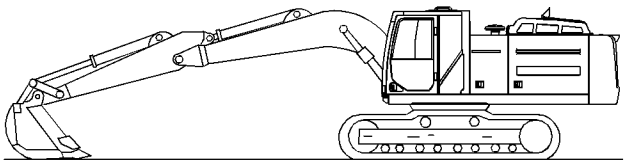


Illustration 400 g02137969

2. Fully retract the stick cylinder rod. Adjust the position of the linkage so that the work tool is parallel to the ground. Lower the boom until the work tool is flat on the ground. Refer to Illustration 400 .

3. Release the system pressure from the implement and swing hydraulic circuits.

a. Shut off the engine.

Note: Perform Step 3b through Step 3d immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

b. Turn the engine start switch to the ON position without starting the engine.

c. Place the hydraulic activation control lever in the UNLOCKED position.

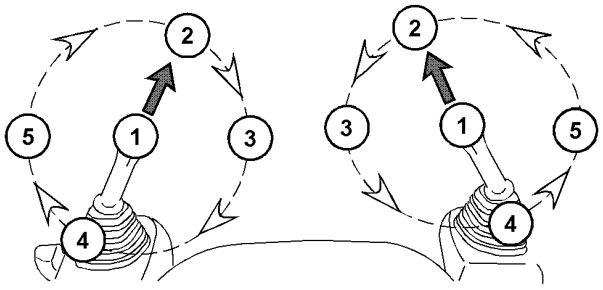


Illustration 401 g03315377

d. Move both joysticks in a circular motion to the FULL STROKE positions multiple times until the pilot accumulator has been exhausted.

Note: Pilot pressure is required to relieve hydraulic system pressure.

e. Place the hydraulic activation control lever in the LOCKED position.

f. Start the engine to recharge pilot accumulator.

Note: Do not activate any levers when recharging pilot accumulator.

g. Shut off the engine.

h. Repeat Step 3b through Step 3g until the high-pressure lines have been released.

Each time the accumulator is recharged, start the joysticks at different positions or rotate in the reverse direction. Doing so will ensure that the same circuit is not being relieved each time.

Note: Pressure could build on these circuits after pressure is released due to linkage settling or bucket rolling.

Note: To release pressure in a single circuit, move the joysticks or pedals of the hydraulic circuit that requires service to the full stroke positions after moving joysticks in a circular motion. Moving the joysticks or pedals to the full stroke position will release the high pressure only in that single hydraulic circuit. Moving the joysticks or pedals to the full stroke position will also release any pressure that might be present in the pilot hydraulic circuit.

4. Release hydraulic system pressure in the attachment circuits, if equipped.

a. Start the engine to charge pilot accumulator.

b. Shut off the engine.

Note: Perform Step 4c through Step 4e immediately after the engine is shut off to insure adequate pilot system pressure is available to release the pressure in the hydraulic circuits.

c. Turn the engine start switch to the ON position without starting the engine.

d. Place the hydraulic activation control lever in the UNLOCKED position.

e. Activate the switch or pedal for the attachment circuit.

f. Place the hydraulic activation control lever in the LOCKED position.

g. Start the engine to recharge pilot accumulator.

Note: Do not activate any pedals or switches when recharging pilot accumulator.

h. Shut off the engine.

i. Repeat Step 4a through Step 4h for each attachment circuit.

5. After releasing the hydraulic pressure in each of the desired hydraulic circuits, place the hydraulic activation control lever in the LOCKED position.

6. Turn the engine start switch to the OFF position.

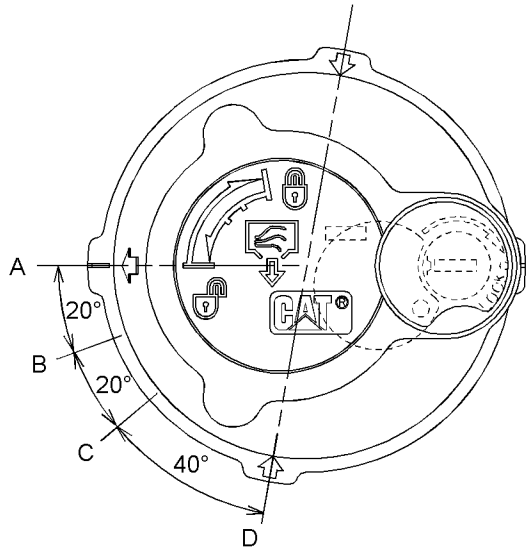


Illustration 402 g02275615

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 402 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push down the filler cap and move the arrow from position (C) to position (D).

Note: The travel hydraulic circuit is open to the hydraulic tank. Pressure from the travel circuit is released by releasing pressure from the return circuit.

8. Release the pressure that may be present in the boom circuit to remove the risk of residual pressure in the line. Make sure that the engine start switch is in the OFF position and the pressure in the hydraulic tank has been released.

For machines equipped with a boom lowering control valve, there is a manual valve located near the base of the boom or a valve on the load control valve on the boom cylinder. Refer to Operation and Maintenance Manual, Equipment Lowering with Engine StoppedMachine with a Boom Lowering Control Valve for more information.

For machines **NOT** equipped with a boom lowering control valve, refer to Operation and Maintenance Manual, Equipment Lowering with Engine StoppedMachine without a Boom Lowering Control Valve for more information.

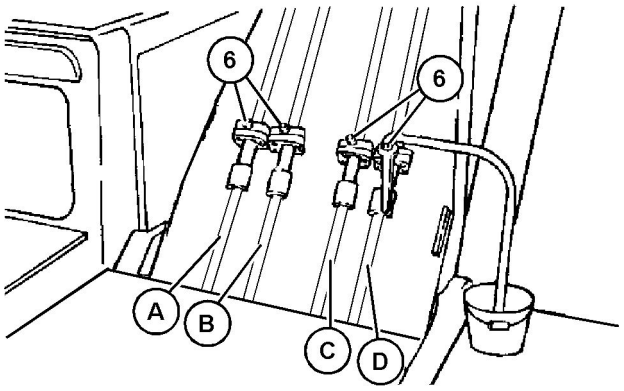


Illustration 403 g06234927

Stick and Bucket circuit locations

(6) Purge Screws (If Equipped)
(A) Circuit A
(B) Circuit B
(C) Circuit C
(D) Circuit D

9. If the purge screws are equipped, perform the following pressure release procedure for each Stick and Bucket circuit. Refer to Illustration 403 and Table 76 for the stick and bucket circuit locations.

Table 76

Stick and Bucket Circuit Locations				
Sales Model	**Circuits**			
	A	**B**	**C**	**D**
326 / 329 / 330	Stick In	None	Stick Out	None
336 / 340	Bucket Close	Stick In	Stick Out	Bucket Open
349 / 352	Stick Out	Stick In	Bucket Close	Bucket Open

a. Connect one end of a drain hose to purge screw (6). Insert the other end of the drain hose into an empty container.

b. Loosen purge screw (6) by 1/2 turn. Hydraulic oil will be drained from the drain hose to the container.

Note: Dispose of drained fluid according to local regulations.

c. Tighten purge screw (6) to a torque of 13 +/- 2 Nm (9 +/- 1 lb ft) after all the hydraulic oil has been drained from the line.

d. Repeat Steps 9a through 9c for all circuits.

e. Remove the drain hose and install hydraulic tank fill cap.

10. The pressure in the multiple hydraulic circuits that require service is now released and lines and components can be disconnected or removed from those hydraulic circuits.

i07746333

Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Cat dealer.

Proper welding procedures are necessary to avoid damage to the electronic controls and to the bearings. When possible, remove the component that must be welded from the machine or the engine and then weld the component. If you must weld near an electronic control on the machine or the engine, temporarily remove the electronic control to prevent heat related damage. The following steps should be followed to weld on a machine or an engine with electronic controls.

1. Turn off the engine. Place the engine start switch in the OFF position.

2. If equipped, turn the battery disconnect switch to the OFF position. If there is no battery disconnect switch, remove the negative battery cable at the battery.

NOTICE
Do NOT use electrical components (ECM or sensors) or electronic component grounding points for grounding the welder.

3. Clamp the ground cable from the welder to the component that will be welded. Place the clamp as close as possible to the weld. Make sure that the electrical path from the ground cable to the component does not go through any bearing. Use this procedure to reduce the possibility of damage to the following components:
   - Bearings of the drive train
   - Hydraulic components
   - Electrical components
   - Other components of the machine
4. Protect any wiring harnesses and components from the debris and the spatter which is created from welding.
5. Use standard welding procedures to weld the materials together.

i04807435

Severe Service Application

SMCS Code: 1000

An engine which operates outside of normal conditions is operating in a severe service application.

An engine that operates in a severe service application may need more frequent maintenance intervals in order to maximize the following conditions:

- Reliability
- Service life

The number of individual applications cause the impossibility of identifying all of the factors which may contribute to severe service operation. Consult your Caterpillar dealer for the unique maintenance that may be necessary for your engine.

An application is a severe service application if any of the following conditions apply:

Severe Environmental Factors

- Frequent operation in dirty air
- Frequent operation at an altitude which is above 1525 m (5000 ft)
- Frequent operation in ambient temperatures which are above 32° C (90° F)
- Frequent operation in ambient temperatures which are below 0° C (32° F)

Severe Operating Conditions

- Frequent operation with inlet air which has a corrosive content
- Operation with inlet air which has a combustible content
- Operation which is outside of the intended application
- Operation with a plugged fuel filter
- Extended operation at low idle (more than 20% of hours)
- Frequent cold starts at temperatures below 0° C (32° F)
- Frequent dry starts (starting after more than 72 hours of shutdown)
- Frequent hot shutdowns (shutting down the engine without the minimum of 2 minutes to 5 minutes of cool down time)
- Operation above the engine rated speed
- Operation below the peak torque speed
- Operating with fuel which does not meet the standards for distillate diesel fuel as stated in Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” “Distillate Diesel Fuel”
- Operating with a blend of distillate fuel which contains more than 20 percent biodiesel

Improper Maintenance Procedures (Maintenance Procedures Which May Contribute to a Severe Service Application)

- Inadequate maintenance of fuel storage tanks from causes such as excessive water, sediment, and microorganism growth.
- Extending maintenance intervals beyond the recommended intervals
- Using fluids which are not recommended in Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Extending maintenance intervals for changing the engine oil and engine coolant without S·O·S validation

- Extending maintenance intervals for changing air filters, oil filters, and fuel filters
- Failure to use a water separator
- Using filters which are not recommended by Special Publication, PEWJ0074, “2008 Cat Filter and Fluid Application Guide”
- Storing the engine for more than 3 months but less than 1 yr (For information about engine storage, refer to Special Publication, SEHS9031, “Storage Procedure for Caterpillar Products”)

i08062734

Maintenance Interval Schedule

SMCS Code: 7000

Ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance. All adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging are included. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, WHICH EVER OCCURS FIRST, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance. Refer to the maintenance procedure for any other exceptions that may change the maintenance intervals.

Note: The aftertreatment system can be expected to function properly for the useful life of the engine (emissions durability period), as defined by regulation. All prescribed maintenance requirements must be followed.

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 6000 hours. S·O·S services after 3,000 hour is strongly recommended. Consult your Cat dealer for details.

When Required

“ Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace“ 287
“ Battery - Recycle“ 288
“ Battery or Battery Cable - Inspect/Replace“. . . . 288
“ Boom Base Pins - Lubricate“ 289
“ Bucket Linkage - Inspect/Adjust“ 292
“ Bucket Tips - Inspect/Replace“. 293
“ Cab Air Filter (Fresh Air) - Clean/Replace“ 296
“ Camera - Clean“ 297
“ Circuit Breakers - Reset“. 298
“ Cooling System Coolant Level - Check“. 302
“ Counterweight Removal Chain - Clean“. 304
“ DEF Filler Screen - Clean“ 306
“ Diesel Exhaust Fluid - Fill“. 308
“ Engine Air Filter Primary Element - Clean/ Replace“ 311
“ Engine Air Filter Secondary Element - Replace“ 314
“ Engine Oil Level - Check“ 314
“ Ether Starting Aid Cylinder - Replace“ 318
“ Film (Product Identification) - Clean“ 320
“ Fuel System - Prime“. 322
“ Fuel System Water Separator - Drain“ 325
“ Fuses - Replace“ 329
“ Fuses - Replace“ 327
“ High Intensity Discharge Lamp (HID) - Replace“ 332
“ Oil Filter - Inspect“ 349
“ Radiator Core - Clean“ 352
“ Track Adjustment - Adjust“ 358
“ Window Washer Reservoir - Fill“ 361
“ Window Wiper - Inspect/Replace“ 361
“ Windows - Clean“. 361

Every 10 Service Hours or Daily for First 100 Hours

“ Boom, Stick and Bucket Linkage - Lubricate“ . . 290

Every 10 Service Hours or Daily

“ Hydraulic System Oil Level - Check“ 345
“ Indicators and Gauges - Test“. 347
“ Seat Belt - Inspect“ 353
“ Track Adjustment - Inspect“ 360
“ Travel Alarm - Test“ 360

“ Undercarriage - Check“ 361

Every 10 Service Hours or Daily for Machines Used in Severe Applications

“ Boom, Stick and Bucket Linkage - Lubricate“ . . 290

Every 50 Service Hours or Weekly

“ Boom, Stick and Bucket Linkage - Lubricate“ . . 290
“ Fuel Tank Water and Sediment - Drain“ 326

Every 100 Service Hours of Continuous Hammer Use

“ Hydraulic System Oil Filter (Case Drain) - Replace“ 336
“ Hydraulic System Oil Filter (Pilot) - Replace“. . . 338
“ Oil Filter (Hydraulic Hammer) - Replace“ 347

Initial 250 Service Hours

“ Final Drive Oil - Change“ 321
“ Hydraulic System Oil Filter (Case Drain) - Replace“ 336
“ Hydraulic System Oil Filter (Pilot) - Replace“. . . 338
“ Hydraulic System Oil Filter (Return) - Replace“ 340
“ Swing Drive Oil - Change“ 355

Every 250 Service Hours

“ Counterweight Removal Chain - Inspect“ 305
“ Engine Oil Sample - Obtain“ 315
“ Final Drive Oil Sample - Obtain“ 322

Every 250 Service Hours for Machines Used in Severe Applications

“ Fuel System Primary Filter (Water Separator) Element - Replace“ 323
“ Fuel System Secondary Filter - Replace“. 324

Every 250 Service Hours or Monthly

“ Condenser (Refrigerant) - Clean“ 298
“ Final Drive Oil Level - Check“ 321
“ Swing Bearing - Lubricate“ 354
“ Swing Drive Oil Level - Check“ 356

Every 250 Service Hours of Partial Hammer Use (50% of Service Hours)

“ Oil Filter (Hydraulic Hammer) - Replace“ 347

Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

“ Cooling System Coolant Sample (Level 2) - Obtain“ 304

Every 500 Service Hours

“ Hydraulic System Oil Sample - Obtain“ 347
“ Pump Coupling Oil Level - Check“ 351
“ Swing Drive Oil Sample - Obtain“. 357

Every 500 Service Hours or 3 Months

“ Belt - Inspect/Adjust/Replace“. 289
“ Cooling System Coolant Sample (Level 1) - Obtain“ 303
“ Engine Oil and Filter - Change“. 316
“ Fuel System Primary Filter (Water Separator) Element - Replace“ 323
“ Fuel System Secondary Filter - Replace“. 324
“ Fuel Tank Cap and Strainer - Clean“ 325

Every 600 Service Hours of Continuous Hammer Use

“ Hydraulic System Oil - Change“ 332
“ Hydraulic System Oil Filter (Case Drain) - Replace“ 336
“ Hydraulic System Oil Filter (Pilot) - Replace“. . . 338

Every 1000 Service Hours or 6 Months

“ Battery - Clean“ 288
“ Battery Hold-Down - Tighten“ 288

“ Counterweight Removal Chain - Lubricate“ 305
“ Hydraulic System Oil Filter (Case Drain) - Replace“ 336
“ Hydraulic System Oil Filter (Pilot) - Replace“. . . 338
“ Rollover Protective Structure (ROPS) - Inspect“ 353
“ Swing Drive Oil - Change“ 355

Every 1000 Service Hours of Partial Hammer Use (50% of Service Hours)

“ Hydraulic System Oil - Change“ 332

Every 2000 Service Hours

“ Fumes Disposal Filter Element - Replace“. 326

Every 2000 Service Hours or 1 Year

“ Cooling System Coolant Sample (Level 2) - Obtain“ 304
“ Engine Valve Lash and Fuel Injector Timing - Check“ 318
“ Engine Valve Rotators - Inspect“ 318
“ Final Drive Oil - Change“. 321
“ Hydraulic System Oil Filter (Return) - Replace“ 340
“ Receiver Dryer (Refrigerant) - Replace“. 352
“ Swing Gear - Lubricate“. 357

Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture

“ Seat Belt - Replace“. 353

Every 5000 Service Hours

“ ARD Spark Plug - Clean“. 287
“ Diesel Exhaust Fluid Filter - Replace“ 309
“ Diesel Exhaust Fluid Injector - Replace“ 310
“ Diesel Particulate Filter - Clean“ 311
“ Pump Coupling Oil - Change“ 350

Every 6000 Service Hours or 3 Years

“ Cooling System Coolant Extender (ELC) - Add“ 300
“ Hydraulic System Oil - Change“ 332

Every 10 000 Service Hours

“ DEF Manifold Filters - Replace“ 306

Every 12 000 Service Hours or 6 Years

“ Cooling System Coolant (ELC) - Change“ 298

i05985684

ARD Spark Plug - Clean

SMCS Code: 1555-070

⚠ 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.

NOTICE
If the engine is running or the key is in the ON position the ARD plug will continue to fire. Turn the key to the OFF position before servicing the ARD plug.

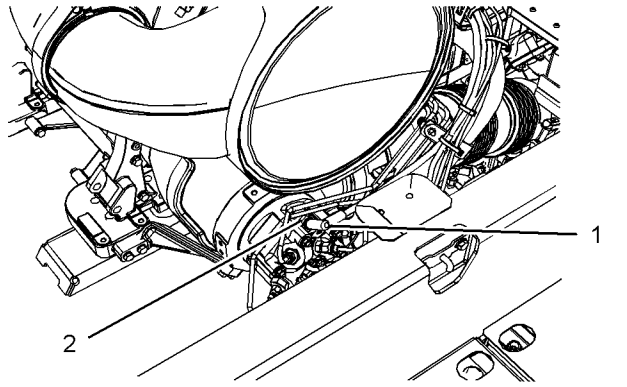


Illustration 404 g02113380

(1) Wiring harness
(2) Spark plug

1. Position the machine on a level surface and lower the bucket to the ground.

2. Move the hydraulic lockout control to the LOCKED position. Stop the engine.

3. Allow the exhaust system to cool before performing this procedure.

4. Unlatch the engine hood and raise the engine hood.

5. Remove any dirt or debris from the area around the spark plug.

6. Remove wire harness (1) from spark plug (2).

7. Use a deep well socket and a breaker bar to loosen the spark plug. If necessary, see your Caterpillar dealer for the part number of the socket. After the spark plug has been loosened, use the socket to remove the spark plug by hand in order to detect problems with the threads.

8. After removing spark plug, clean the ground probe inside the ARD combustion head by running a Plug Bore Brush through the hole in the ARD combustion head. Run the brush through the hole several times.

9. Carefully clean the spark plug using a nonmetallic cleaning pad. If the probe appears to be bent, replace the spark plug. Otherwise, install the original spark plug.

Note: The spark plug may be damaged if the spark plug is dropped. Do not install a spark plug that has been dropped.

NOTICE
Do not overtighten the spark plug. The shell can be cracked and the gasket can be deformed. The metal can deform and the gasket can be damaged. The shell can be stretched. This will loosen the seal that is between the shell and the insulator, allowing combustion pressure to blow past the seal. Serious damage to the engine can occur.

Use the proper torque.

10. Install the spark plug by hand until the spark plug contacts the ARD. Tighten the spark plug to a torque of 43.4 N·m (32 lb ft) to 51.5 N·m (38 lb ft).

11. Connect the wiring harness.

12. Close the engine hood and latch the engine hood.

i04004709

Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/ Replace

SMCS Code: 1054-510-A/C; 1054-040-A/C

NOTICE
An air recirculation filter element plugged with dust will result in decreased performance and service life to the air conditioner or cab heater.

To prevent decreased performance, clean the filter element, as required.

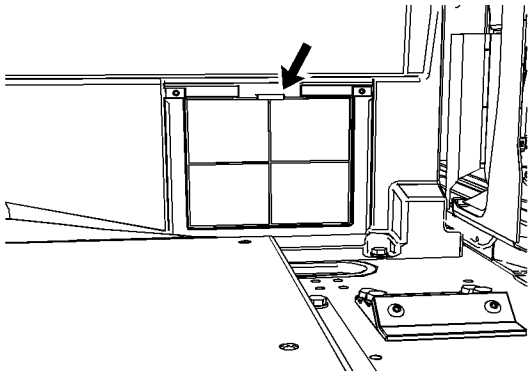


Illustration 405 g02017613

The air conditioner filter is located on the lower left side of the cab behind the seat.

1. Slide the operator seat forward.

2. Slide the filter element upward.

3. Tap the air filter in order to remove the dirt. Do not use compressed air to clean the filter.

4. After you clean the filter element, inspect the filter element. If the filter element is damaged or badly contaminated, use a new filter element. Make sure that the filter element is dry.

5. Install the filter element.

NOTICE
Failure to reinstall the filter element for the air conditioning system will contaminate and damage the system components.

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.

i07746330

Battery - Recycle

SMCS Code: 1401-561

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- An authorized battery collection facility
- Recycling facility

i00934872

Battery Hold-Down - Tighten

SMCS Code: 7257

Tighten the hold-downs for the battery in order to prevent the batteries from moving during machine operation.

i04064489

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-040; 1401; 1401-510; 1401-561; 1402-040; 1402-510

⚠ WARNING

Personal injury can result from battery fumes or explosion.

Batteries give off flammable fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts the skin or eyes.

Prevent sparks near the batteries. Sparks could cause vapors to explode. Do not allow jumper cable ends to contact each other or the engine. Improper jumper cable connections can cause an explosion.

Always wear protective glasses when working with batteries.

1. Turn all of the switches to the OFF position. Turn the engine start switch key to the OFF position.

2. Turn the battery disconnect switch to the OFF position. Remove the key.

3. Disconnect the negative battery cable at the battery.

4. Disconnect the positive battery cable at the battery.

5. Disconnect the battery cables at the battery disconnect switch. The battery disconnect switch is connected to the machine frame.

6. Make necessary repairs or replace the battery.

7. Connect the battery cable at the battery disconnect switch.

8. Connect the positive battery cable of the battery.

9. Connect the negative battery cable of the battery.

10. Install the key and turn the battery disconnect switch to the ON position.

i03865109

Belt - Inspect/Adjust/Replace

SMCS Code: 1357-025; 1357-040; 1357-510; 1397-025; 1397-040; 1397-510

⚠ 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.

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.

2. Inspect the belt for wear and for cracking.

3. If the belt requires replacement, perform Step 3a through Step 3c.

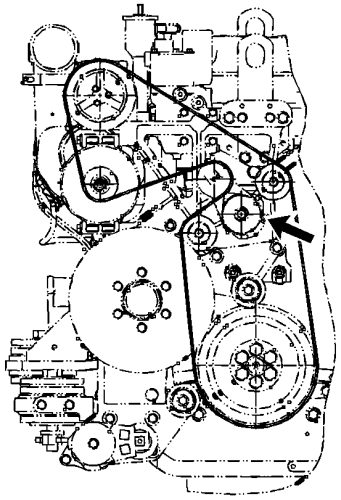


Illustration 406 g02108953

a. Turn the belt tensioner in order to release the tension from the belt.

b. Remove the belt.

c. Install a new belt.

Variable Fan (If Equipped)

1. Unlatch the engine hood and raise the engine hood.

2. Inspect the belt for wear and for cracking.

3. If the belt requires replacement, perform Step 3a through Step 3c.

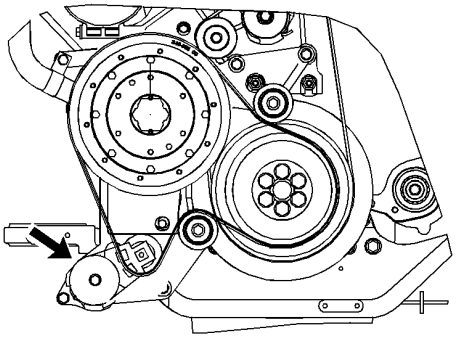


Illustration 407 g02108955

a. Turn the belt tensioner in order to release the tension on the belt.

b. Remove the belt.

c. Install a new belt.

i03865131

Boom Base Pins - Lubricate

SMCS Code: 6501-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom linkage. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more information on molybdenum grease.

When the boom pin is replaced, lubricate the new boom pin.

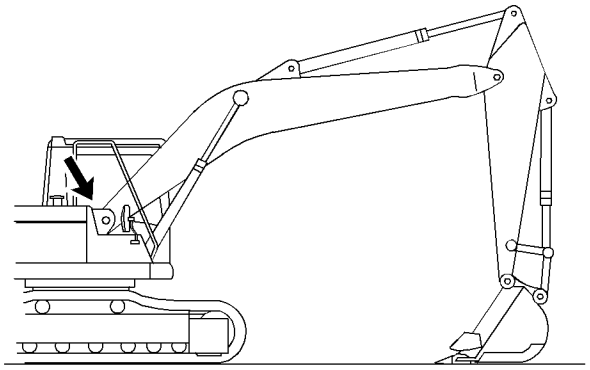


Illustration 408 g02108998

1. Park the machine on a level surface and lower the bucket to the ground.

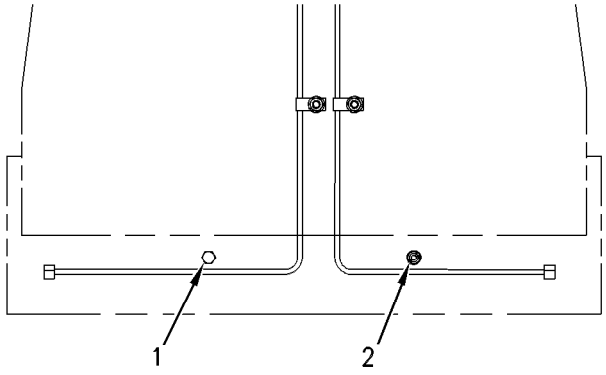


Illustration 409 g00537172

Typical example

(1) Vent plug
(2) Fitting

Note: Vent plug (1) and fitting (2) are on the base of the boom.

2. Remove vent plug (1).

3. Apply lubricant through fitting (2) until lubricant comes out of the plug hole.

4. Install vent plug (1).

i03865613

Boom, Stick and Bucket Linkage - Lubricate

SMCS Code: 6501-086; 6502-086; 6513-086

Note: Caterpillar recommends the use of 5% molybdenum grease for lubricating the boom, stick, and bucket linkage. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more information on molybdenum grease.

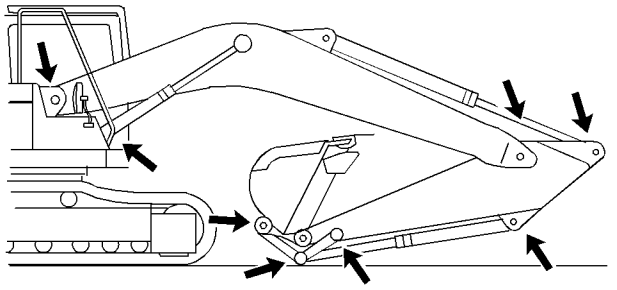


Illustration 410 g02109428

Wipe all fittings before you apply lubricant.

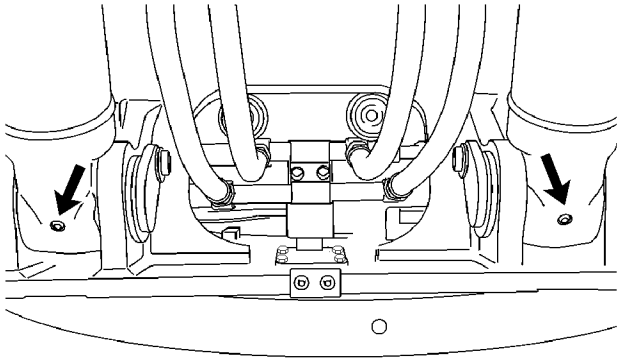


Illustration 411 g01122104

1. Apply lubricant through the fitting at the base of each boom cylinder.

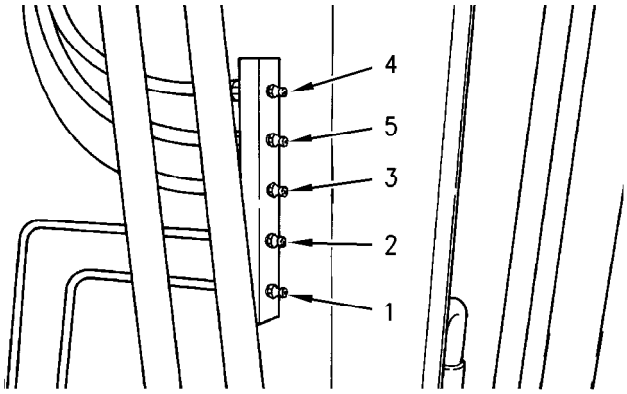


Illustration 412 g00685798

2. The fittings are at the base of the boom. The fittings can be serviced from the platform on the storage box. To lubricate the lower boom bearings, apply lubricant through fittings (1) and (2). To lubricate the boom cylinder rod, apply lubricant through fittings (3) and (4). To lubricate the stick cylinder head, apply lubricant through fitting (5).

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 work tool is suspended. Then apply lubricant when the boom is lowered and the work tool is rested on the ground with a slight downward pressure.

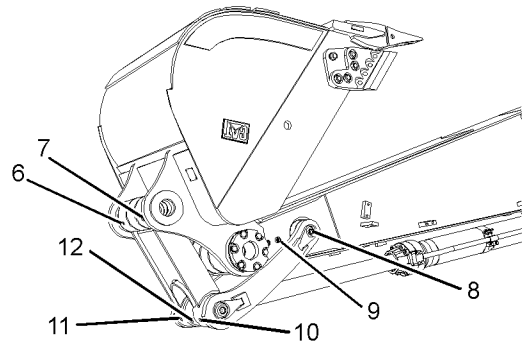


Illustration 413 g01396856

3. Apply lubricant through fittings (6) and (7). These fittings are on the bucket.

4. Apply lubricant through fittings (8) and (9). These fittings are on the stick.

5. Apply lubricant through fittings (10), (11), and (12). These fittings are on the link.

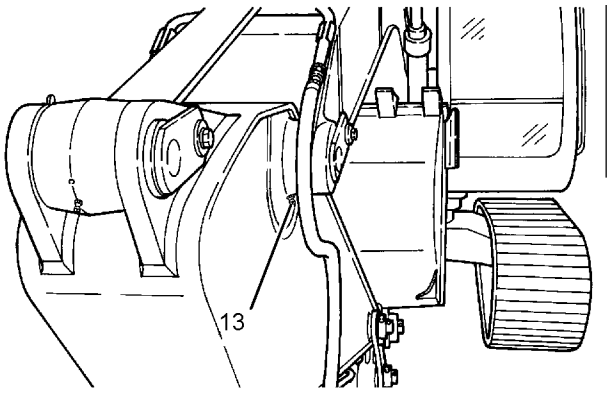


Illustration 414 g01122102

6. Apply lubricant through fitting (13). Fitting (13) is at the connection point of the boom and of the stick.

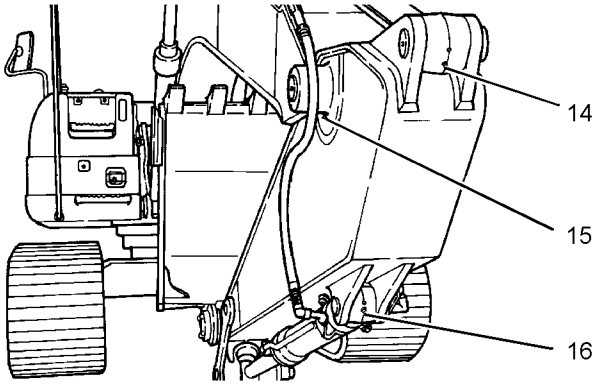


Illustration 415 g01122103

7. Apply lubricant through fitting (14) on the stick cylinder rod. Apply lubricant through fitting (15). Fitting (15) is at the connection point of the boom and of the stick. Apply lubricant through fitting (16) on the bucket cylinder head end.

Grease Block on the Stick

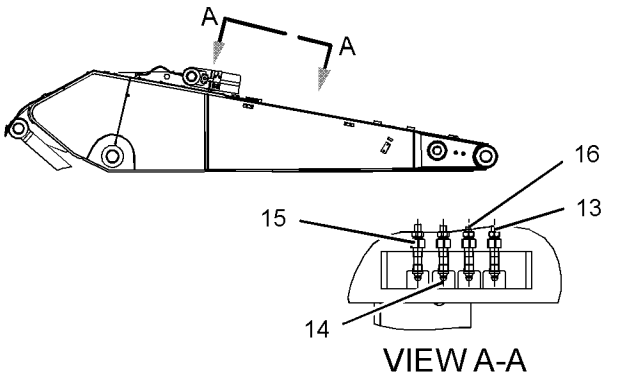


Illustration 416 g01396894

(13) Left side connection point of boom and stick
(14) Stick cylinder rod
(15) Right side connection point of boom and stick
(16) Bucket cylinder head end

Some machines may be equipped with a grease block that is located on the stick. Apply lubricant through the fittings.

i03902571

Bucket Linkage - Inspect/ Adjust

SMCS Code: 6513-040; 6513-025

⚠ WARNING

Unexpected machine movement can cause injury or death.

To avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

NOTICE
Improperly adjusted bucket clearance could cause galling on the contact surfaces of the bucket and stick, resulting in excessive noise and/or damaged O-ring seals.

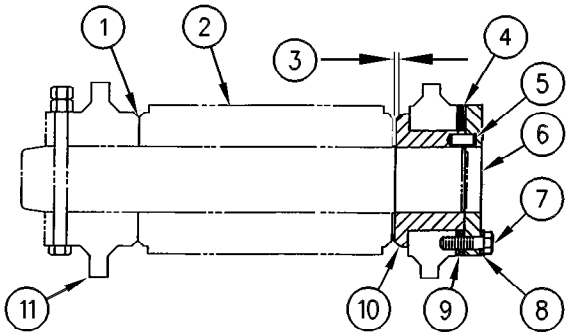


Illustration 417 g00101687

(1) No gap. (2) Stick boss. (3) Bucket clearance. (4) Shims. (5) Pin. (6) Plate. (7) Bolts. (8) Washers. (9) Location. (10) Flange. (11) Bucket boss.

The clearance of the bucket control linkage on this machine can be adjusted by shimming. If the gap between the bucket and the stick becomes excessive, adjust bucket clearance (3) to 0.5 to 1 mm (0.02 to 0.04 inch).

Two shims of different thickness are used at location (9). The thicknesses of the shims are 0.5 mm (0.02 inch) and 1.0 mm (0.04 inch).

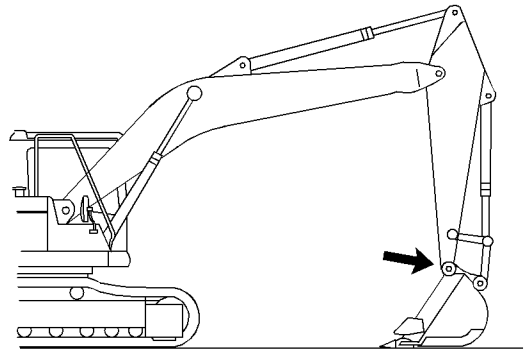


Illustration 418 g02109636

Area for linkage adjustment

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 (2) and the bucket boss (11) are in full face contact at no gap (1). This will help to determine the total clearance of the connection point of the stick and of the bucket.
3. Move the hydraulic lockout control to the LOCKED position. Stop the engine.
4. Measure bucket clearance (3), which is the existing total clearance.

5. Determine the number of shims that need to be removed from shims (4) by using the following calculation:

Subtract 0.5 mm (0.02 inch) or 1.0 mm (0.04 inch) from bucket clearance (3).

6. Remove the appropriate number of shims at location (9) in order to meet the above thickness. Make sure that you use a minimum of three 0.5 mm (0.02 inch) shims. To remove the shims, remove bolts (7), washers (8), and plate (6).

7. After the correct number of shims has been removed and pin (5) is aligned with the pin hole, install plate (6), washers (8), and bolts (7). Tighten bolts (7) to a torque of 240 ± 40 N·m (175 ± 30 lb ft).

8. After installation, make sure that bucket clearance (3) is still correct.

i07089696

Bucket Tips - Inspect/Replace

SMCS Code: 6805-510; 6805-040

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket tips.

Note: In order to maximize the life of the bucket tip and the penetration of the bucket tip, the bucket tip can be rotated.

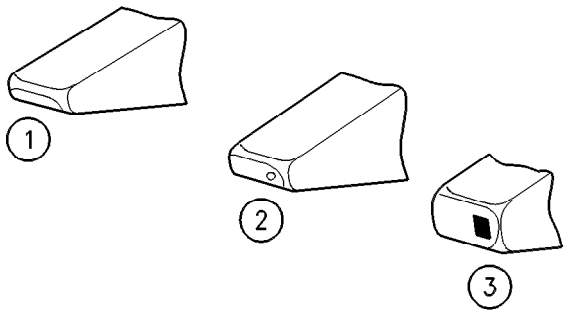


Illustration 419 g00101352

(1) Usable
(2) Replace
(3) Overworn

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal

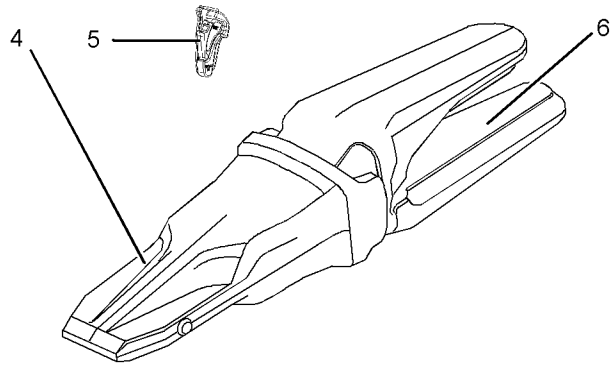


Illustration 420 g01389463

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.

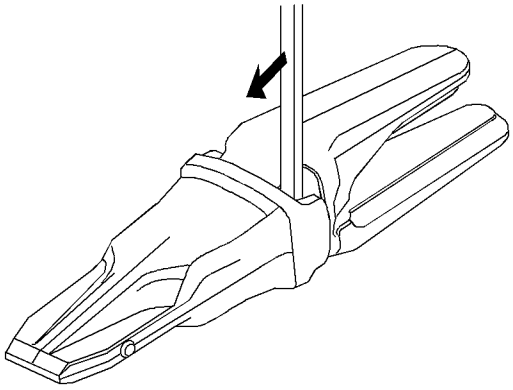


Illustration 421 g01175361

1. Use a pry bar in order to disengage retainer (5).

2. Use the pry bar in order to remove retainer (5) from bucket tip (4).

3. Remove bucket tip (4) from adapter (6) with a slight counterclockwise rotation.

4. Clean adapter (6).

Installation

1. Clean the adapter and the area around the latch, if necessary.

2. Install the new bucket tip onto the adapter with a slight clockwise rotation.

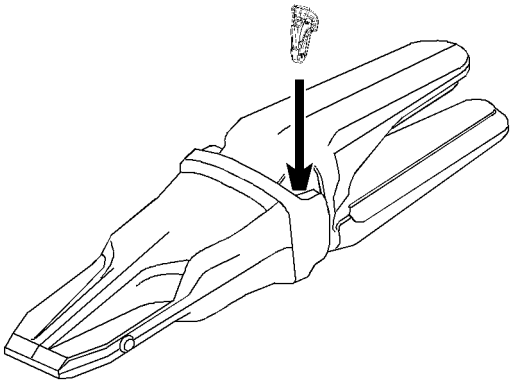


Illustration 422 g01124736

3. Install the retainer. Make sure that the retainer's latch catches under the tip pocket.

4. Make sure that the latch is properly seated by trying to remove the bucket tip.

Bucket Tips (Cat® Advansys) - If Equipped

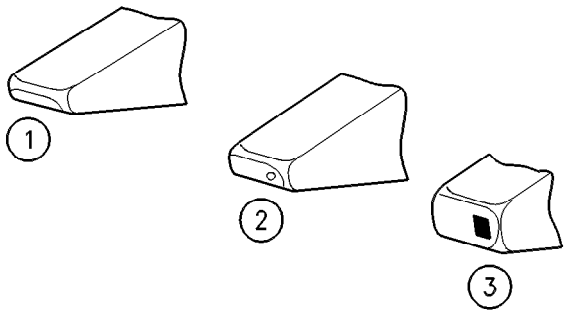


Illustration 423 g00101352

(1) Usable
(2) Removal Procedure
(3) Removal Procedure

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

Removal

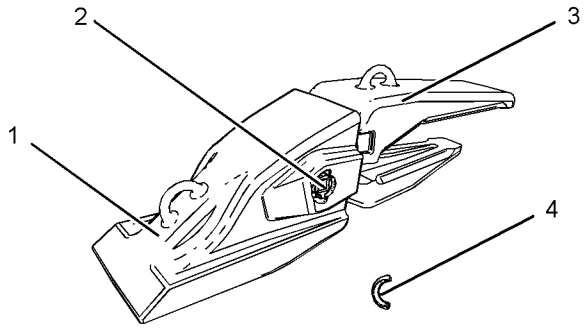


Illustration 424 g03830653

(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).

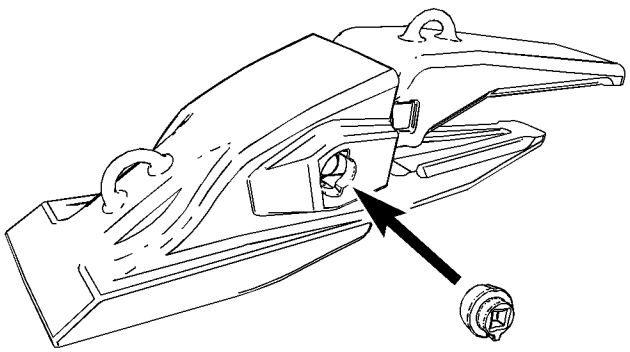


Illustration 425 g03832654

3. Use a 1/2" ratchet to rotate the retainer (2) 180 degrees to the locked position.

Side Cutters (If Equipped)

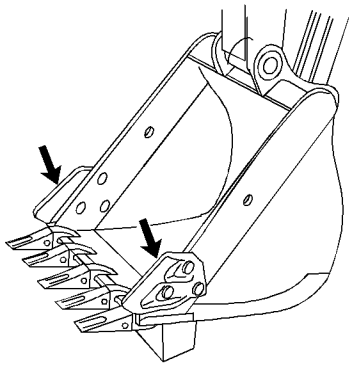


Illustration 426 g01389740

Bucket with side cutters
Side cutters

1. Remove the mounting bolts and the side cutters.

2. Clean the mounting surface of the side plate on the bucket and of the side cutter. Remove any burrs or protrusions on the mating surfaces.

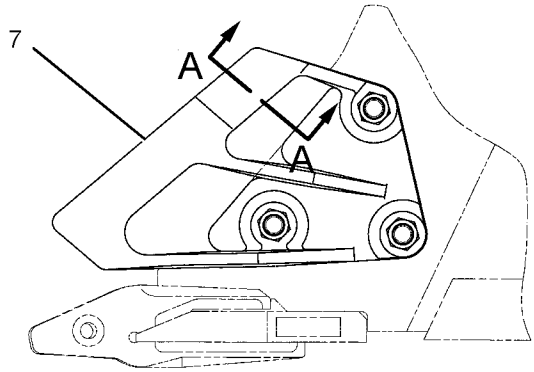


Illustration 427 g01389456

(7) Side cutter

Note: Some side cutters may be rotated for additional wear.

3. Install the side cutter.

Note: Certain bolts may require thread compound.

4. Hand tighten the bolts.

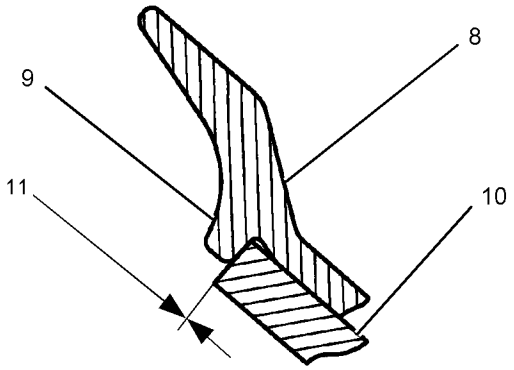


Illustration 428 g01389457

Section A-A From Illustration 427

(8) Side cutter
(9) Shear ledge on a side cutter
(10) Side plate on a bucket
(11) 0.0 mm (0.0 inch)

5. Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.

6. Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

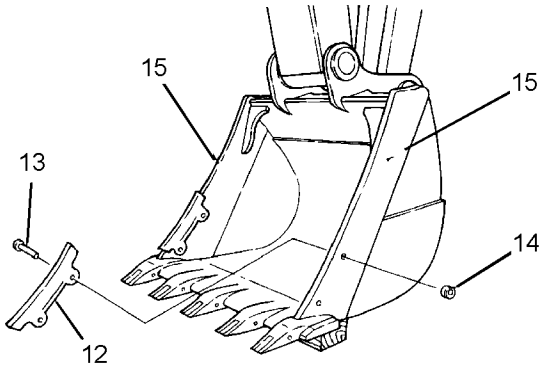


Illustration 429 g01389458

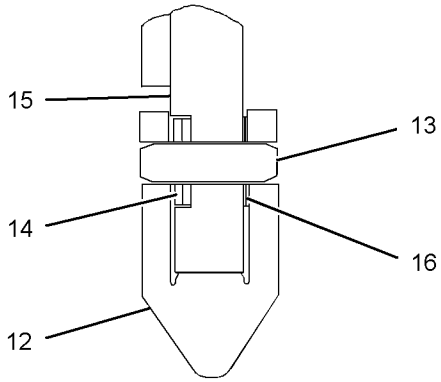


Illustration 430 g01903698

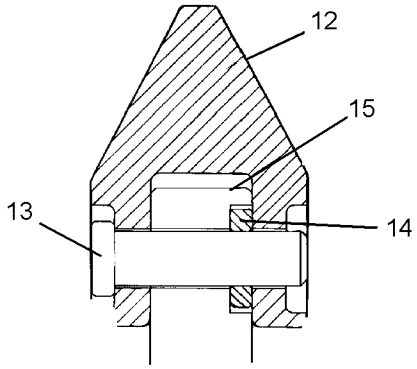


Illustration 431 g01389459

(12) Side protector
(13) Pin
(14) Retainer
(15) Side plate
(16) Shim

1. Hit pin (13) from the side of the bucket without the retainer in order to remove side protector (12) from side plate (15).

2. Clean side protector (12), pin (13), retainer (14) and side plate (15) before installation.

Note: Lateral clearance between the side plate and the side protector should not exceed 1 mm (0.04 inch). Shims (16) may be required in order to decrease the lateral clearance which will decrease movement. Install the shims(16) between the side plate and the side protector on the opposite side of the retainer.

3. Put retainer (14) in side plate (15).

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.

i03901495

Cab Air Filter (Fresh Air) - Clean/Replace

SMCS Code: 7342-070; 7342-510

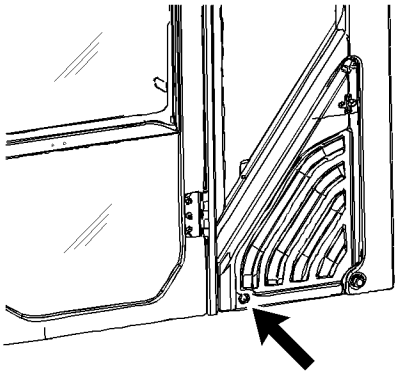


Illustration 432 g01973174

The cab air filter is located on the left side of the cab.

1. Use the ignition key in order to open the access panel.

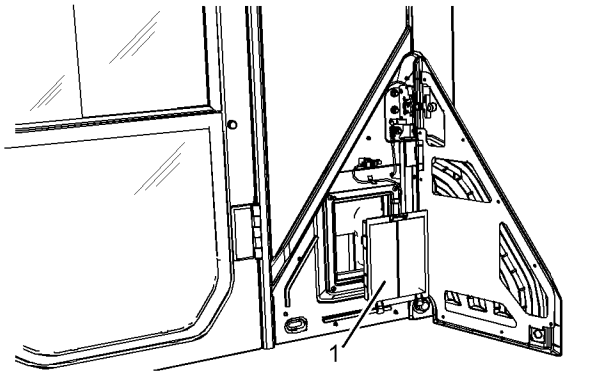


Illustration 433 g02144326

(1) Air filter

2. Remove air filter (1).

3. Clean the air filter with a maximum of 200 kPa (30 psi) pressure air.

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 and the filter cover.

i06587366

Camera - Clean
(If Equipped)

SMCS Code: 7348-070

⚠ WARNING

Failure to use an appropriate external ladder or an appropriate platform for direct access to the cameras could result in slipping and falling which could result in personal injury or death. Be sure to use an appropriate external ladder or an appropriate platform for direct access to the cameras.

The counterweight of the machine and the engine hood of the machine are not approved as maintenance platforms.

⚠ WARNING

Unexpected machine movement can cause injury or death.

In order to avoid possible machine movement, move the hydraulic lockout control to the LOCKED position and attach a Special Instruction, SEHS7332, "Do Not Operate" or similar warning tag to the hydraulic lockout control.

Note: When you access the cameras for cleaning, be sure to observe safe procedures for access. Maintain a three-point contact and/or use a body harness.

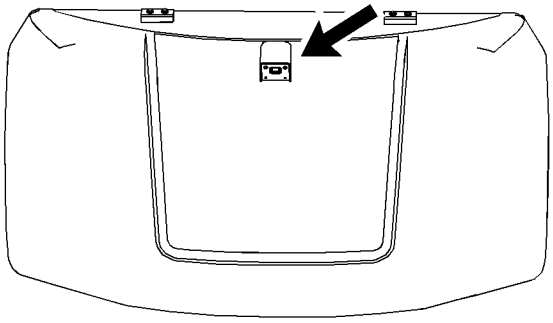


Illustration 434 g02158495

The rear view camera is located on top of the counterweight.



Illustration 435 g06035100

The side view camera is located on top of Fuel Tank.

If necessary, use a damp cloth in order to clean the glass of the camera. The camera is sealed. The camera is not affected by a wash with high-pressure spray.

Note: Alternatively, cameras may be cleaned from ground level by using a wash with a high-pressure spray or a damp rag on a wand.

i04481112

Circuit Breakers - Reset

SMCS Code: 1420-529

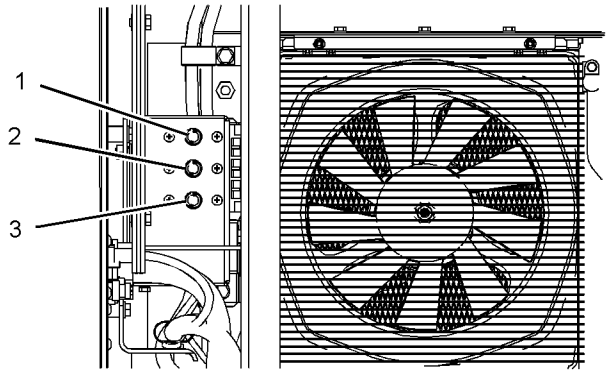


Illustration 436 g02025211

The circuit breaker is located behind the front left access door.

Alternator Circuit (1) – This circuit breaker is designed to protect the alternator. If the batteries are installed with reversed polarity, the circuit breaker would prevent the alternator from damaging the rectifier.

Main Circuit (2) – This circuit breaker is designed to protect the wires between the batteries and the fuses. If the wires are shorted to the machine's body, this circuit breaker would minimize the damage to the wires.

Spare (3) – Spare circuit breaker.

Circuit Breaker Reset – Push in the button in order to reset the circuit breaker. If the electrical system is working properly, the button will remain depressed. If the button does not remain depressed, check the appropriate electrical circuit. Repair the electrical circuit, if necessary.

i03741442

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.

1. Open the front access door on the left side of the machine. The condenser is located behind the cab.

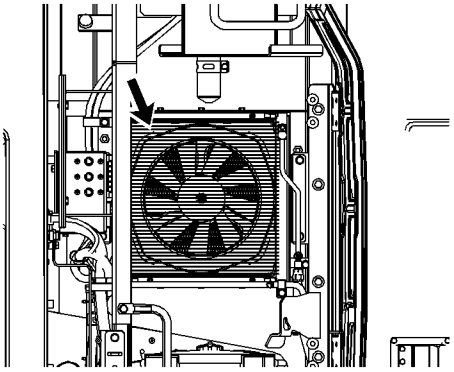


Illustration 437 g02020571

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.

i06906695

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 premixed or concentrate coolants and Caterpillar Extender.

Note: This machine was filled at the factory with Caterpillar Extended Life Coolant.

If the coolant in the machine is changed to Extended Life Coolant from another type of coolant, see Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

1. Unlatch the engine hood and raise the engine hood.

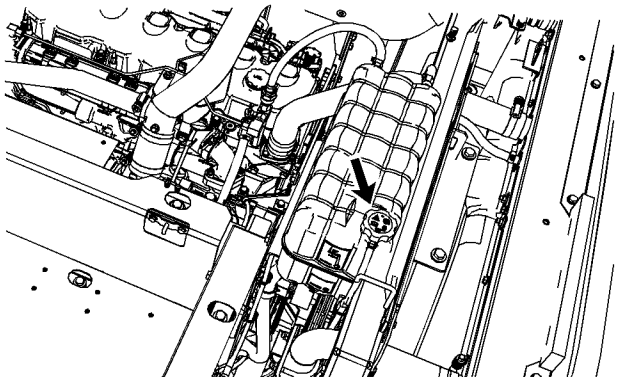


Illustration 438 g02019833

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 o-ring of the cooling system pressure cap. If the o-ring is damaged, replace the pressure cap.

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

5. Open the rear access door on the left side of the machine.

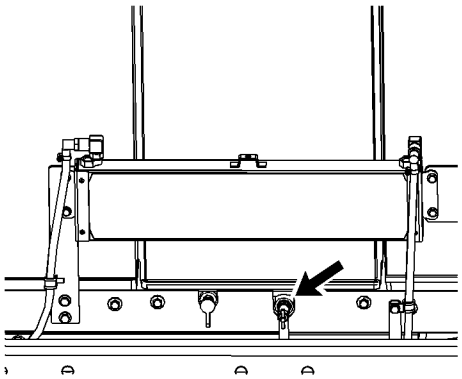


Illustration 439 g02019836

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.

7. Flush the cooling system. Follow Step 7a through Step 7h to flush the cooling system.

a. Close the drain valve.

b. Fill the cooling system with clean water.

c. Install the pressure cap.

NOTICE
Do not run the engine with plain water in the cooling system for more than 5 min. The water may vaporize and trapped air may damage the NRS cooler.

d. Start the engine and run the engine until the engine reaches operating temperature.

e. Stop the engine and allow the engine to cool.

f. Loosen the pressure cap slowly to relieve any pressure in the cooling system.

g. Open the drain valve that is on the bottom of the radiator and allow the coolant to drain into a suitable container.

h. Flush the radiator with clean water until the draining water is transparent.

8. Close the drain valve.

9. Add the Extended Life Coolant. Refer to the following topics:

- Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Operation and Maintenance Manual, “Capacities (Refill)”

10. After the cooling system has been filled, perform the following procedures during initial start-up:

a. Start the engine without the filler cap.

b. Run the engine at low idle for 10 minutes.

c. Then, increase the engine speed to a high idle until the water temperature regulator is open and the coolant level is stabilized.

d. Maintain the coolant at the proper level as the water temperature regulator opens, and the air is purged from the cooling system and NRS cooler. Refer to Operation and Maintenance Manual, “Cooling System Coolant Level - Check”.

11. Install the cooling system pressure cap.

12. Stop the engine.

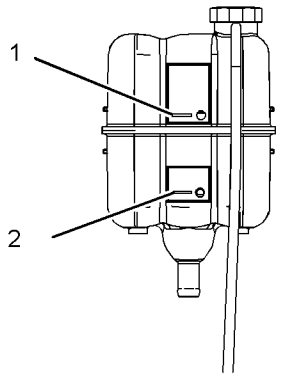


Illustration 440 g02019838

(1) “FULL”
(2) “LOW”

13. Check the coolant reservoir. Maintain the coolant level between “FULL” mark (1) and “LOW” mark (2).

14. If additional coolant is necessary, remove the pressure cap and add the appropriate coolant solution.

15. Install the pressure cap.

16. Close the engine hood and latch the engine hood. Close the left access door.

i04054670

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 Caterpillar Extended Life Coolant (ELC) when you add coolant to the cooling system. See Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for all cooling system requirements.

Use a Coolant Conditioner Test Kit in order to check the concentration of the coolant.

NOTICE
Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for premixed or concentrate coolants and Caterpillar Extender.

Note: This machine was filled at the factory with Caterpillar Extended Life Coolant.

1. Park the machine on level ground.

2. Stop the engine.

3. Unlatch the engine hood and raise the engine hood.

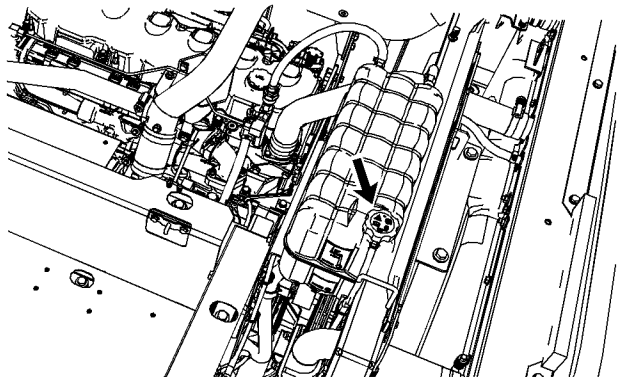


Illustration 441 g02019833

4. Make sure that the cooling system has cooled down. Loosen the cooling system pressure cap slowly in order to relieve system pressure. Remove the pressure cap.

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

5. It may be necessary to drain some coolant from the radiator so that Caterpillar Extender can be added to the cooling system.

Note: Always discard drained fluids according to local regulations.

6. Add Caterpillar Extended Life Coolant (ELC) to the cooling system. Refer to the following topics for the proper amount of Caterpillar Extender:

- Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Operation and Maintenance Manual, “Capacities (Refill)”

7. Inspect the o-ring of the cooling system pressure cap. If the o-ring is damaged, replace the pressure cap.

8. Install the cooling system pressure cap.

9. Close the engine hood and latch the engine hood.

i05196273

Cooling System Coolant Level - Check

SMCS Code: 1350-040; 1350-535-FLV; 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.

Note: Your machine may be equipped with an automated function for checking fluid levels. Refer to Operation and Maintenance Manual, “Monitoring System” regarding the automated system.

1. Unlatch the engine hood and raise the engine hood.

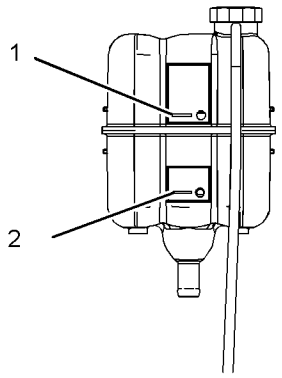


Illustration 442 g02019838

(1) “FULL” level
(2) “LOW” level

2. Check the coolant level of the coolant reservoir when the engine is cold. Maintain the coolant level between the “FULL” mark and the “LOW” mark. If the coolant reservoir is empty, follow Steps 2a through 2g.

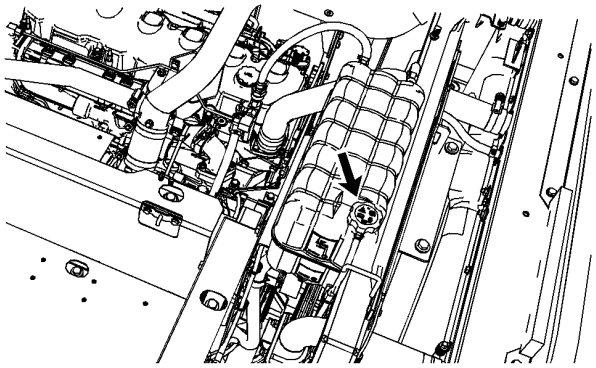


Illustration 443 g02019833

a. Slowly loosen the cooling system pressure cap in order to relieve system pressure. Remove the pressure cap.

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

b. Add the appropriate coolant solution to the cooling system. Refer to the following topics:

- Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”
- Operation and Maintenance Manual, “Capacities (Refill)”

c. Start the engine. Operate the engine without the cooling system pressure cap until the water temperature regulator opens and the coolant level stabilizes.

d. Inspect the condition of the o-ring on the pressure cap. If the o-ring is damaged, replace the pressure cap.

e. Install the cooling system pressure cap.

f. Stop the engine.

g. Close the engine hood and latch the engine hood.

i04381184

Cooling System Coolant Sample (Level 1) - Obtain

SMCS Code: 1395-554; 1395-008; 7542

⚠ WARNING

Personal injury can result from hot coolant, steam and alkali.

At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.

Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.

Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.

Note: It is not necessary to obtain a Coolant Sample (Level 1) if the cooling system is filled with Cat ELC (Extended Life Coolant). Cooling systems that are filled with Cat ELC should have a Coolant Sample (Level 2) that is obtained at the recommended interval that is stated in the Maintenance Interval Schedule.

Note: Obtain a Coolant Sample (Level 1) if the cooling system is filled with any other coolant instead of Cat ELC. This includes the following types of coolants.

- Commercial long life coolants that meet the Caterpillar Engine Coolant Specification -1 (Caterpillar EC-1)
- Cat Diesel Engine Antifreeze/Coolant (DEAC)
- Commercial heavy-duty coolant/antifreeze

NOTICE
Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat ® products.

Dispose of all fluids according to local regulations and mandates.

Note: Level 1 results may indicate a need for Level 2 Analysis.

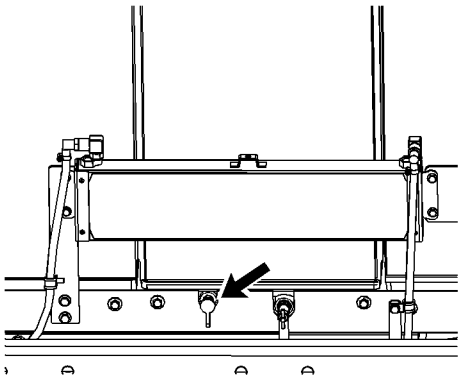


Illustration 444 g02020754

Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of S·O·S analysis, establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.

- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Obtain the coolant sample while the engine is running.
- Obtain the coolant sample while the coolant is at operating temperature.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

For additional information about coolant analysis, see Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Cat dealer.

i07349178

Cooling System Coolant Sample (Level 2) - Obtain

SMCS Code: 1395-008; 1395-554; 7542

Reference: Refer to Operation and Maintenance Manual, “Cooling System Coolant Sample (Level 1) - Obtain” for the guidelines for proper sampling of the coolant.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Cat dealer.

Submit the sample for Level 2 analysis.

Reference: For additional information about coolant analysis, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Cat dealer.

i03591653

Counterweight Removal Chain - Clean
(If Equipped)

SMCS Code: 7056-070-CX

S/N: BZ21–Up

S/N: KEA1–Up

S/N: NDC1–Up

S/N: A9J1–Up

⚠ WARNING

Proper operation of the Counterweight Removal System depends on a properly lubricated counterweight chain. If the chain is not lubricated properly, the chain may rust and seize during the removal operation. A seized chain can fracture and result in complete failure of the chain. The counterweight can then suddenly fall which can result in personal injury or death.

Use an approved ladder or platform when lubricating the upper portion of the chain.

If seizure of the chain occurs during counterweight removal, stop the operation of the counterweight removal system and contact your nearest dealer for chain replacement.

The counterweight removal chain must be clean and free from rust. A chain with dirt or rust cannot be wound correctly.

1. If necessary, remove the entire chain assembly in order to properly clean the chain assembly of rust and foreign contaminants.
2. Clean the chain assembly with a clean, nonflammable solvent and a wire brush.
3. Allow the chain assembly to dry. Lubricate the counterweight removal chain. Refer to Operation and Maintenance Manual, “Counterweight Removal Chain - Lubricate” for the proper procedure.
4. If the chain assembly was removed, install the chain assembly.

Note: Always clean the chain of rust and foreign contaminants.

i03481843

Counterweight Removal Chain - Inspect
(If Equipped)

SMCS Code: 7056-040-CX

S/N: BZ21–Up

S/N: KEA1–Up

S/N: NDC1–Up

S/N: A9J1–Up

⚠ WARNING

Proper operation of the Counterweight Removal System depends on a properly lubricated counterweight chain. If the chain is not lubricated properly, the chain may rust and seize during the removal operation. A seized chain can fracture and result in complete failure of the chain. The counterweight can then suddenly fall which can result in personal injury or death.

Use an approved ladder or platform when lubricating the upper portion of the chain.

If seizure of the chain occurs during counterweight removal, stop the operation of the counterweight removal system and contact your nearest dealer for chain replacement.

The counterweight removal chain must be clean and free from rust. A chain with dirt or rust cannot be wound correctly.

1. Inspect the chain.

2. Make sure that the chain is properly lubricated.

3. Make sure that the chain is free of defects, rust, or foreign contaminants.

i03591620

Counterweight Removal Chain - Lubricate
(If Equipped)

SMCS Code: 7056-086-CX

S/N: BZ21–Up

S/N: KEA1–Up

S/N: NDC1–Up

S/N: A9J1–Up

⚠ WARNING

Proper operation of the Counterweight Removal System depends on a properly lubricated counterweight chain. If the chain is not lubricated properly, the chain may rust and seize during the removal operation. A seized chain can fracture and result in complete failure of the chain. The counterweight can then suddenly fall which can result in personal injury or death.

Use an approved ladder or platform when lubricating the upper portion of the chain.

If seizure of the chain occurs during counterweight removal, stop the operation of the counterweight removal system and contact your nearest dealer for chain replacement.

The counterweight removal chain must be clean and free from rust. A chain with dirt or rust cannot be wound correctly.

1. Inspect the chain.

2. Remove any foreign material and rust from the chain.

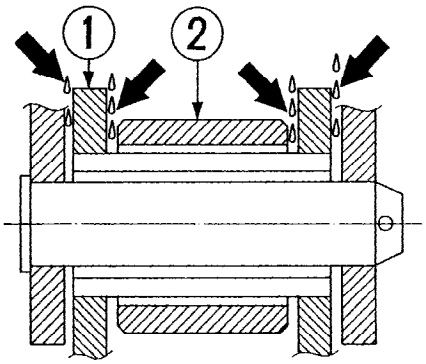


Illustration 445 g00115489

(1) Link plate edge. (2) Roller.

3. Lubricate the surfaces between each link plate edge (1) and roller (2) with SAE 30 engine oil.

Note: Always lubricate the chain during removal of the counterweight, after the counterweight is lowered to the blocks on the ground.

i08057952

DEF Filler Screen - Clean ((Emission Related Component))

SMCS Code: 108K-070-Z3

NOTICE
Ensure that the engine is stopped before any servicing or repair is performed.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Cat Dealer Service Tool Catalog” or refer to Special Publication, PECJ0003, “Cat Shop Supplies and Tools Catalog” for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

The filler neck adapter filter screen in the diesel exhaust fluid tank will need to be cleaned or replaced if contaminated.

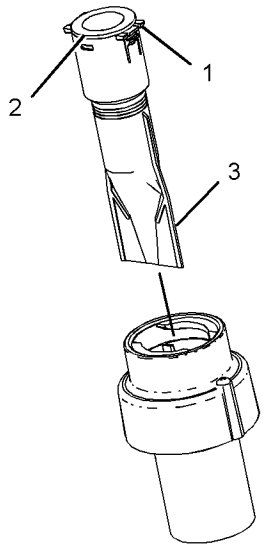


Illustration 446 g03618438

1. Use a screwdriver or pick to press the tabs (1).

2. Pull the screen assembly (2) upward from both sides and remove from the fill neck adapter

3. Use water or compressed air to clean out the filter screen (3). If there is any debris inside, let dry and remove the debris by turning the screen upside down and dumping debris out. If the debris cannot be removed or the filter screen is damaged, replace the filler neck adapter filter screen.

i07443771

DEF Manifold Filters - Replace (Emission Related Component)

SMCS Code: 108K-510-FI

NOTICE
Ensure that the engine is stopped before any servicing or repair is performed.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Cat Dealer Service Tool Catalog” or refer to Special Publication, PECJ0003, “Cat Shop Supplies and Tools Catalog” for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Note: Refer to Special Instruction, REHS8231, “Removal Procedures for Diesel Exhaust Fluid (DEF) Connectors” for the correct removal procedure of hose assemblies (1) and (5).

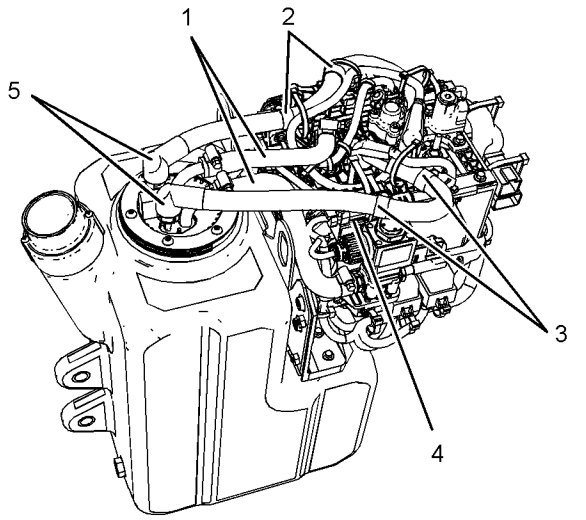


Illustration 447 g03662693

Typical Example

1. Clamp off hoses (1).

2. Remove clips (2) and (3). Disconnect harness assemblies (4). Remove hose assemblies (1) and (5).

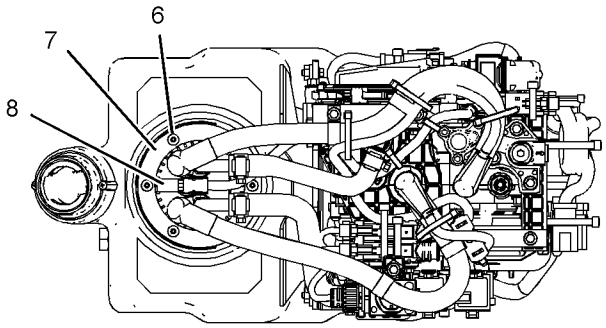


Illustration 448 g03665701

Typical Example

3. Remove bolts (6), plate (7), tank manifold (8), and gasket (not shown).

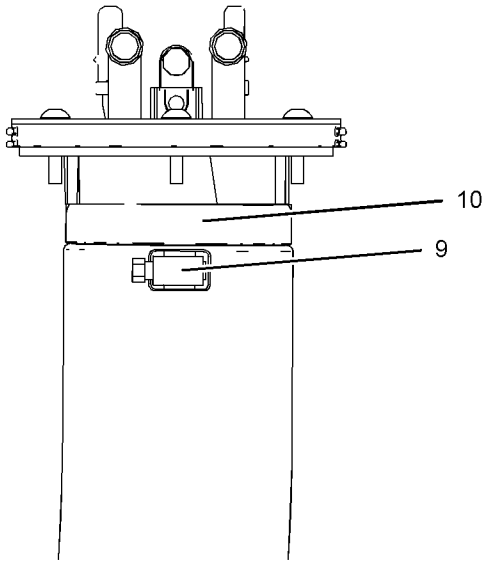


Illustration 449 g03665737

4. Unscrew the band clamp (9) and remove the band clamp from the filter base (10).

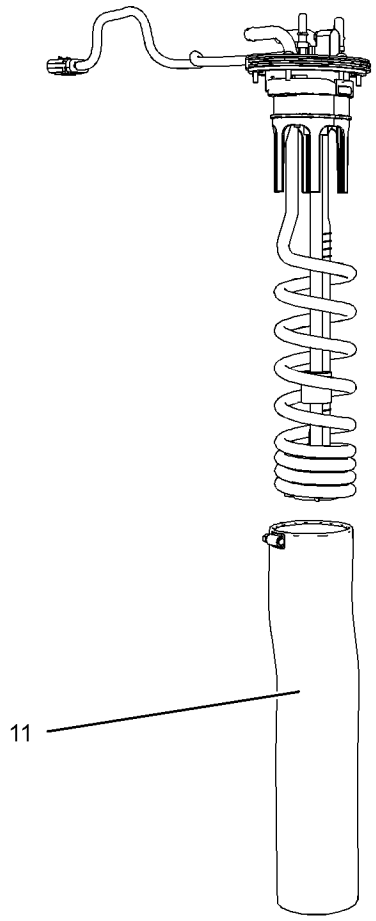


Illustration 450 g03664911

5. Remove the filter (11) from the filter base.

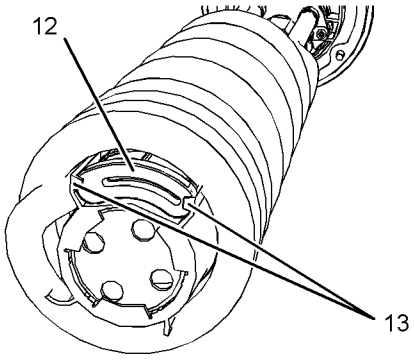


Illustration 451 g03666075

6. Remove the suction filter (12) at the bottom of the header coils by pulling tabs (13). Replace with a new suction filter.

7. Install new filter by pulling filter over the manifold coils up to the bottom of the assembled filter base.

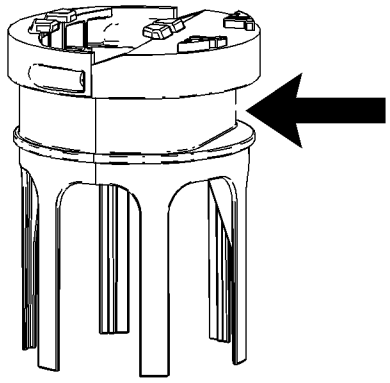


Illustration 452 g03665754

8. Tighten the band clamp 4.5 ± 0.7 N·m (40 ± 6 lb in), ensuring that the band clamp is aligned, as shown in illustration 452 , to the flat spot on the base. Ensure that the filter does not bunch when tightening the band clamp.

9. Install the tank manifold following steps 3 through 5 in reverse order with a new gasket.

10. Tighten bolts (6) in an alternating sequence to 5 ± 1 N·m (44 ± 9 lb in). Tighten bolts (6) a second time in an alternating sequence to 5 ± 1 N·m (44 ± 9 lb in). Apply rubber lubricant to the o-ring seal inside of hose assemblies (1).

i07143042

Diesel Exhaust Fluid - Fill

SMCS Code: 108K-544

Note: Stop the engine and turn the key to the OFF position before filling the DEF tank. Failure to stop the engine may cause fault codes.

Refer to Operation and Maintenance Manual, “Selective Catalytic Reduction Warning System” for more information.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

Reference: See Operation and Maintenance Manual, “Capacities (Refill)” for the capacity of the DEF tank for your machine.

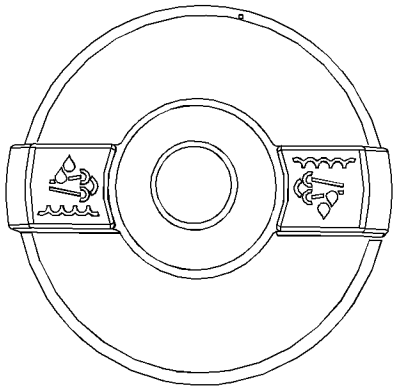


Illustration 453 g03746390

Blue DEF Tank Filler Cap

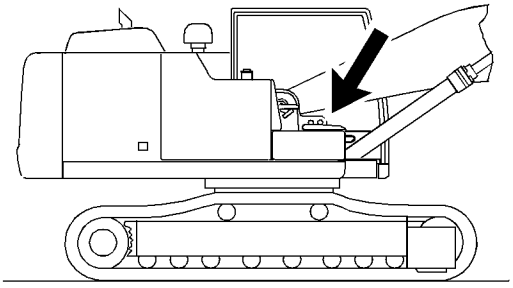


Illustration 454 g03419017

The DEF tank is located inside the storage box on the right side of the machine.

1. Clean the blue DEF tank filler cap and the surrounding area.

2. Remove the blue DEF tank filler cap.

3. Fill the tank with diesel exhaust fluid (DEF).

Note: Do not fill the DEF tank from a contaminated container or funnel.

Note: Do not over fill the tank. DEF can freeze and needs room for expansion.

4. Install the blue DEF tank filler cap.

Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for more information on diesel exhaust fluid (DEF) guidelines.

i05751008

Diesel Exhaust Fluid Filter - Replace

SMCS Code: 108K-510-FI

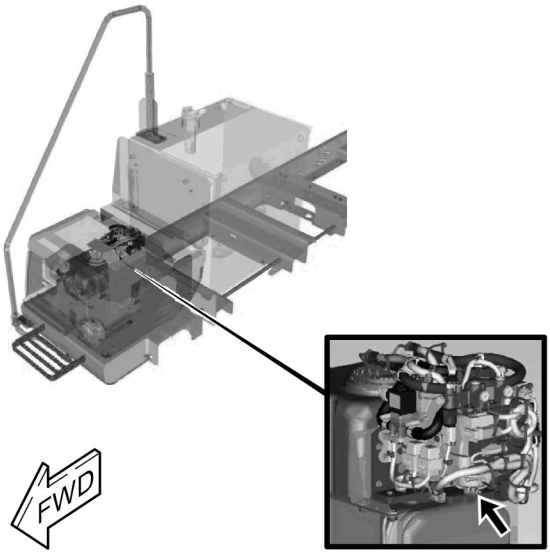


Illustration 455 g03650779

The Diesel Exhaust Fluid (DEF) filter is located on the DEF tank. The DEF tank is located next to the storage box on the right side of the machine.

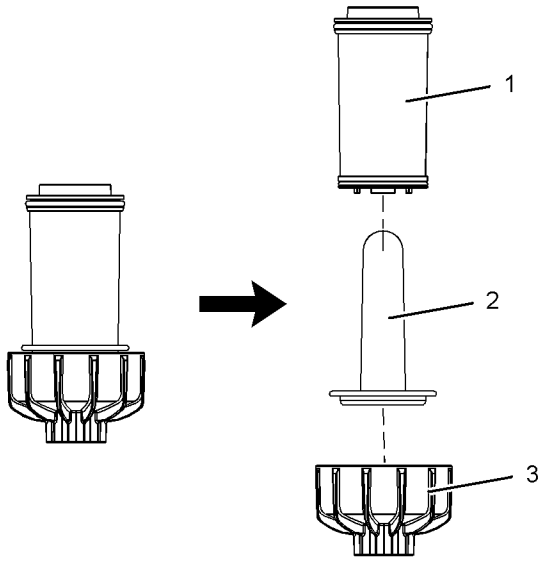


Illustration 456 g03332612

Typical Example

NOTICE
Ensure that the engine is stopped before any servicing or repair is performed.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Cat Dealer Service Tool Catalog” or refer to Special Publication, PECJ0003, “Cat Shop Supplies and Tools Catalog” for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

1. Remove the diesel exhaust fluid (DEF) filter cap (3) with a 27 mm (1.06 inch) wrench.

2. Remove the rubber cone insert (2) from the DEF filter (1).

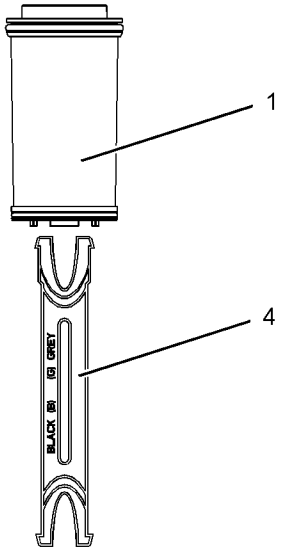


Illustration 457 g03332637
Typical Example

3. Insert the DEF filter removal tool (4) into the DEF filter (1) and remove the DEF filter (1).

Note: Wear gloves when you handle the DEF filter removal tool (4).

4. Clean the area around the filter housing.

5. Apply a thin coat of 207 - 1601 Lubricant to the seals of the new DEF filter (1).

6. Install new DEF filter (1) and rubber cone insert. Torque the filter to 20 ± 5 N·m (14.8 ± 3.7 lb ft) with a 27 mm (1.06 inch) wrench.

i07400077

Diesel Exhaust Fluid Injector - Replace
(Emission Related Component)

SMCS Code: 108I-510

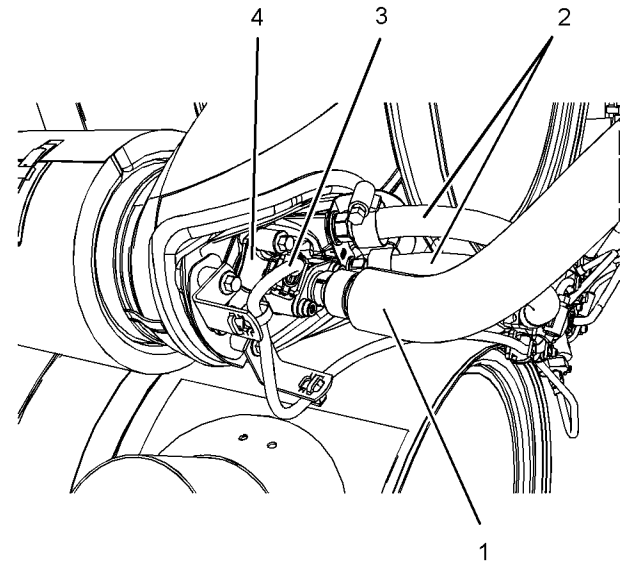


Illustration 458 g03363165
Typical example shown

1. Remove the diesel exhaust fluid (DEF) line (1) from the injector (4).

2. Remove the coolant lines (2) from the injector.

3. Remove the electrical connector (3) from the injector.

4. Remove the bolts from the injector and remove the injector.

5. Replace gasket. The steel side of the gasket should face towards diesel particulate filter (DPF) outlet.

6. Replace the injector.

7. Apply anti-seize to bolt threads.

8. Torque the bolts of the injector to 5 N·m (3.7 lb ft). Retighten all bolts to 5 N·m (3.7 lb ft), then turn 90°.

9. Connect the electrical connector.

10. Connect the coolant lines.

11. Connect the DEF line.

i07400083

Diesel Particulate Filter - Clean (Emission Related Component)

SMCS Code: 108F-070; 1091-070

Consult your Cat dealer when the DPF needs to be cleaned.

The approved Caterpillar DPF maintenance procedure requires that one of the following actions be taken when the DPF needs to be cleaned:

- The DPF from your machine can be replaced with a new DPF
- The DPF from your machine can be replaced with a remanufactured DPF
- The DPF from your machine can be cleaned by your local authorized Cat dealer, or a Caterpillar approved DPF cleaning machine, and reinstalled

Note: To maintain emissions documentation, the DPF that is removed from the machine when the DPF is cleaned must be reinstalled on the same machine.

Note: A specific ash service regeneration must be performed before removing a DPF that will be cleaned. All three scenarios listed above require a reset of the ash monitoring system in the engine ECM.

i05770381

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-510; 1054-070

Check the primary filter if a message or a warning is displayed on the monitor display.

1. Open the front access door on the left side of the machine.

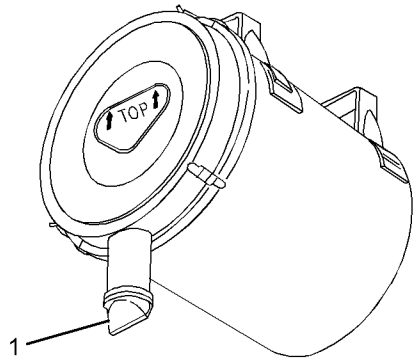


Illustration 459 g01266485

2. Squeeze the outlet tube (1) slightly in order to purge the dirt from the outlet tube.

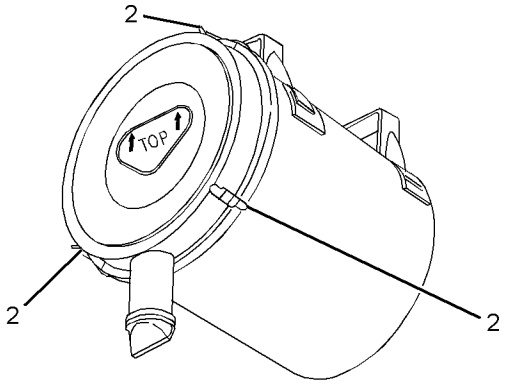


Illustration 460 g01266486

3. Loosen the cover latches (2) and remove the air cleaner cover.

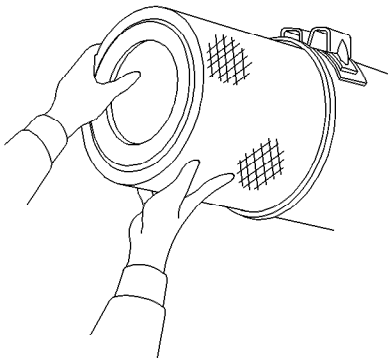


Illustration 461 g00101415

4. Remove the primary filter element from the air cleaner housing.

5. Clean the air cleaner cover and the inside of the air cleaner housing.

6. Inspect the O-ring seal on the air cleaner cover. Replace the O-ring seal if the O-ring seal is worn or damaged.

7. Install the clean primary filter.

Note: Refer to “Cleaning Primary Air Filter Elements”.

8. Install the air cleaner cover and close the latches securely.



Illustration 462 g00101416

Note: Install the air cleaner cover properly. The arrows must point upward.

9. Replace the filter if the “Restricted Air Filter ” indicator on the monitor display still comes on.

10. Close the access door.

Cleaning Primary Air Filter Elements

NOTICE
Caterpillar recommends certified air filter cleaning services available at participating Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

When the primary air filter element is cleaned, check for rips or tears in the filter material. Replace the primary air filter element after the primary air filter element has been cleaned six times. The primary air filter element should be replaced at least one time per year. This replacement should be performed regardless how many times the filter was cleaned.

NOTICE
Do not clean the air filter elements by bumping or tapping. This could damage the seals. Do not use elements with damaged pleats, gaskets, or seals. Damaged elements will allow dirt to pass through. Engine damage could result.

Visually inspect the primary air filter elements before cleaning. Inspect the air filter elements for damage to the seal, the gaskets, and the outer cover. Discard any damaged air filter elements.

There are two common methods that are used to clean primary air filter elements:

- Pressurized air
- Vacuum cleaning

Pressurized Air

Pressurized air can be used to clean primary air filter elements that have not been cleaned more than two times. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

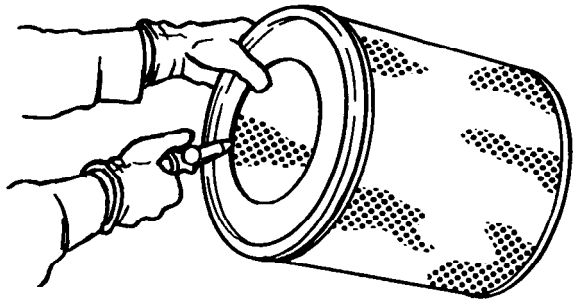


Illustration 463 g00281692

Note: When the primary air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Aim the hose so that the air flows inside the element along the length of the filter in order to help prevent damage to the paper pleats. Do not aim the stream of air directly at the primary air filter element. Dirt could be forced further into the pleats.

Vacuum Cleaning

Vacuum cleaning is another method for cleaning primary air filter elements which require daily cleaning because of a dry, dusty environment. Cleaning with pressurized air is recommended prior to vacuum cleaning. Vacuum cleaning will not remove deposits of carbon and oil.

Inspecting the Primary Air Filter Elements

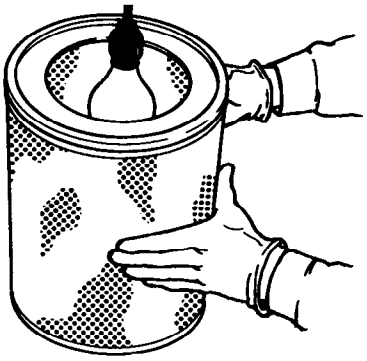


Illustration 464 g00281693

Inspect the clean, dry primary air filter element. Use a 60 W blue light in a dark room or in a similar facility. Place the blue light in the primary air filter element. Rotate the primary air filter element. Inspect the primary air filter element for tears and/or holes. Inspect the primary air filter element for light that may show through the filter material. If necessary, compare the primary air filter element to a new primary air filter element that has the same part number.

Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets, or seals. Discard damaged primary air filter elements.

Storing Primary Air Filter Elements

If a primary air filter element that passes inspection will not be used, the primary air filter element can be stored for future use.

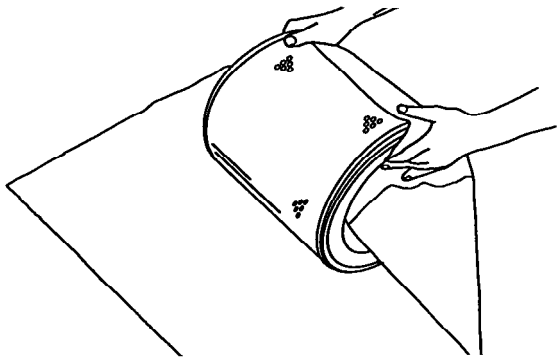


Illustration 465 g00281694

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An air flow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the primary air filter element into a box for storage. For identification, mark the outside of the box and mark the primary air filter element. Include the following information:

- The date that the filter was cleaned
- Number of times the filter has been cleaned

Store the box in a dry location.

i05770379

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510

NOTICE
Always replace the secondary filter element. Never attempt to reuse the secondary filter element by cleaning the element.

When the primary filter element is replaced, the secondary filter element should be replaced.

The secondary filter element should also be replaced if the air filter restriction warning appears on the message display after the installation of a clean primary filter element.

1. Open the access door on the front left side of the machine.
2. See Operation and Maintenance Manual, “Engine Air Filter Primary Element - Clean/Replace”. Remove the air cleaner cover from the air cleaner housing. Remove the primary filter element from the air cleaner housing.

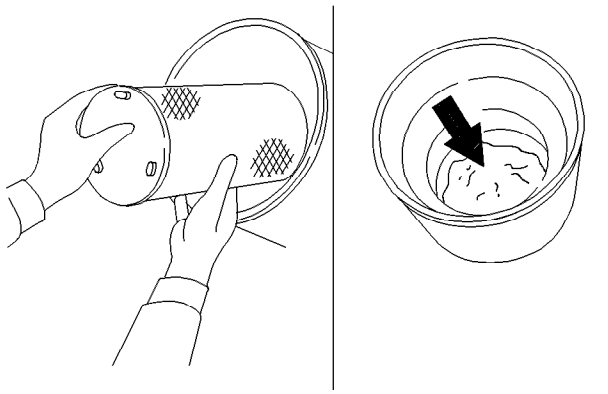


Illustration 466 g00101451

3. Remove the secondary filter element.
4. Cover the air inlet opening. Clean the inside of the air cleaner housing.
5. Remove the cover from the air inlet opening.
6. Install the new secondary filter element.
7. Install the primary filter element.
8. Install the air cleaner cover and close the latches securely.
9. Close the access door.

i03866257

Engine Oil Level - Check

SMCS Code: 1000-535

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

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

NOTICE
Do not overfill the crankcase. Engine damage can result.

Note: This machine is equipped with both an automated function for checking fluid levels and a dipstick. Refer to Operation and Maintenance Manual, “Monitoring System” regarding the automated system. If the machine is on an incline or the engine has been stopped only for a short time, then the engine oil does not return to the crankcase and the fluid level cannot be properly checked by either method. Park the machine on level ground and check the oil level after the engine has been stopped for at least 30 minutes.

Check the oil level while the engine is stopped. Do not check the oil level while the engine is running.

1. Open the engine hood.

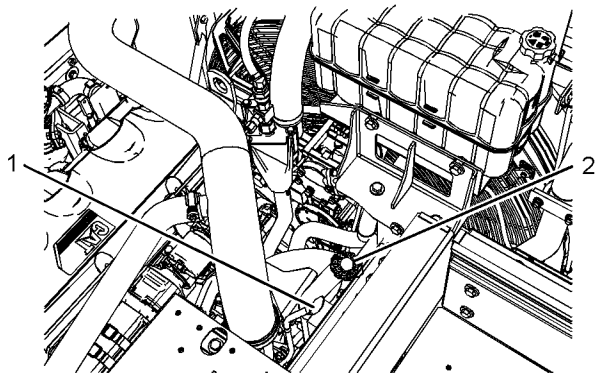


Illustration 467 g02109834

(1) Dipstick
(2) Oil filler plug

2. Remove dipstick (1). Wipe the oil off the dipstick and reinsert the dipstick.

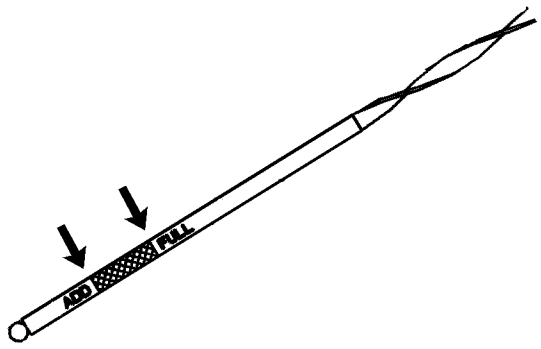


Illustration 468 g02109835

3. Remove the dipstick and check the dipstick. The oil level should be between the “FULL” mark and the “ADD” mark.

NOTICE
Do not fill above the “FULL” mark on the dipstick.

If the oil level is above the “FULL” Mark, the crankshaft might dip into the oil during engine operation. This will lead to excessively high oil temperatures. High oil temperatures can reduce the lubricating characteristics of oil.

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

4. Remove oil filler plug (2) in order to add oil, if necessary. See Operation and Maintenance Manual, “Lubricant Viscosities”.

Note: If the oil is deteriorated or badly contaminated, change the oil regardless of the maintenance interval.

5. Clean the oil filler plug. Install the oil filler plug.

6. Close the engine hood.

i03866334

Engine Oil Sample - Obtain

SMCS Code: 1000-008; 1000; 1348-008; 1348-554-SM; 7542-554-OC; 7542-008; 7542-554-SM

Open the access door on the right side of the machine in order to access the sampling valve.

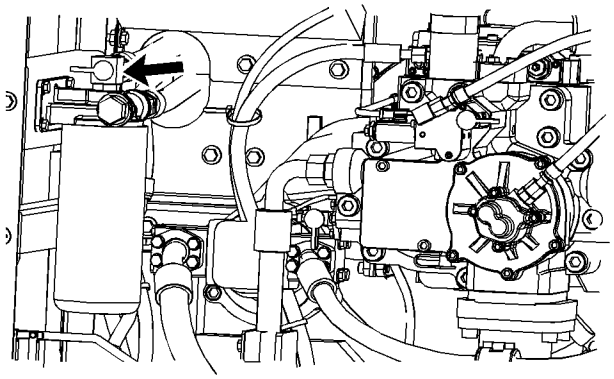


Illustration 469 g01129870

The sampling valve for the engine oil is located on the top of the engine oil filter.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” “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.

i05066669

Engine Oil and Filter - Change

SMCS Code: 1318-510

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

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

Park the machine on a level surface and engage the parking brake. Stop the engine.

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.

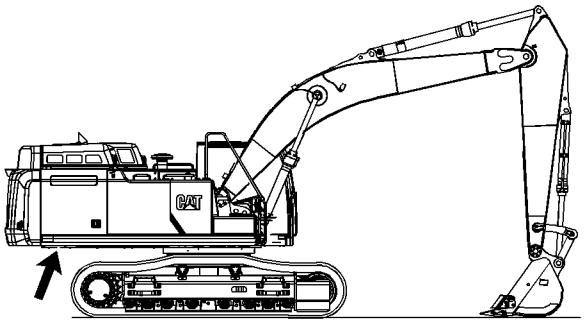


Illustration 470 g02114034

The crankcase drain valve is located under the rear of the upper structure.

1. Remove the bolts and the washers. Open the crankcase drain valve access cover.

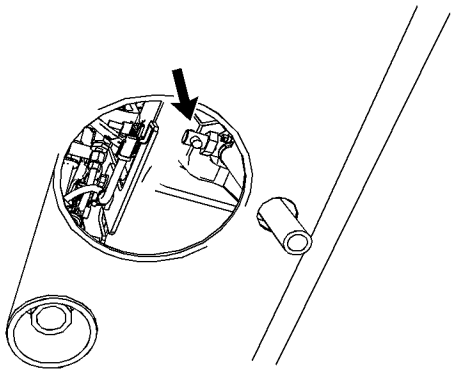


Illustration 471 g02114173

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

2. Open the crankcase drain valve. Allow the oil to drain into a suitable container.

Note: Dispose of drained fluids according to local regulations.

3. Close the drain valve.

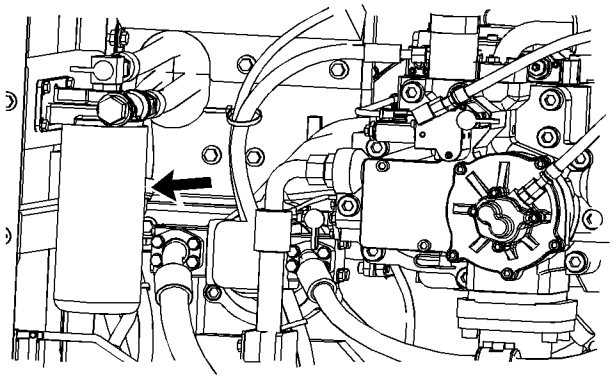


Illustration 472 g01129934

4. Open the access door on the left side of the machine.

5. Remove the oil filter with a strap type wrench. See Operation and Maintenance Manual, “Oil Filter - Inspect”.

Note: Dispose of the used oil filter according to local regulations.

6. Clean the filter housing base. Make sure that all of the old filter gasket is removed.

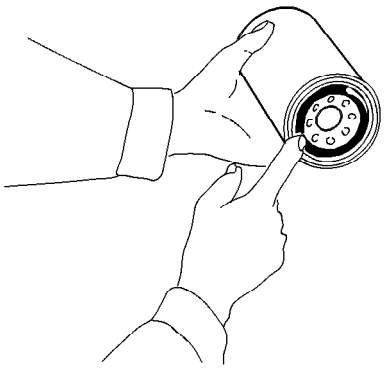


Illustration 473 g00101634

7. Apply a thin coat of engine oil to the gasket of the new filter.

8. Install the new filter by hand.

Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

9. Close the access door on the left side of the machine.

10. Close the crankcase drain valve access cover.

11. Install the bolts and the washers.

12. Unlatch the engine hood and raise the engine hood.

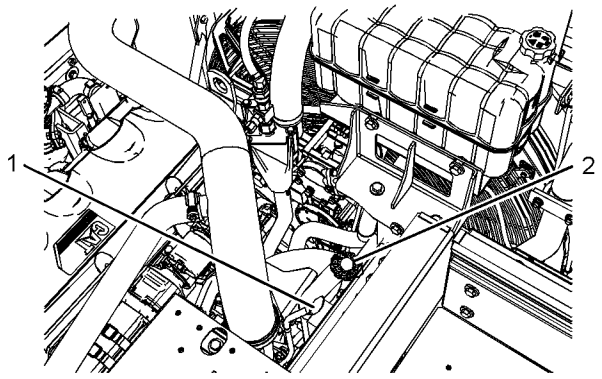


Illustration 474 g02109834

(1) Dipstick
(2) Oil filler plug

13. Remove oil filler plug (2). Fill the crankcase with new oil. See Operation and Maintenance Manual, “Capacities (Refill)”. Clean the oil filler plug and install the oil filler plug.

NOTICE
Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

14. Start the engine and allow the oil to warm. Check the engine for leaks. Stop the engine.

15. Wait for fifteen minutes so that the oil can drain back into the crankcase, before you check the oil.

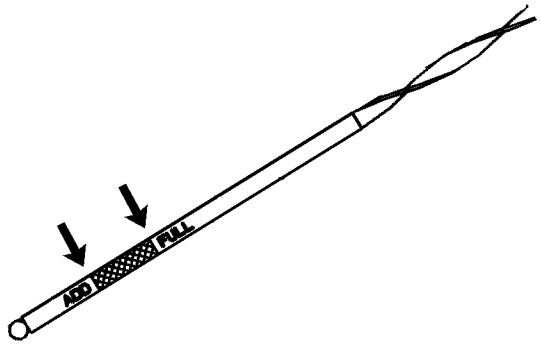


Illustration 475 g02109835

16. Remove the dipstick. Maintain the oil between the marks on the “ENGINE STOPPED” side of the dipstick.

17. Close the engine hood and latch the engine hood.

Fast Fill

If your machine is equipped with a deluxe service center, you may drain the engine oil through the fast fill port or you may add the engine oil through a fast fill port.

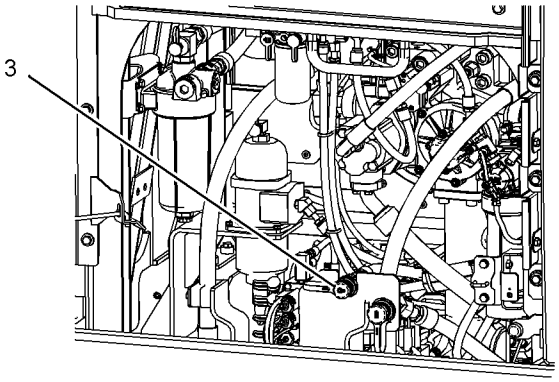


Illustration 476 g02114193

1. Open the access door on the right side of the machine.

2. Remove the dust cover (3).

3. Attach the hose to the coupling.

Note: Make sure that the coupling and receiver are free from debris before attaching. Reinstall the dust covers when done.

4. Drain the oil or add the oil, as needed.

5. Install the dust cover.

i00707053

Engine Valve Lash and Fuel Injector Timing - Check

SMCS Code: 1105-025; 1209-535; 1290-531-FT

Refer to the Service Manual for the complete procedure for checking the engine valve lash. This procedure lists the steps for the engine valve lash adjustment and the steps in order to check the engine valve lash.

Note: Make sure that a qualified mechanic works on the injector fuel timing. Special tools and training are required.

Refer to the Service Manual for the complete procedure for checking the injector fuel timing or for adjusting the injector fuel timing.

Note: The correct fuel timing specification is given on the Engine Information Plate. Fuel timing specifications may differ for distinct engine applications and/or power ratings.

i00059702

Engine Valve Rotators - Inspect

SMCS Code: 1109-040

⚠ WARNING

When inspecting the valve rotators, protective glasses or face shield and protective clothing must be worn to prevent being burned by hot oil spray.

1. Start the engine and run the engine at low idle.

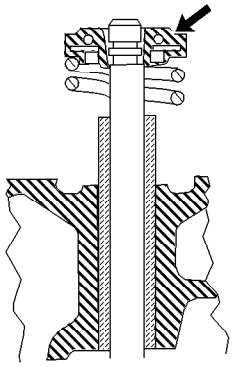


Illustration 477 g00102025

2. Watch the top surface on each valve rotator. Each valve rotator should turn slightly whenever the cylinder valve closes.

If a cylinder valve fails to rotate, consult your Caterpillar dealer.

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.

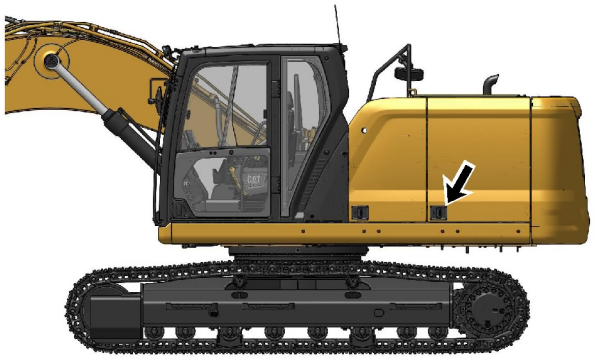


Illustration 478 g06179792

1. Open the rear access door at the left side of the machine.

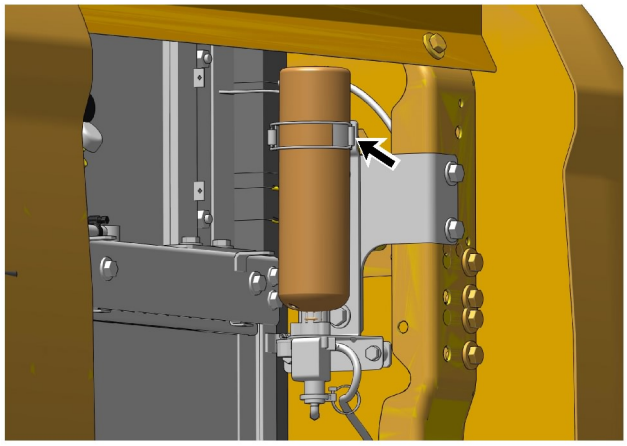


Illustration 479 g06211094

2. Loosen the cylinder retaining clamp.

3. Unscrew the empty ether starting aid cylinder and remove the empty ether starting aid cylinder.

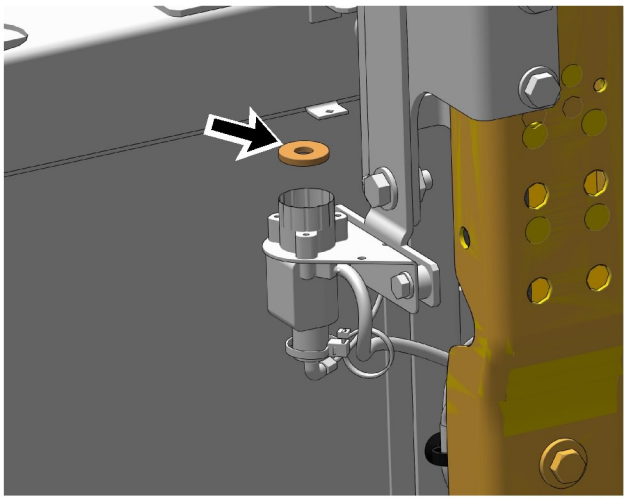


Illustration 480 g06211096

4. Remove the used gasket.

5. Install a new gasket.

Note: A new gasket and O-ring is provided with each new ether starting aid cylinder.

6. Install the new ether starting aid cylinder.

7. Tighten the ether starting aid cylinder hand tight.

8. Tighten the cylinder retaining clamp securely.

9. Close the access door.

i07681009

Film (Product Identification) - Clean

SMCS Code: 7405-070; 7557-070

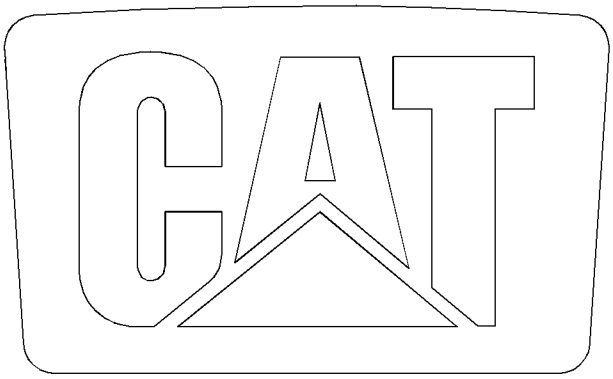


Illustration 481 g02174985

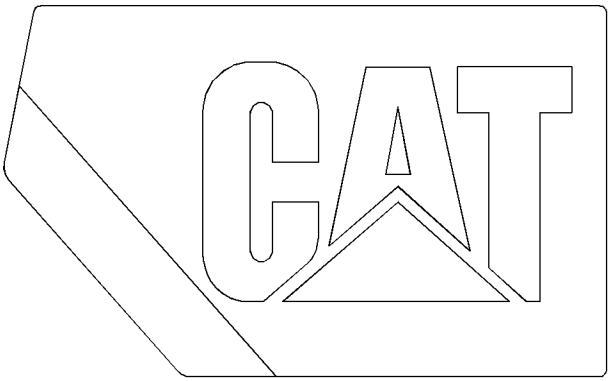


Illustration 482 g02175297



Illustration 483 g06394021

Typical example of the Product Identification Films.

Cleaning of the Films

Make sure that all of the product identification films are legible. Make sure that the recommended procedures are used in order to clean the product identification films. Ensure that all the product identification films are not damaged or missing. Clean the product identification films or replace the films.

Hand Washing

Use a wet solution with no abrasive material that contains no solvents and no alcohol. Use a wet solution with a “pH” value between 3 and 11. Use a soft brush, a rag, or a sponge in order to clean the product identification films. Avoid wearing down the surface of the product identification films with unnecessary scrubbing. Ensure that the surface of the product identification films is flushed with clean water and allow the product identification films to air dry.

Power Washing

Power washing or washing with pressure may be used in order to clean product identification films. However, aggressive washing can damage the product identification films.

Excessive pressure during power washing can damage the product identification films by forcing water underneath the product identification films. Water lessens the adhesion of the product identification film to the product, allowing the product identification film to lift or curl. These problems are magnified by wind. These problems are critical for the perforated film on windows.

To avoid lifting of the edge or other damage to the product identification films, follow these important steps:

- Use a spray nozzle with a wide spray pattern.
- A maximum pressure of 83 bar (1200 psi)
- A maximum water temperature of 50° C (120° F)
- Hold the nozzle perpendicular to the product identification film at a minimum distance of 305 mm (12 inch).

- Do not direct a stream of water at a sharp angle to the edge of the product identification film.

i06882903

Final Drive Oil - Change

SMCS Code: 4050-044-FLV

WARNING

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

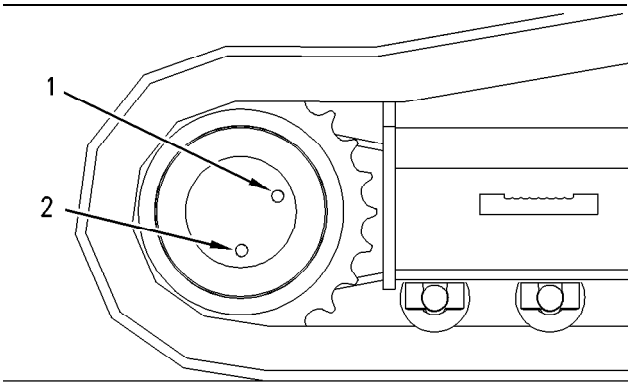


Illustration 484 g00822278

(1) Oil level plug
(2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

2. Remove drain plug (2) and level plug (1). Allow the oil to drain into a suitable container.

3. Clean the plugs and inspect the O-ring seals. If wear or damage is evident, replace the drain plug, the level plug, and/or the O-ring seals.

4. Install drain plug (2).

5. Fill the final drive to the bottom of the opening on level plug (1). See Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill)”.

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

6. Install level plug (1).

7. Perform Step 1 to Step 6 on the other final drive. Use a different container for the oil so that the oil samples from the final drives will be separate.

8. Completely remove the oil that has spilled onto surfaces.

9. Start the machine and allow the final drives to run through several cycles.

10. Stop the machine. Check the oil level.

11. Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Cat dealer.

12. Properly dispose of the drained material. Obey local regulations for the disposal of the material.

i03914051

Final Drive Oil Level - Check

SMCS Code: 4050-535-FLV

WARNING

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

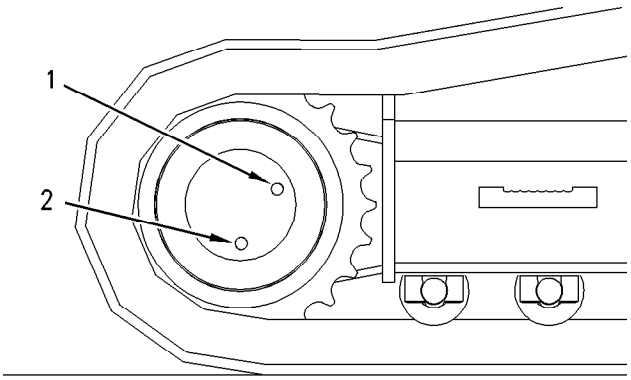


Illustration 485 g00822278

(1) Oil level plug
(2) Oil drain plug

1. Position one final drive so that oil drain plug (2) is at the bottom.

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

2. Remove oil level plug (1).

3. Check the oil level. The oil should be near the bottom of the level plug opening.

4. Add oil through the level plug opening, if necessary. See Operation and Maintenance, “Lubricant Viscosities”.

Note: If the oil fills slowly, the fill hole may be blocked by the planetary gear. Rotate the final drive in order to move the planetary gear away from the fill hole.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. The final drive may become contaminated.

5. Clean oil level plug (1). Inspect the O-ring seal. Replace the O-ring seal if the O-ring seal is worn or damaged.

6. Install oil level plug (1).

7. Repeat the procedure for the other final drive.

i03756611

Final Drive Oil Sample - Obtain

SMCS Code: 4011-008; 4050-SM; 4050-008; 7542-008

⚠ WARNING

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

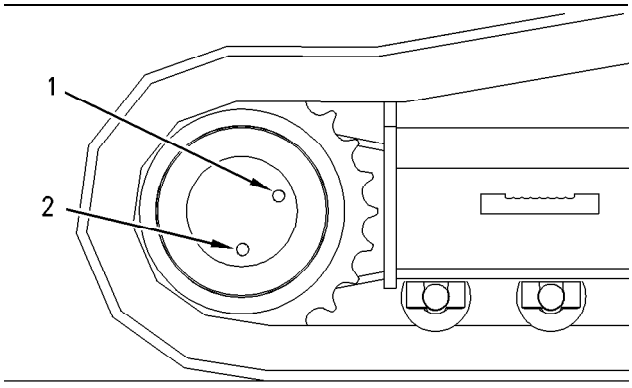


Illustration 486 g00822278

(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”.

i07318401

Fuel System - Prime

SMCS Code: 1250-548

⚠ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat ® products.

Dispose of all fluids according to local regulations and mandates.

NOTICE
Do not loosen the fuel lines at the fuel manifold. The fittings may be damaged and/or a loss of priming pressure may occur when the fuel lines are loosened.

NOTICE
Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.

Prime the fuel system to fill the fuel filter, and prime the fuel system to purge trapped air. The fuel system should be primed under the following conditions:

- The fuel tank is running low.
- The machine has been stored.
- The fuel filter is being replaced.
- The fuel system has been repaired.

1. Turn the engine start switch to the ON position. Leave the engine start switch in the ON position for 4 minutes.

2. Verify that the water separator is full of fuel.

3. If the water separator is not full of fuel, turn the engine start switch OFF and then turn the engine start switch ON. Turning the engine start switch off and on will cycle the fuel priming pump again.

4. When the water separator is full of fuel, attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate at low idle until the engine is running smoothly. If the engine cannot be started, or if the engine continues to misfire or smoke, repeat Step 1.

i03901456

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1263-510-FQ

⚠ WARNING

Personal injury or death may result from failure to adhere to the following procedures.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

NOTICE
Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

The primary filter/water separator is located behind the access door on the right side of the machine.

1. Open the access door on the right side of the machine.

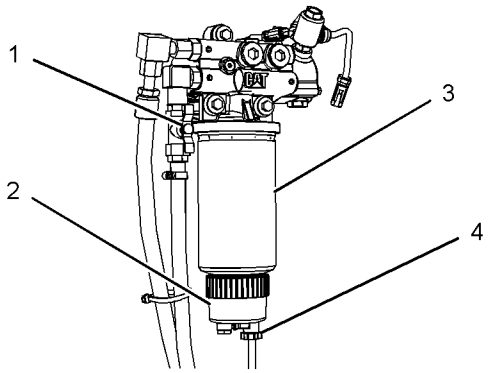


Illustration 487 g02144267

(1) Shutoff valve
(2) Bowl
(3) Filter
(4) Drain valve

2. Turn off the fuel supply to the fuel filter by turning shutoff valve (1) clockwise.

3. Turn drain valve (4) counterclockwise in order to open. The drain valve is located on the bottom of the water separator.

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

4. Drain the water and the sediment into a suitable container.

Note: Dispose of used fluids according to local regulations.

5. Close drain valve (4).

6. Remove filter (3) from the filter base. A filter wrench may be used to loosen the filter.

7. Remove filter (3) from bowl (2). Discard the used filter.

Note: The water separator bowl is reusable. Do not discard the water separator bowl.

8. Clean the inside surfaces of filter base and bowl (2).

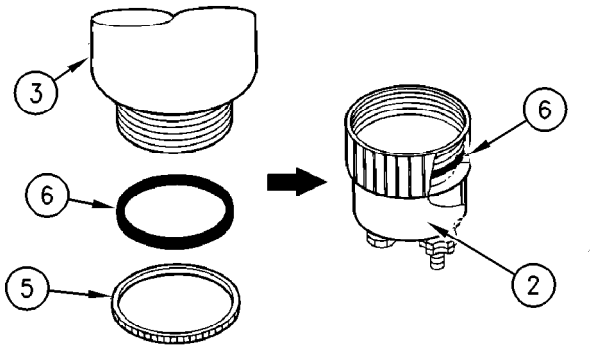


Illustration 488 g00752055

(2) Bowl
(3) Filter
(5) Cap
(6) Seal

9. Remove cap (5) from the bottom of new filter (3). Remove seal (6) from cap (5) and inspect the seal for damage. Replace the seal if the seal is damaged.

10. Lubricate the seal (6) for the bowl (2) with clean diesel fuel or lubricate the seal with clean motor oil. Place the seal in the groove in the bowl.

11. Install the bowl (2) onto the new filter by hand until the bowl is snug. Tighten the bowl to 10 N·m (7 lb ft) to approximately 1/6 of a turn. Do not use tools to tighten the bowl to the new filter.

12. Lubricate the seal on the new filter with clean diesel fuel or lubricate the seal with clean motor oil.

13. Install the new filter by hand.

Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

Note: Do not start the engine until all service to the fuel system is complete. For instructions about priming the fuel system, refer to Operation and Maintenance Manual, “Fuel System - Prime”.

14. Close the access door.

i05736554

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510

⚠ WARNING

Personal injury or death can result from a fire.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

NOTICE
Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

NOTICE
Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.

1. Open the front access door on the left side of the machine.

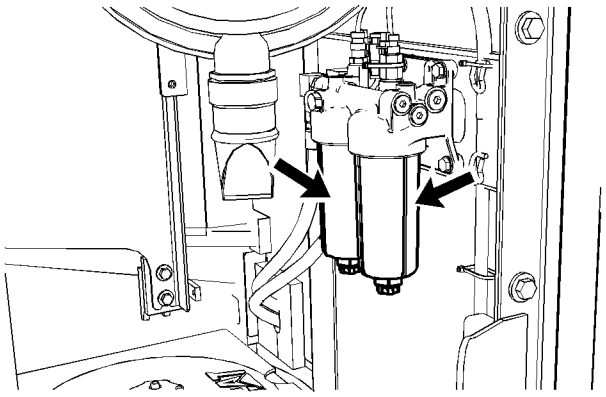


Illustration 489 g03645124

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

2. Remove the two secondary fuel filters.

Note: The fuel filter has not been drained. The filter contains fuel. When you remove the filter, use caution in order to avoid spilling the fuel.

3. Inspect the fuel filter for debris by cutting the fuel filter open.

4. Clean the mounting base of the fuel filter. Make sure that all of the old seal is removed from the mounting base.

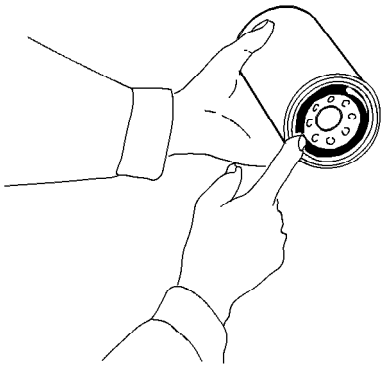


Illustration 490 g00101318

5. Apply a thin coat of clean diesel fuel to the sealing surface of the new fuel filter.

6. Install the new filter by hand.

Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

7. Prime the fuel system. See Operation and Maintenance Manual, “Fuel System - Prime” for instructions.

8. Close the access door on the left side of the machine.

i03743908

Fuel System Water Separator - Drain

SMCS Code: 1263

1. Open the access door on the right side of the machine.

2. Provide a suitable container for used fluid.

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

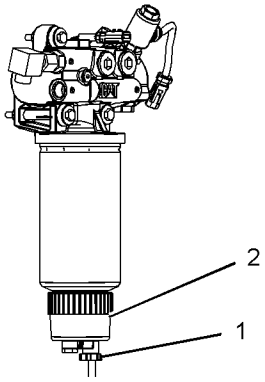


Illustration 491 g02022485

(1) Drain valve
(2) Bowl

3. Check bowl (2) in the bottom of the water separator. Open drain valve (1). Drain the water and sediment in the bowl.

Note: Dispose of used fluids according to local regulations.

4. Close drain valve (1).

5. Close the access door.

i04156175

Fuel Tank Cap and Strainer - Clean

SMCS Code: 1273-070-STR

1. The fuel tank is located on the right side of the machine.

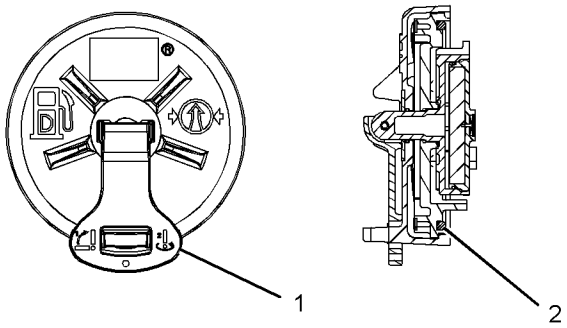


Illustration 492 g02022539

2. Lift lever (1) and turn lever (1) counterclockwise until the lever stops. Remove the cap.

3. Inspect seal (2) for damage. Replace the seal, if necessary.

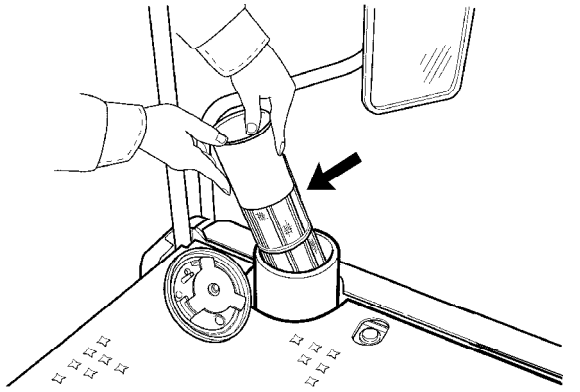


Illustration 493 g00824196

4. Remove the strainer that is located in the filler opening.

5. Wash the strainer and the fuel tank cap in a clean, nonflammable solvent.

6. Apply a thin film of fuel to the gasket of the fuel tank cap.

7. Install the strainer into the filler opening.

8. Install the fuel tank cap.

i04363385

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543

Refer to this Operation and Maintenance Manual, “Fuel Tank Shutoff and Drain Control” for the exact location of the fuel tank drain valve

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

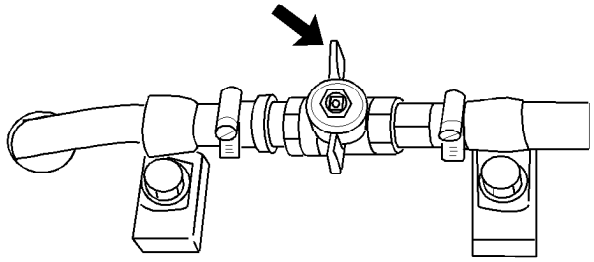


Illustration 494 g01043694

Typical example

1. Open the drain valve by turning the valve counterclockwise. Allow the water and the sediment to drain into a suitable container.

Note: Dispose of drained fluids according to local regulations.

2. Close the drain valve by turning the valve clockwise.

i05059390

Fumes Disposal Filter Element - Replace
(If Equipped)

SMCS Code: 1074

⚠ 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.

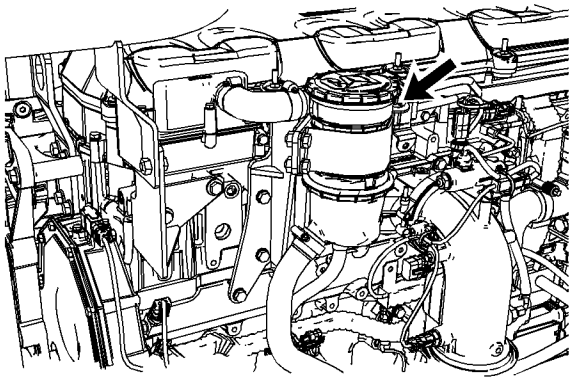


Illustration 495 g02109947

Note: Perform the maintenance while the engine is off.

1. Open the engine hood.

2. Remove the lid that holds the canister to the filter base assembly.

3. Remove the filter element. Dispose of the used element properly.

4. Install the new filter.

5. Install the lid.

6. Close the engine hood.

i06753580

Fuses - Replace

SMCS Code: 1417-510

S/N: BZ210001–Up

S/N: KEA10001–Up

S/N: WNA10001–Up

S/N: HLB10001–Up

S/N: NDC10001–Up

S/N: HPD10001–Up

S/N: YEG10001–Up

S/N: A9J10001–Up

S/N: KBP10001–Up

S/N: TEW10001–Up

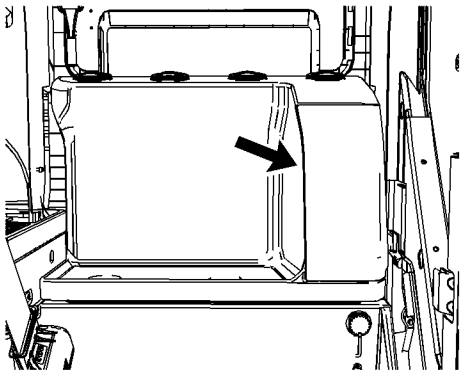


Illustration 496 g02110353

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.

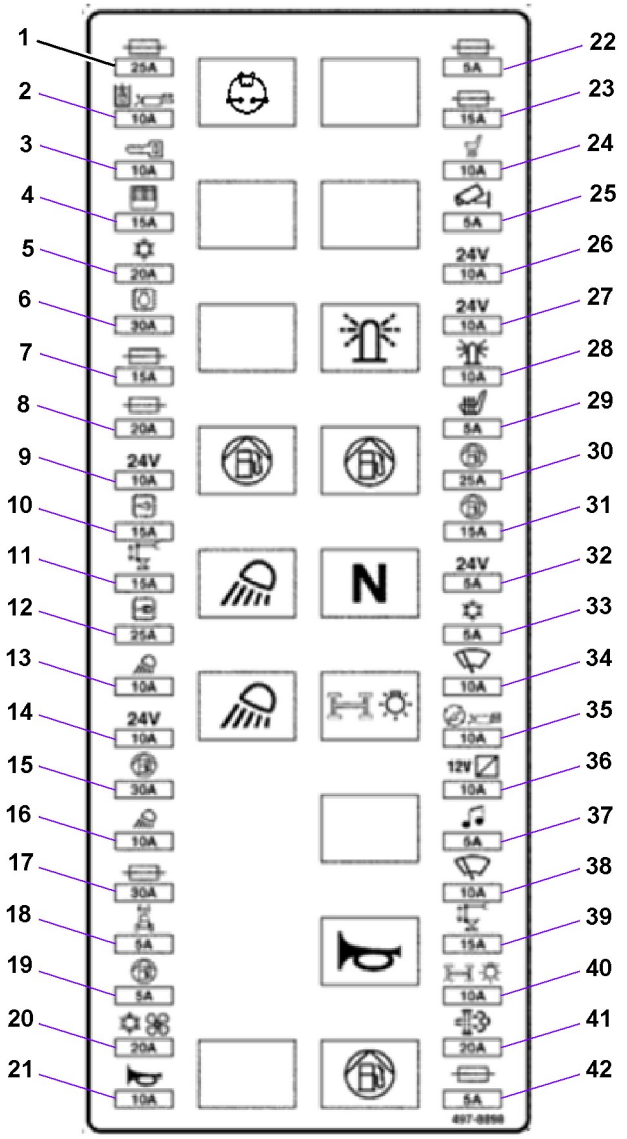


Illustration 497 g06106611

(1) Aftertreatment Power – 25 Amp

(2) Hydraulic Lock – 10 Amp

(3) Engine Start Switch – 10 Amp

(4) Monitor – 15 Amp

(5) Air Conditioner Condenser Blower – 20 Amp

(6) Engine Control Module (ECM) – 30 Amp

(7) Spare – 15 Amp

(8) Spare – 20 Amp

(9) Auxiliary – 10 Amp

(10) Engine Emission System Control Module – 15 Amp

(11) Cat Grade Control – 15 Amp

(12) Excavator Control Module – 25 Amp

(13) Cab Light – 10 Amp

(14) Auxiliary Hydraulic Circuit – 10 Amp

(15) Electric Refueling Pump – 30 Amp

(16) Boom Light – 10 Amp

(17) Spare – 30 Amp

(18) Product Link – 5 Amp

(19) Lifting Pump – 5 Amp

(20) Heater and Air Conditioner Blower Fan – 20 Amp

(21) Horn – 10 Amp

(22) Spare – 5 Amp

(23) Spare – 15 Amp

(24) Air Suspension Seat – 10 Amp

(25) Camera – 5 Amp

(26) Auxiliary – 10 Amp

(27) Auxiliary – 10 Amp

(28) Beacon – 10 Amp

(29) Seat Heater – 5 Amp

(30) Smart Refueling – 25 Amp

(31) Priming Pump – 15 Amp

(32) Auxiliary – 5 Amp

(33) Air Conditioner – 5 Amp

(34) Lower Window Wiper – 10 Amp

(35) Attachment Solenoid – 10 Amp

(36) 12V Converter – 10 Amp

(37) Radio – 5 Amp

(38) Window Wiper – 10 Amp

(39) Cat Grade Control – 15 Amp

(40) Chassis Light – 10 Amp

(41) Clean Emissions Module (CEM) – 20 Amp

(42) Caution Lamp – 5 Amp

Relays

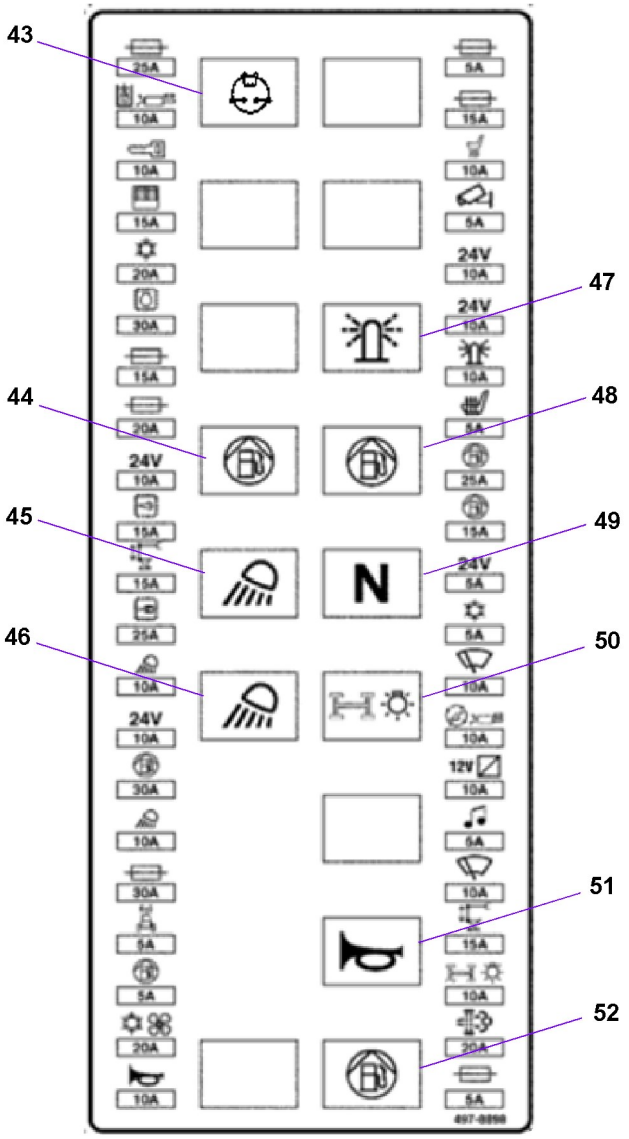


Illustration 498 g06109039

(43) – Aftertreatment Power

(44) – Priming Pump

(45) – Cab Lamp

(46) – Boom Lamp

(47) – Beacon

(48) – Smart Refueling

(49) – Neutral Start

(50) – Chassis Lamp/Caution Lamp

(51) – Horn

(52) – Lifting Pump

i06758017

Fuses - Replace

SMCS Code: 1417-510

S/N: BZ21–10000

S/N: KEA1–10000

S/N: WNA1–10000

S/N: HLB1–10000

S/N: NDC1–10000

S/N: HPD1–10000

S/N: YEG1–10000

S/N: A9J1–10000

S/N: KBP1–10000

S/N: TEW1–10000

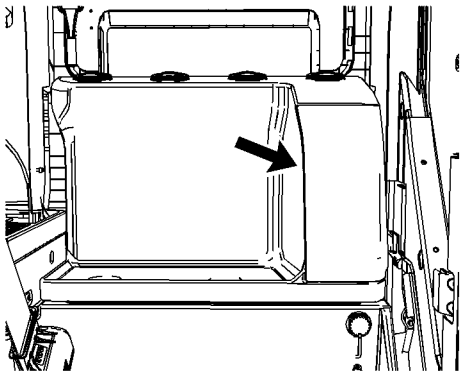


Illustration 499 g02110353

The fuse panel is located 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.

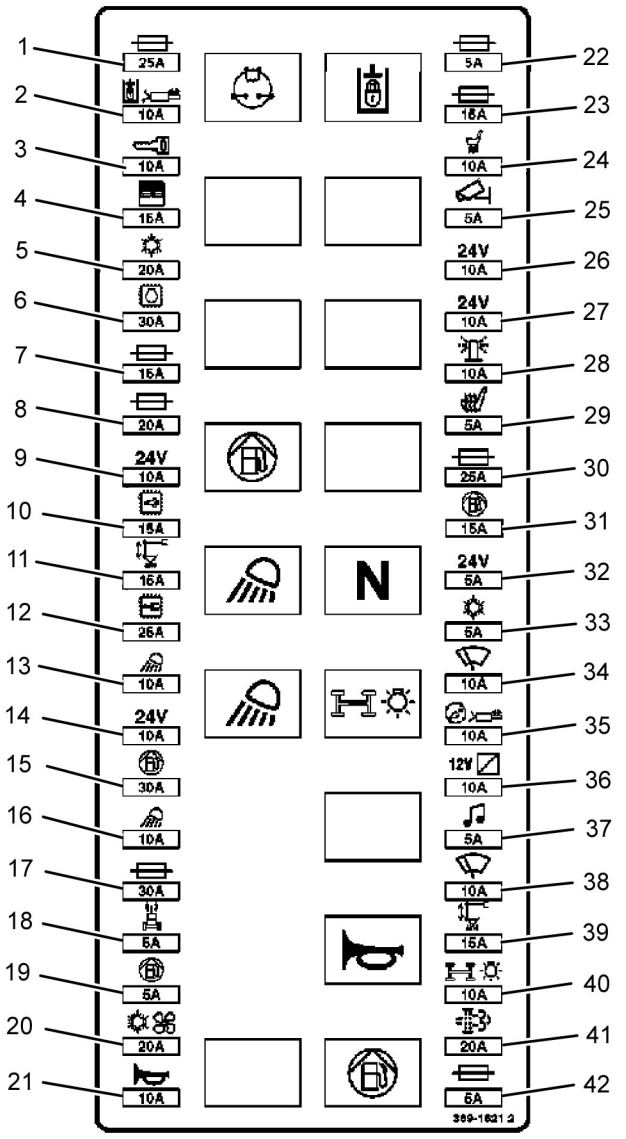


Illustration 500 g03867533

(1) Spare – 25 Amp

(2) Hydraulic Lock – 10 Amp

(3) Engine Start Switch – 10 Amp

(4) Monitor – 15 Amp

(5) Air Conditioner Condenser Blower – 20 Amp

(6) Engine Control Module (ECM) – 30 Amp

(7) Spare – 15 Amp

(8) Spare – 20 Amp

(9) Auxiliary – 10 Amp

(10) Engine Emission System Control Module – 15 Amp

(11) Cat Grade Control – 15 Amp

(12) Excavator Control Module – 25 Amp

(13) Cab Light – 10 Amp

(14) Auxiliary Hydraulic Circuit – 10 Amp

(15) Electric Refueling Pump – 30 Amp

(16) Boom Light – 10 Amp

(17) Spare – 30 Amp

(18) Product Link – 5 Amp

(19) Lifting Pump – 5 Amp

(20) Heater and Air Conditioner Blower Fan – 20 Amp

(21) Horn – 10 Amp

(22) Spare – 5 Amp

(23) Spare – 15 Amp

(24) Air Suspension Seat – 10 Amp

(25) Camera – 5 Amp

(26) Auxiliary – 10 Amp

(27) Auxiliary – 10 Amp

(28) Beacon – 10 Amp

(29) Seat Heater – 5 Amp

(30) Spare – 25 Amp

(31) Priming Pump – 15 Amp

(32) Auxiliary – 5 Amp

(33) Air Conditioner – 5 Amp

(34) Lower Window Wiper – 10 Amp

(35) Attachment Solenoid – 10 Amp

(36) 12V Converter – 10 Amp

(37) Radio – 5 Amp

(38) Window Wiper – 10 Amp

(39) Cat Grade Control – 15 Amp

(40) Chassis Light – 10 Amp

(41) Clean Emissions Module (CEM) – 20 Amp

(42) Spare – 5 Amp

Relays

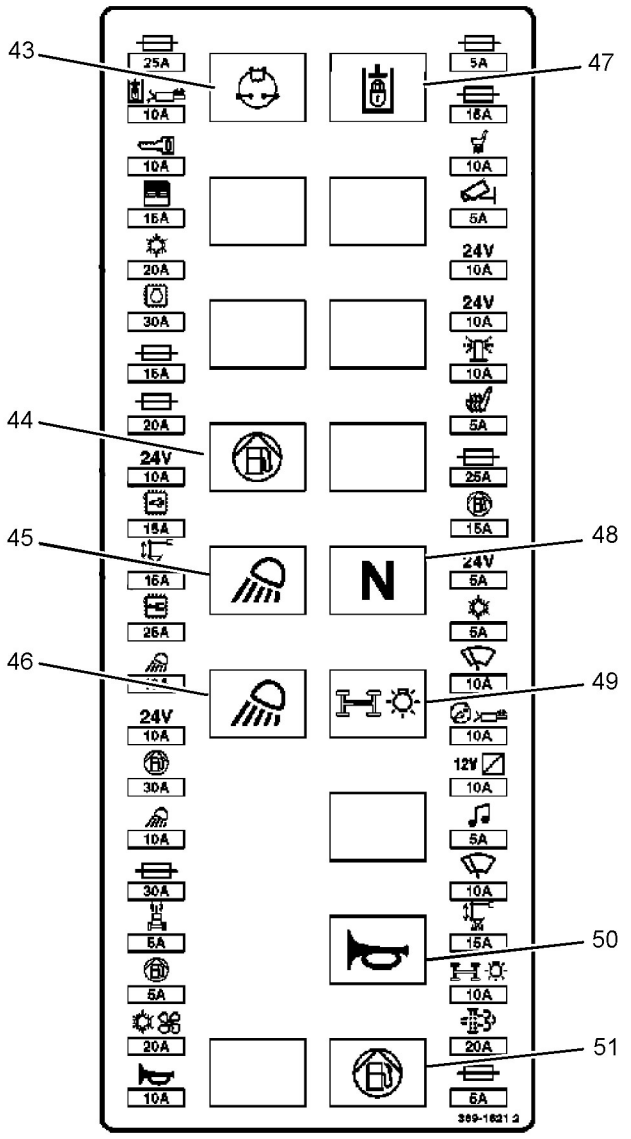


Illustration 501 g06109320

(43) – **Aftertreatment Power**

(44) – **Priming Pump**

(45) – **Cab Light**

(46) – **Boom Light**

(47) – **Hydraulic Lock**

(48) – **Neutral Start**

(49) – **Chassis Light**

(50) – **Horn**

(51) – **Lifting Pump**

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.

i05984275

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.

The 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. An oil change is strongly recommended when oil deterioration or contamination is detected. The maintenance interval for the hydraulic oil filter is not changed.

Machines with hammers are not included in the 6000 service hour or 3 year maintenance interval. Machines with hammers must use the intervals that are listed in the Maintenance Interval Schedule. Machines that are used in severe conditions are not included in the 6000 service hour or 3 year maintenance interval. Machines that are used in severe conditions must use the interval in the Maintenance Interval Schedule.

Procedure to Change the Hydraulic Oil

WARNING

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

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat ® products.

Dispose of all fluids according to local regulations and mandates.

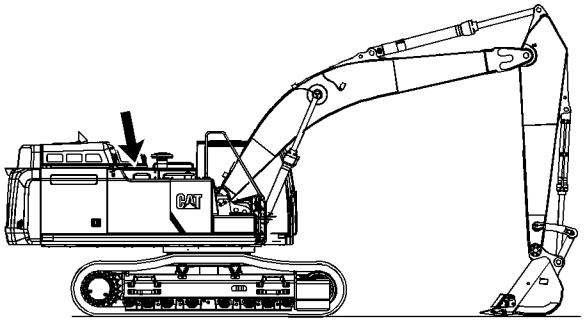


Illustration 502 g02111809

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.

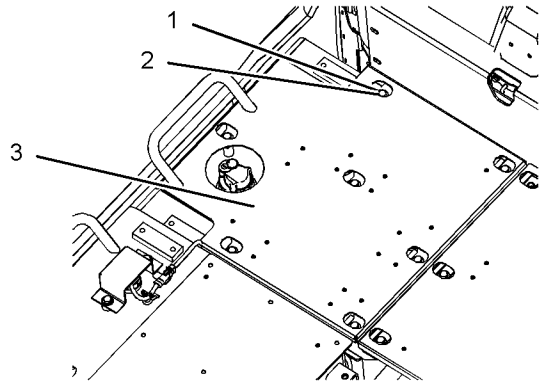


Illustration 503 g02112656

(1) Bolts
(2) Washers
(3) Cover

2. Remove bolts (1), washers (2) and cover (3) from the top of the hydraulic tank.

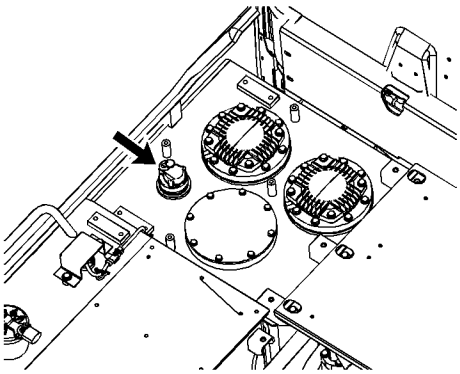


Illustration 504 g02112657

3. Clean the area thoroughly in order to keep dirt out of the screen cover. Clean the area thoroughly in order to keep dirt out of the fill/vent plug.

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

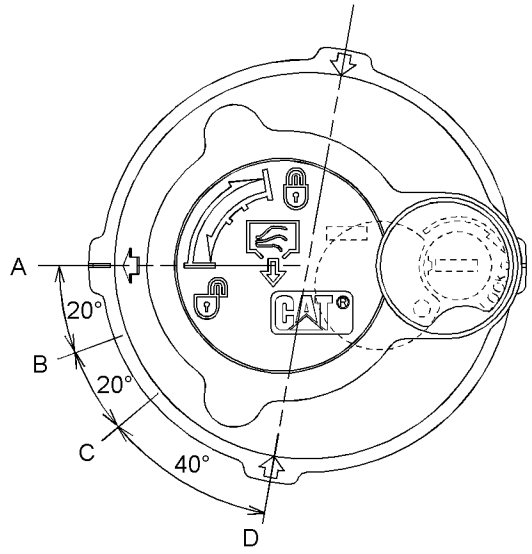


Illustration 505 g02275615

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 505 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the filler cap down and move the arrow from position (C) to position (D).

d. After the tank pressure is relieved, remove the filler cap.

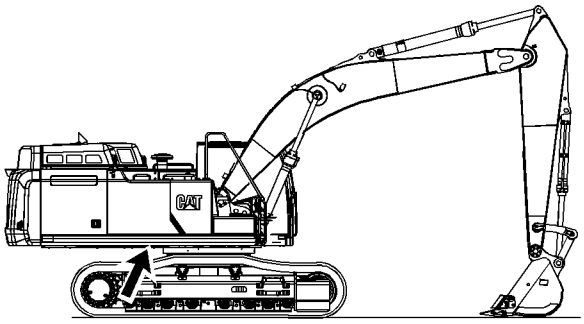


Illustration 506 g02112823

The oil drain valve is located under the hydraulic tank.

5. Remove the hydraulic tank access cover that is located under the upper structure. Removing the cover will allow access to the drain valve.

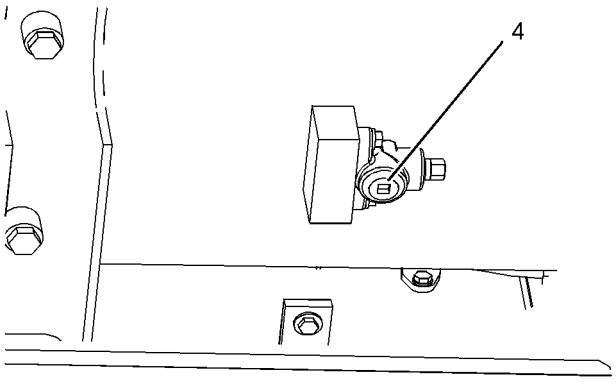


Illustration 507 g01124017

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

6. Remove plug (4).

7. Inspect the O-ring. Replace the O-ring if wear or damage is evident.

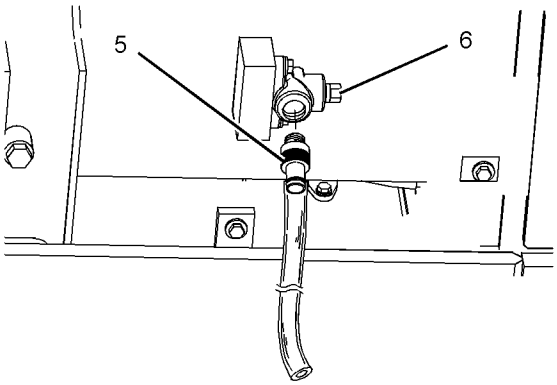


Illustration 508 g01124018

8. Install swivel hose (5) with clear plastic tubing.

9. Loosen drain plug (6) in order to drain the oil.

10. Drain the oil into a suitable container.

11. After the oil has been drained, tighten drain plug (6) to a torque of 110 ± 15 N·m (81 ± 11 lb ft).

12. Remove the swivel hose.

13. Clean plug (4) and install the plug. Tighten the plug to 90 ± 8 N·m (66 ± 6 lb ft).

14. Open the access door that is located on the right side of the machine.

15. Clean the pump, the hydraulic lines, and the hydraulic tank.

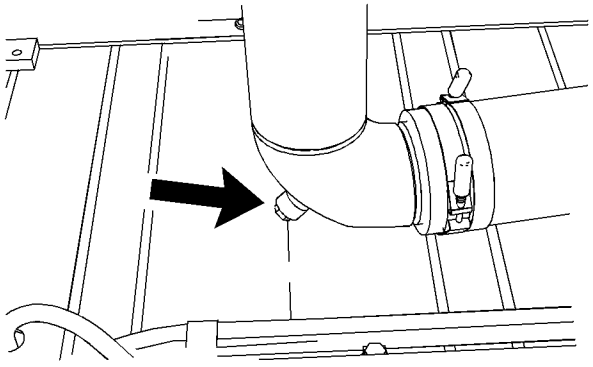


Illustration 509 g02022854

16. Remove the plug from the tube. Allow the oil to drain into a container.

Note: Dispose of used filters and used fluids according to local regulations.

17. Inspect the O-ring. Replace the O-ring if wear or damage is evident.

18. Clean the plug. Install the plug and the O-ring into the drain port.

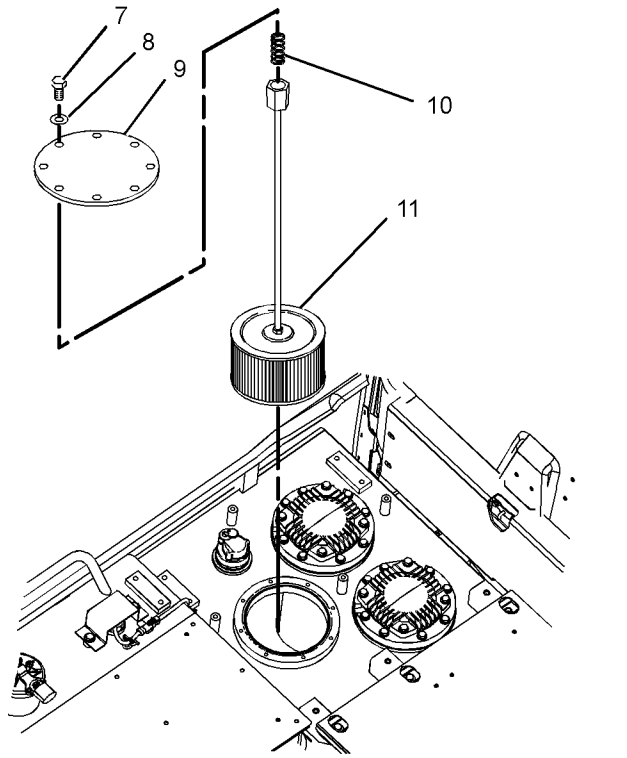


Illustration 510 g02112827

(7) Bolts
(8) Washers
(9) Cover
(10) Spring
(11) Screen

19. Remove bolts (7), washers (8) and cover (9).

Note: Dispose of used filters and used fluids according to local regulations.

Note: Do not allow spring (10) to fall back into the tank.

20. Remove spring (10) and screen (11).

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

21. Wash the screen in a clean nonflammable solvent. Allow the screen to dry. Inspect the screen. Replace the screen, if the screen is damaged.

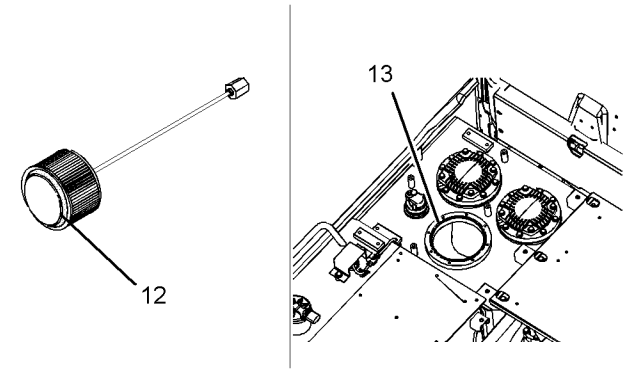


Illustration 511 g02112829

(12) O-ring seal
(13) O-ring seal

22. Inspect O-ring seals (12) and (13). Replace the O-ring seals if wear or damage is evident.

23. 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.

24. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, “Capacities (Refill)”.

25. 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.

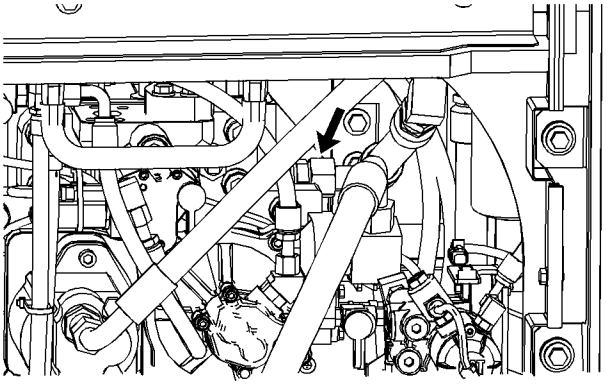


Illustration 512 g02112831

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.

26. When the hydraulic oil has been replaced, the air must be removed from the hydraulic oil system. Use the following procedure to remove the air from the hydraulic oil system.

a. While the engine is stopped, loosen the hose coupling on the side of the pump. Leave the hose coupling unattached for several minutes until the pump is filled with hydraulic oil. After the pump is filled with hydraulic oil, tighten the hose coupling. Start the engine. When the engine is at low idle, fully raise the boom. Hold the boom in this position.

b. Stop the engine. Slowly lower the boom until the bucket is on the ground. The hydraulic tank will pressurize.

c. Slowly loosen the hose coupling until the hydraulic oil flows out of the hose coupling. This process indicates that the air has been released from the pump. Tighten the hose coupling.

27. Close the access door.

28. Start the engine. Operate the engine at idling speed for 5 minutes.

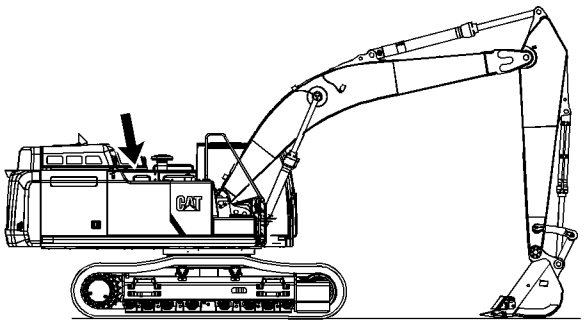


Illustration 513 g02111809

29. Operate the control levers in order to circulate the hydraulic oil. Lower the bucket to the ground so that the stick is vertical to the ground. Stop the engine.

30. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

31. Close the access door.

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.

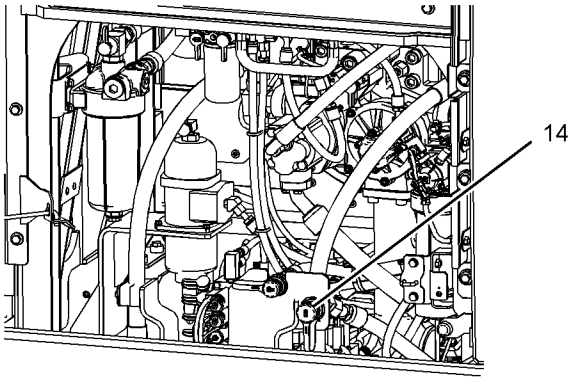


Illustration 514 g02114333

1. Open the access door on the right side of the machine.

2. Remove the dust cover (14).

3. Attach the hose to the male coupling.

Note: Make sure that the coupling and receiver are free from debris before attaching. Reinstall the dust covers when done.

4. Drain the oil or add the oil, as needed.

5. Install the dust cover.

i04119333

Hydraulic System Oil Filter (Case Drain) - Replace

SMCS Code: 5068-510; 5091-510

⚠ WARNING

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

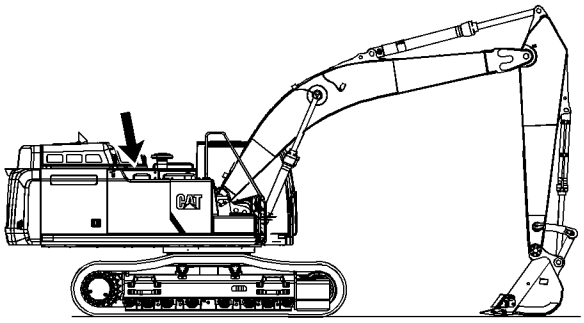


Illustration 515 g02111809

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.
2. Move the hydraulic lockout control to the UNLOCKED position.
3. Turn the engine start switch to the ON position.
4. Move the joysticks and the travel levers/pedals to the full stroke positions in order to relieve the pressure in the pilot lines.
5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

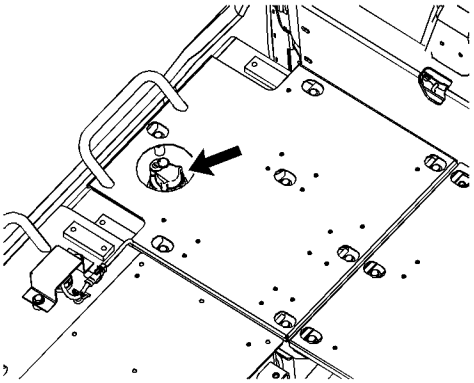


Illustration 516 g02111812

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

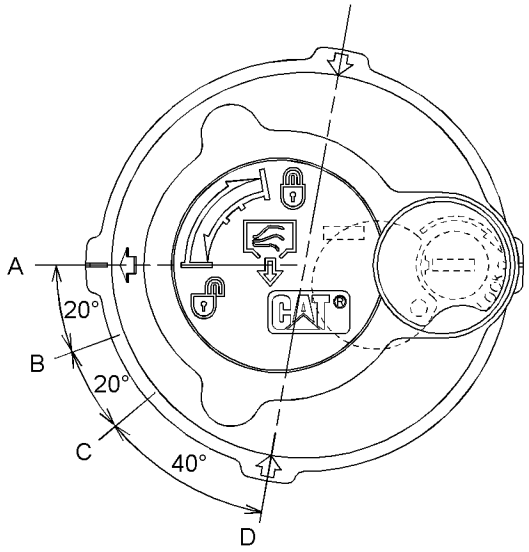


Illustration 517 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

6. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 517 for filler cap positions.
   a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).
   b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).
   c. Push the filler cap down and move the arrow from position (C) to position (D).
   d. After the tank pressure is relieved, tighten the filler cap on the hydraulic tank to position (A).
7. After the pressure is relieved, tighten the filler cap.
8. Open the access door on the right side of the machine.

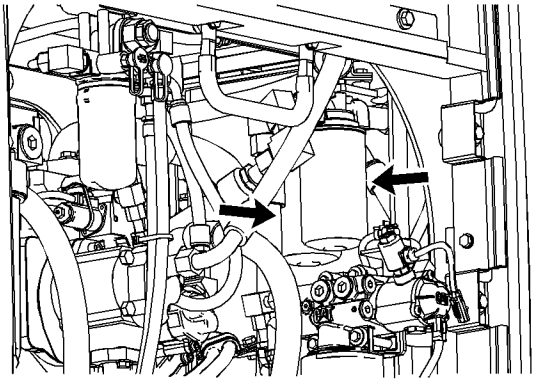


Illustration 518 g02112364

9. Clean the area in order to keep dirt out of the filter base.

10. Remove the used case drain filter from the filter base.

Note: Dispose of used filters according to local regulations.

11. Clean the filter base.

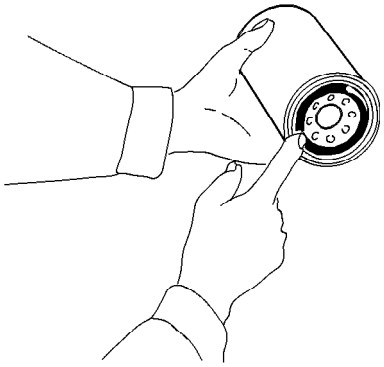


Illustration 519 g00101502

12. Coat the seal of a new case drain filter with clean hydraulic oil.

13. Install the new case drain filter by hand.

Instructions for the installation of the filter are printed on the side of each Cat spin-on filter. For filters that are not Cat branded, refer to the installation instructions that are provided by the supplier of the filter.

14. Start the engine and operate the machine slowly for 10 to 15 minutes. Move each cylinder evenly through several cycles.

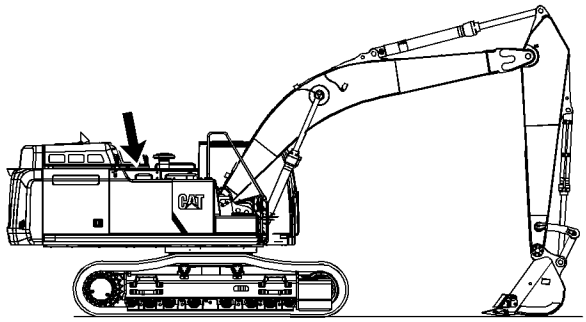


Illustration 520 g02111809

15. Return the machine to the position that is shown above. Check the machine for oil leaks.

16. Stop the engine.

17. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

18. Close the access door.

i04119429

Hydraulic System Oil Filter (Pilot) - Replace

SMCS Code: 5068-510; 5068-510-PS; 5092-510

⚠ WARNING

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

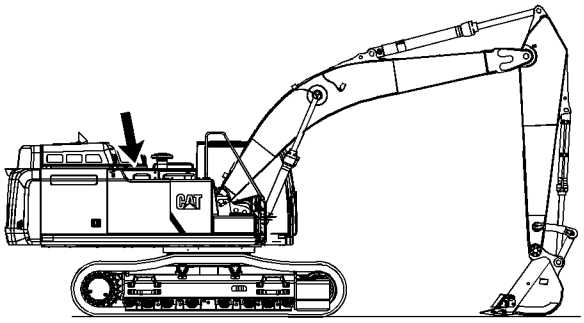


Illustration 521 g02111809

1. Park the machine on level ground. Lower the bucket to the ground so that the stick is vertical.

2. Move the hydraulic lockout control to the UNLOCKED position.

3. Turn the engine start switch to the ON position.

4. Move the joysticks and the travel levers/pedals to the full stroke positions in order to relieve the pressure in the pilot lines.

5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

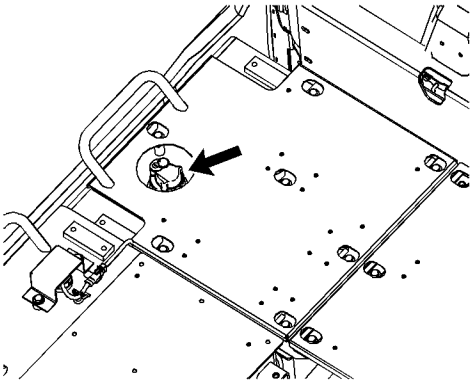


Illustration 522 g02111812

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

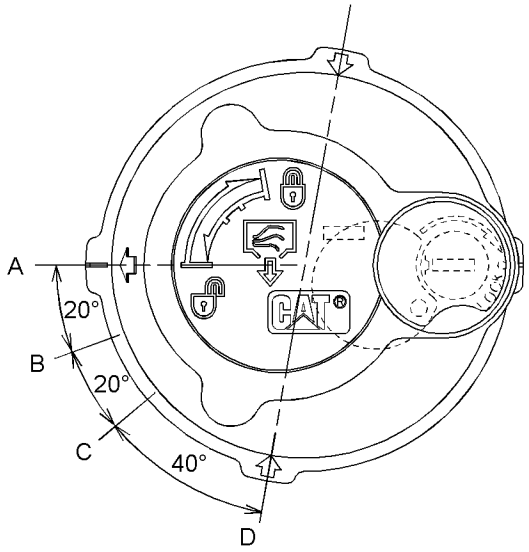


Illustration 523 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

6. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 523 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the filler cap down and move the arrow from position (C) to position (D).

d. After the tank pressure is relieved, tighten the filler cap on the hydraulic tank to position (A).

7. Open the access door on the right side of the machine.

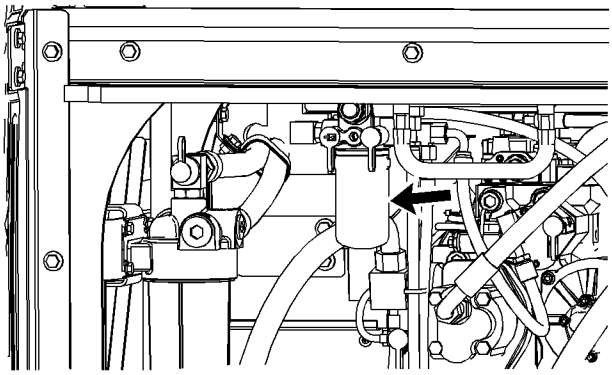


Illustration 524 g02112538

8. Clean the area in order to keep dirt out of the filter base.

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

9. Remove the used pilot filter element from the filter base.

Note: Used filters should always be disposed of according to local regulations.

10. Clean the filter base.

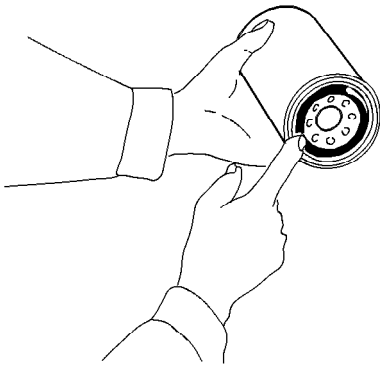


Illustration 525 g00101502

11. Coat the seal of a new pilot filter with clean hydraulic oil.

12. Install the new oil filter by hand.

Instructions for the installation of the filter are printed on the side of each Cat spin-on filter. For filters that are not Cat branded, refer to the installation instructions that are provided by the supplier of the filter.

13. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

14. Close the access door.

i04766136

Hydraulic System Oil Filter (Return) - Replace

SMCS Code: 5068-510-RJ

⚠ WARNING

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

The return filter is a cartridge type filter. The amount of foreign material that enters the hydraulic system is reduced when the filter element is replaced.

Two different filters are available for the return filter. One filter is used for standard applications such as digging and normal use of a hammer. The second filter is used for an application such as demolishing a ceiling in a tunnel with a hammer.

Note: If the message display shows that the hydraulic return filter is plugged, turn off the machine. After you make sure that the warning has disappeared, start the machine and run the machine on level ground for approximately 10 minutes. If the warning still appears in the message display, inspect the filter and replace the filter, if necessary.

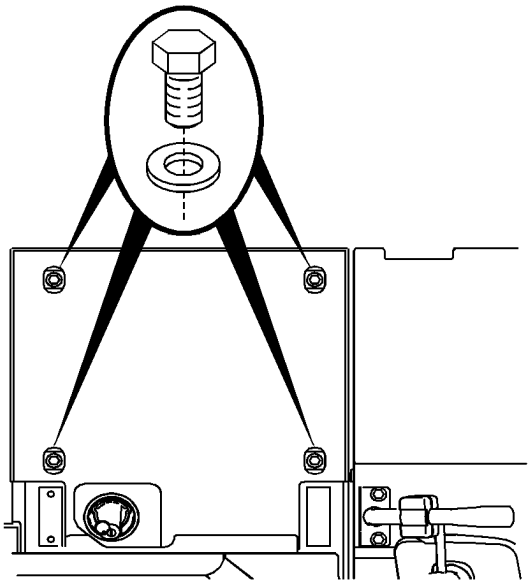


Illustration 526 g02515157

1. Remove the bolts, washers, and the cover from the top of the hydraulic tank.

2. Clean the area thoroughly in order to keep dirt out of the return filter. Clean the area thoroughly in order to keep dirt out of the filler cap.

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

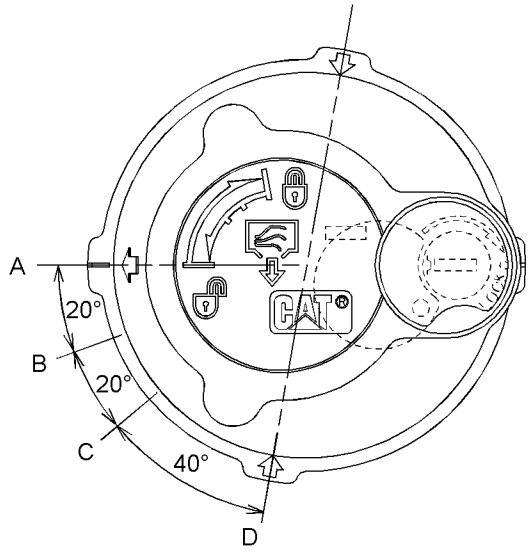


Illustration 527 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

3. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 527 for filler cap positions.

a. Turn the filler cap counterclockwise, with no downward force applied, and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the center of the filler cap down. Without tilting the filler cap, move the arrow from position (C) to position (D).

d. The hydraulic tank pressure is relieved. The filler cap can now be removed if needed.

e. Tighten the filler cap on the hydraulic tank to position (A).

4. Check the hydraulic system oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

5. Remove the filter cartridge. Perform the following steps in order to remove the filter cartridge.

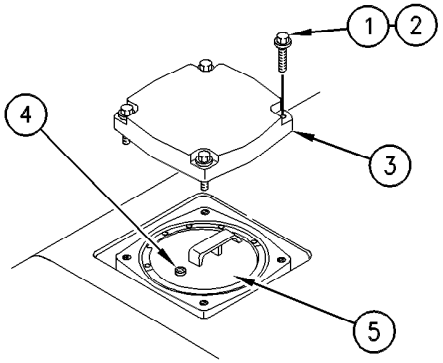


Illustration 528 g00102211

(1) Bolts
(2) Washers
(3) Cover
(4) Plug
(5) Filter cartridge

a. Remove bolts (1), washers (2), and cover (3).

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

b. Remove plug (4) in order to release the pressure in filter cartridge (5).

Note: When plug (4) is removed the oil level in the return filter drops to the level of the hydraulic tank.

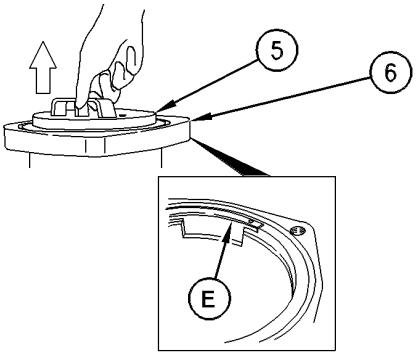


Illustration 529 g02515262

(5) Filter cartridge
(6) Filter case
(E) Guide

c. Pull up the handle at the top of filter cartridge (5) until the filter cartridge contacts guide (E) on filter case (6).

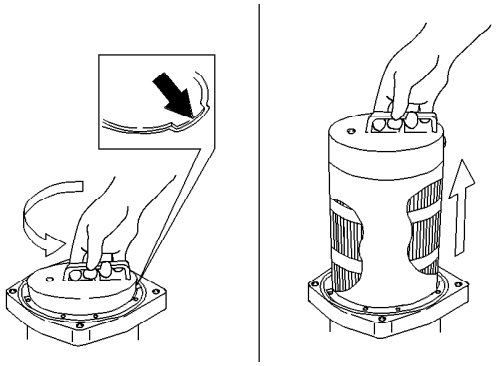


Illustration 530 g00102214

d. Turn the filter cartridge counterclockwise by 180 degrees in order to align the projection of the filter cartridge with the notch of the filter case. Pull out the filter cartridge.

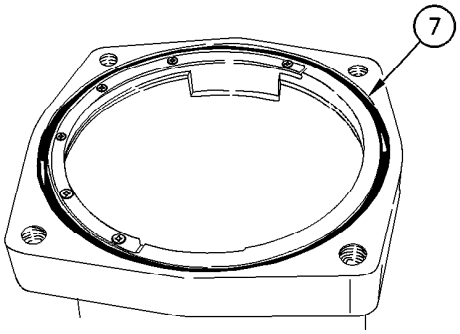


Illustration 531 g00102219

(7) O-ring

e. Inspect the cover and O-ring (7). If either part is damaged, replace the part.

f. Inspect the filter cartridge for debris and for damage. If necessary, replace the filter cartridge.

6. Remove the filter element. Perform Step 6a through Step 6f in order to remove the filter element.

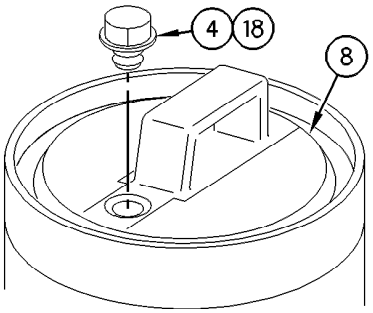


Illustration 532 g00104507

(4) Plug
(8) Plate
(18) O-ring

a. Make sure that plug (4) is removed. Make sure that all of O-ring (18) is removed from plate (8).

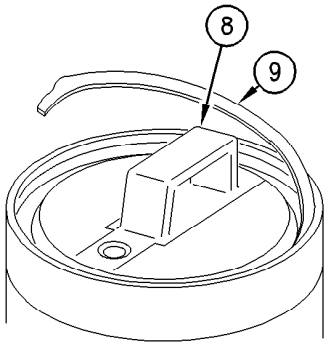


Illustration 533 g00918893

(8) Plate
(9) Spiral retaining ring

b. Remove spiral retaining ring (9).

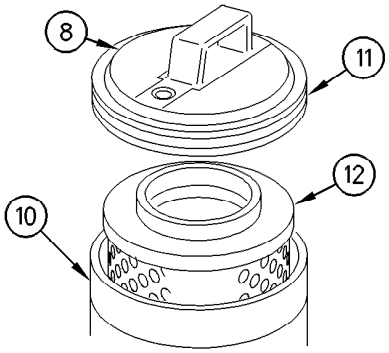


Illustration 534 g00104510

(8) Plate
(10) Shell
(11) O-ring
(12) Filter element

c. Hold the filter cartridge with one hand. Grasp the grip of plate (8) with your other hand. Lift plate (8) in order to separate plate (8) from the filter cartridge.

d. Remove O-ring (11) from plate (8).

e. Lift filter element (12) from shell (10).

f. Pour the remaining oil into a suitable container.

Note: Dispose of used oil according to local regulations.

g. Repeat Step 6a through Step 6f for the other filter groups.

7. Clean the shell of the filter cartridge. Perform Step 7a through Step 7d in order to clean the shell of the filter cartridge.

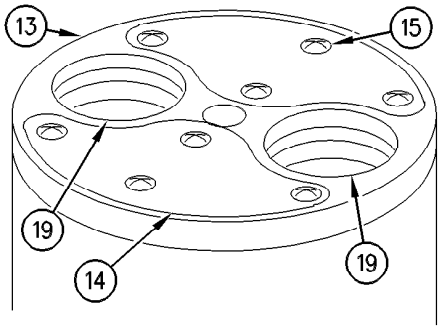


Illustration 535 g00104511

(13) Slide plate
(14) Pads
(15) Screws
(19) Port

a. Turn shell (10) upside-down.

b. Remove screws (15).

c. Remove Pads (14) from slide plate (13).

d. Wash the following parts in a clean nonflammable solvent: plug (4), plate (8), spiral retaining ring (9), shell (10) and Pads (14). Dry the parts.

8. Install the filter elements. Perform Step 8a through Step 8k in order to install the filter elements.

Note: Consult a Caterpillar dealer for the Service Kit that is needed to install the filter element and the filter cartridge.

a. Apply spray type oil to the inside of shell (10) in order to prevent rust.

b. Apply grease to a new O-ring (11).

c. Plate (8) will contact the inside of shell (10). Apply grease to this point.

d. Apply grease to O-rings inside ports (19) at the bottom of shell (10).

e. Install new Pads (14). Tighten the screws to a torque of 0.4 N·m (3.5 lb in).

f. Apply spray type oil into the clearance between shell (10) and slide plate (13).

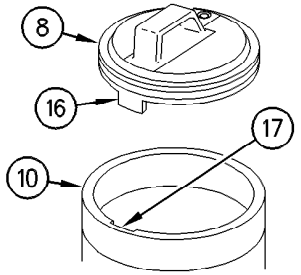


Illustration 536 g00104512

(8) Plate
(10) Shell
(16) Boss
(17) Notch

g. Turn over shell (10). Apply grease to the two O-rings on new element (12). Install element (12) into shell (10).

h. Move boss (16) in alignment with notch (17). Install plate (8) into shell (10).

i. Install spiral retaining ring (9) into the groove in shell (10).

j. Apply grease to new O-ring (18). Install O-ring (18) on plug (4).

k. Install plug (4) into plate (8).

9. Install the filter cartridge. Perform Step 9a through Step 9e in order to install the filter cartridge.

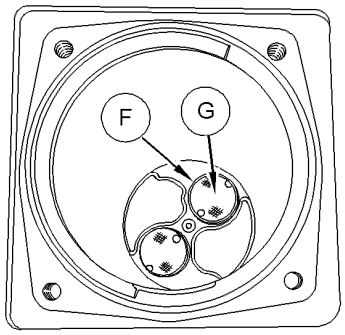


Illustration 537 g02515259

(F) Port
(G) Slide plate

a. Check that ports (F) at the bottom of the filter case are closed.

Note: If the ports are open, rotate slide plate (G) counterclockwise to the stopper in order to fully close the ports. When the ports are fully closed, any remaining oil in the filter case should be completely removed.

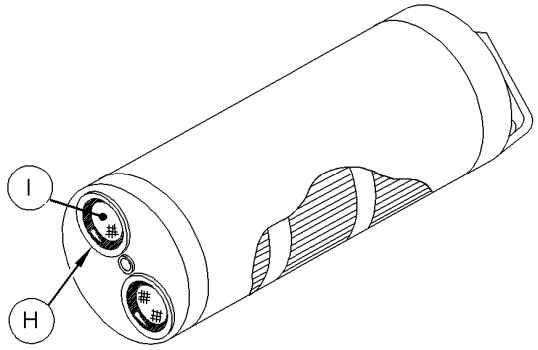


Illustration 538 g02515258

(I) Slide plate
(H) Port

b. Check that ports (H) of the filter cartridge are fully closed.

Note: The filter cartridge cannot be installed unless the ports are fully closed. If the ports are open, rotate slide plate (I) counterclockwise to the stopper in order to fully close the ports.

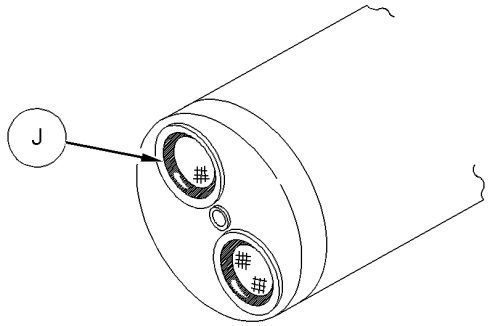


Illustration 539 g02515257

(J) O-rings

c. Check that O-rings (J) have been installed and that oil has been applied to O-rings (J).

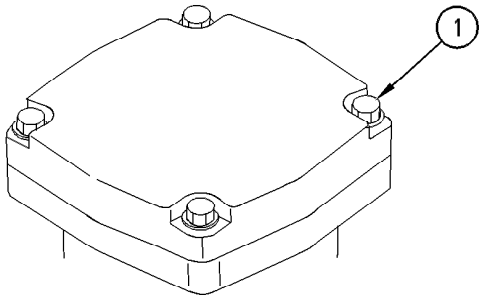


Illustration 540 g00102225

(1) Bolts

d. Install the filter cartridge into the filter case. Turn the filter cartridge clockwise by 180 degrees and push down the filter cartridge when the filter cartridge contacts guide (E).

e. Install plug (4), cover (3), washers (2), and bolts (1). Tighten bolts (1) to a torque of 29 ± 5 N·m (22 ± 4 lb ft).

10. Check the hydraulic system oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

i04119541

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.

The hydraulic oil tank is on the right side of the machine.

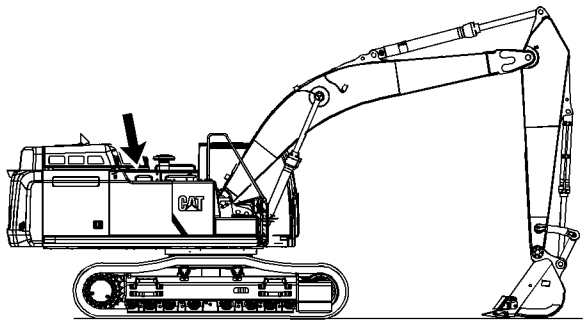


Illustration 541 g02111809

1. Park the machine on level ground. Lower the bucket to the ground with the stick in a vertical position, as shown.

2. Open the access door on the right side of the machine.

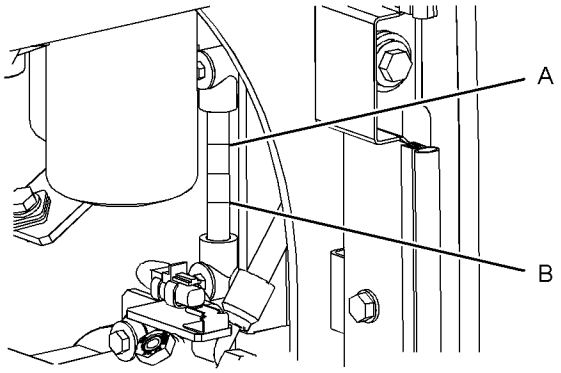


Illustration 542 g02111810

(A) High temperature range
(B) Low temperature range

3. For a cold machine, maintain the hydraulic oil level in the low temperature range. For a machine that is at normal operating temperature, maintain the hydraulic oil level in the high temperature range.

4. Add oil, if necessary. See Operation and Maintenance, “Lubricant Viscosities”.

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information that pertains to Containing Fluid Spillage.

Note: Perform Step 5 through Step 7 if the oil level is low.

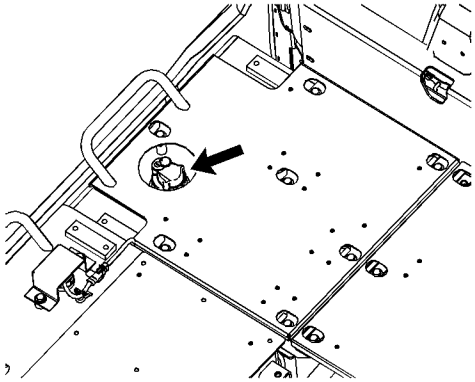


Illustration 543 g02111812

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

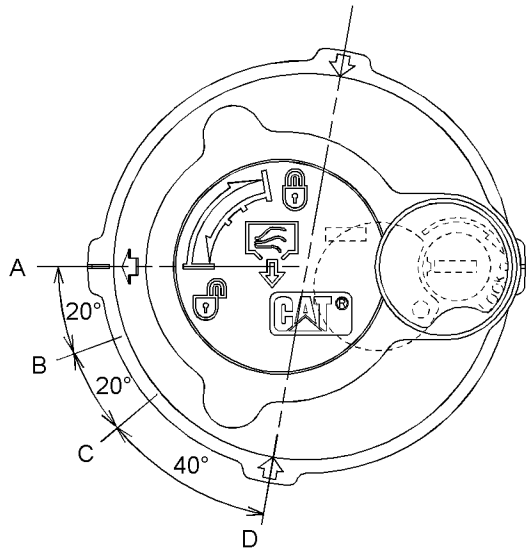


Illustration 544 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

5. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 544 for filler cap positions.

a. Turn the filler cap counterclockwise and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the filler cap down and move the arrow from position (C) to position (D).

d. After the tank pressure is relieved, remove the filler cap.

6. Check the O-ring seal of the filler cap. Replace the O-ring seal if the O-ring seal is damaged.

7. Clean the filler cap and install the filler cap.

8. Close the access door.

i05984310

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008-OC; 5095-SM; 5095-008; 7542-008; 7542

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 6000 hours. S·O·S services after 3,000 hours is strongly Recommended. Consult your Cat dealer for details.

⚠ WARNING

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

Open the access door on the right side of the machine in order to access the sampling valve.

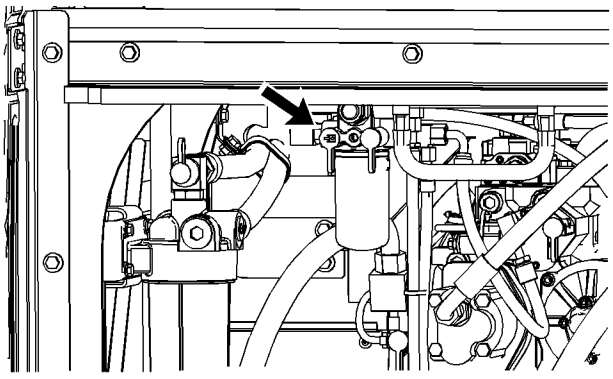


Illustration 545 g02110935

The hydraulic oil sampling valve is located on the housing of the pilot filter.

Refer to Special Publication, SEBU6250, “S·O·S Oil Analysis” for information that pertains to a sample of the hydraulic oil. For additional information about taking an oil sample, refer to Special Publication, PEGJ0047, “How To Take A Good Oil Sample”.

i03753191

Indicators and Gauges - Test

SMCS Code: 7450-081; 7490-081

1. Look for broken lenses on the gauges, broken indicator lights, broken switches, and other broken components in the cab.

2. Start the engine.

3. Look for inoperative gauges.

4. Turn on all machine lights. Check for proper operation.

5. Move the machine forward. Release the travel levers and the travel pedals. The machine should stop.

6. Stop the engine.

7. Make any repairs that are required before operating the machine.

i04882709

Oil Filter (Hydraulic Hammer) - Replace

SMCS Code: 5068-510

⚠ WARNING

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

1. Park the machine on level ground in the service position.

2. Move the hydraulic lockout control to the UNLOCKED position.

3. Turn the engine start switch to the ON position.

4. Move the joysticks and the travel levers/pedals to the full stroke positions in order to relieve the pressure in the hydraulic lines.

5. Turn the engine start switch to the OFF position and return the lever for the hydraulic lockout control to the LOCKED position.

⚠ WARNING

Pressurized system!

The hydraulic tank contains hot oil under pressure. To prevent burns from the sudden release of hot oil, relieve the tank pressure with the engine off by slowly turning the cap approximately 1/8 of a turn until the cap reaches the secondary stop.

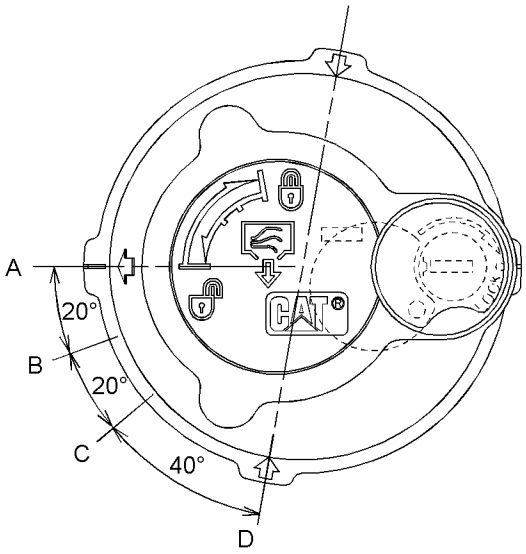


Illustration 546 g02275615

Filler cap

(A) LOCK position
(B) PRESSURE RELEASE - START position
(C) PRESSURE RELEASE - END position
(D) OPEN position

6. Release the pressure that may be present in the return hydraulic circuit with the following procedure. Refer to Illustration 546 for filler cap positions.

a. Turn the filler cap counterclockwise, with no downward force applied, and move the arrow from position (A) to position (B).

b. Release the pressure for a minimum of 45 seconds by moving the arrow from position (B) to position (C).

c. Push the center of the filler cap down. Without tilting the filler cap, move the arrow from position (C) to position (D).

d. The hydraulic tank pressure is relieved. Tighten the filler cap on the hydraulic tank to position (A).

7. The oil filter for the hammer is located near the base of the boom.

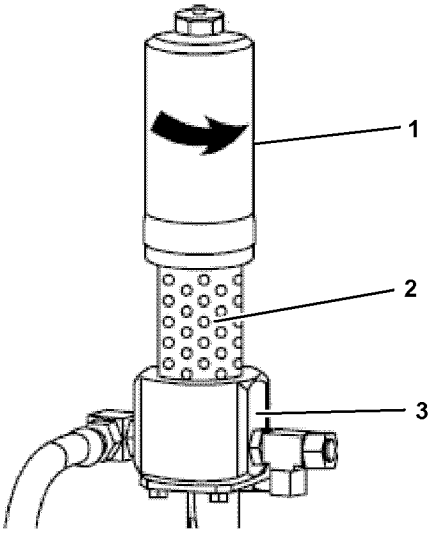


Illustration 547 g02902799

(1) Filter case
(2) Filter element
(3) Filter base

8. Position a suitable container in order to contain the oil.

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

9. Loosen filter case (1).

10. Lift filter case (1) in order to remove filter element (2).

11. Remove the used filter element from filter base (3).

Note: The element cannot be reused.

Note: Used filter elements should always be disposed of according to local regulations.

12. Clean filter case (1) and inspect the O-ring for damage. Replace the O-ring if necessary.

13. Install the new filter element.

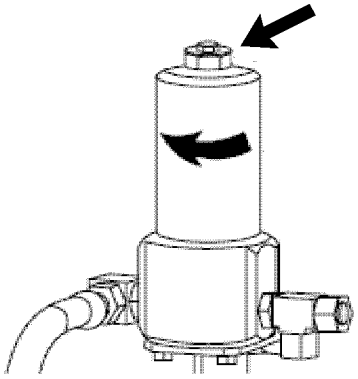


Illustration 548 g02909599

14. Assemble filter case (1). Tighten the nut on the filter case to a torque of 100 ± 10 N·m (74 ± 7 lb ft).

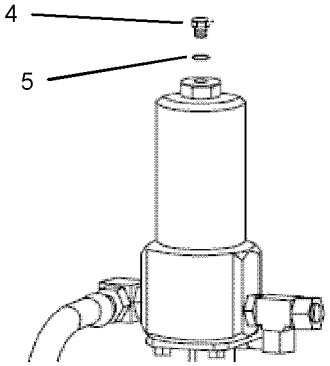


Illustration 549 g02909737

15. Remove plug (4) and inspect O-ring (5) for damage. Replace the O-ring if necessary. Tighten plug (4) to a torque of 13 ± 2 N·m (10 ± 1.5 lb ft)

16. Start the engine and operate the machine slowly for 10 to 15 minutes. Move each cylinder evenly through several cycles and operate the hammer.

17. Return the machine to the service position. Check the machine for oil leaks.

18. Stop the engine.

19. Check the hydraulic oil level.

Reference: For the correct procedure, refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

i02106227

Oil Filter - Inspect

SMCS Code: 1308-507; 5068-507

Inspect a Used Filter for Debris

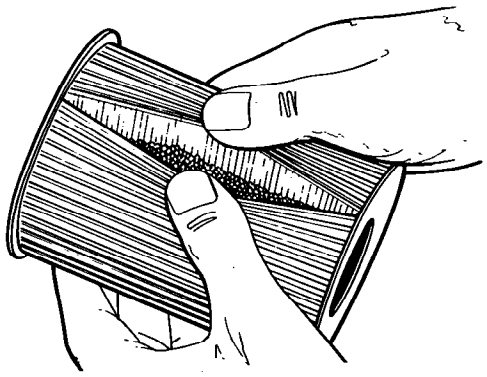


Illustration 550 g00100013

The element is shown with debris.

Use a filter cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminum parts of the engine such as main bearings, rod bearings, or turbocharger bearings.

Small amounts of debris may be found in the filter element. This could be caused by friction and by normal wear. Consult your Caterpillar dealer in order to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar can result in severe engine damage to engine bearings, to the crankshaft, and to other parts. This can result in larger particles in unfiltered oil. The particles could enter the lubricating system and the particles could cause damage.

i05097269

Pump Coupling Oil - Change

SMCS Code: 5062-044

⚠ WARNING

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

Note: If the machine is parked on an incline or the engine has been stopped for a short period of time, the oil in the pump coupling will not return to the housing. Park the machine on level ground and drain the oil after the engine has been stopped for at least 15 minutes.

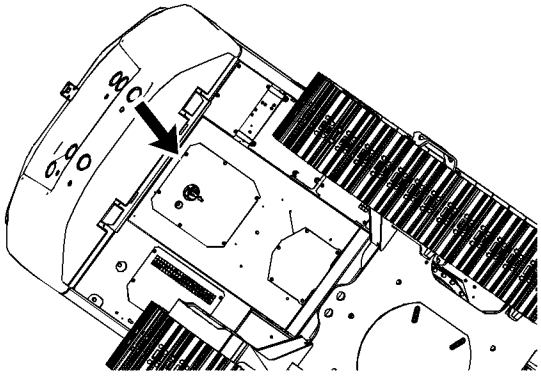


Illustration 551 g02110864

1. Remove the cover plate in order to gain access to the drain plug.

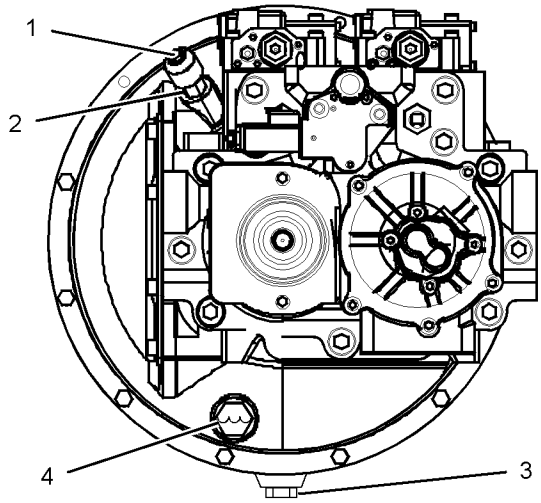


Illustration 552 g01513294

(1) Breather cap
(2) Adapter
(3) Oil drain plug
(4) Oil level sight gauge

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

2. Remove drain plug (3). Allow the oil to drain into a suitable container.

3. Clean the drain plug and inspect the O-ring seal. If wear or damage is evident, replace the drain plug and/or the O-ring seal.

4. Install drain plug (3).

5. Open the access door on the right side of the machine.

NOTICE
Do not overfill the housing for the pump coupling. Overfilling will the cause the engine oil to overheat and engine damage can result.

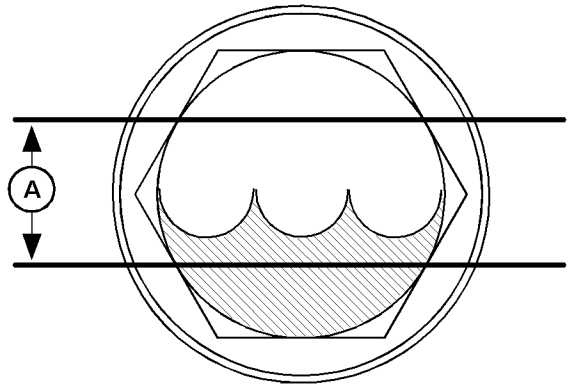


Illustration 553 g03208836
Sight Gauge

6. Remove breather cap (1) and adapter (2). Fill the housing with new oil to area (A) of sight gauge (4). See Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill) ”.

7. Clean the breather cap and the adapter. Inspect the O-ring seal. If wear or damage is evident, replace the damaged part.

8. Install the breather cap and the adapter.

9. Check for leaks.

10. Close the access door on the right side of the machine.

11. Install the cover plate.

i05097229

Pump Coupling Oil Level - Check

SMCS Code: 5062-535

⚠ WARNING

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

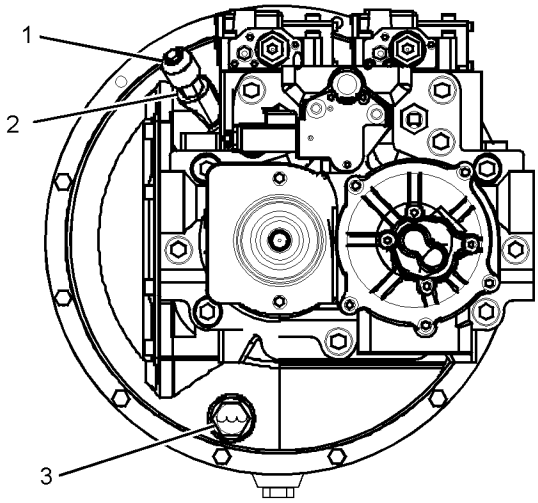


Illustration 554 g01513216
(1) Breather
(2) Adapter
(3) Sight Gauge

Note: Check the oil level for the pump coupling with the machine on a level surface. If the machine is parked on an incline or the engine has been stopped for a short period, the oil in the pump coupling will not return to the housing. The fluid level cannot be checked properly. Park the machine on level ground and check the oil level after the engine has been stopped for at least 15 minutes.

1. Open the access door on the right side of the machine.

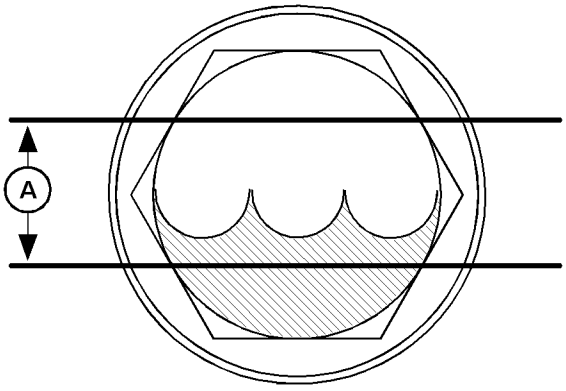


Illustration 555 g03208836
Sight Gauge

2. Maintain the oil level in area (A) of sight gauge (3). If the oil level is low, then add oil. See Operation and Maintenance Manual, “Lubricant Viscosities”.

NOTICE
Do not overfill the housing for the pump coupling. Overfilling will the cause the engine oil to overheat and engine damage can result.

3. Remove breather cap (1) and adapter (2) and fill to the recommended oil level.
4. Clean the breather cap and the adapter. Inspect the O-ring seal. If wear or damage is evident, replace the damaged part.
5. Replace the breather cap and the adapter.
6. Close the right side access door.

i03753236

Radiator Core - Clean

SMCS Code: 1353-070

⚠ WARNING

Personal injury can result from air pressure.

Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.

Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

1. Open the rear access door on the left side of the machine.

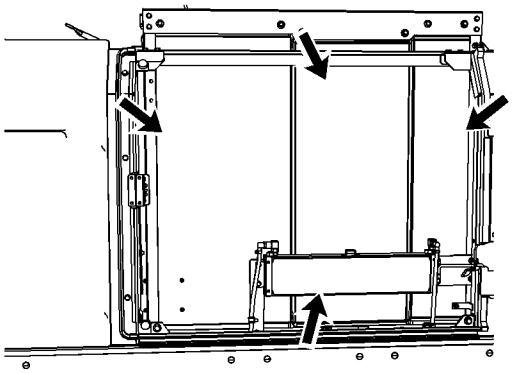


Illustration 556 g02024540

2. Check all of the core fins for debris.
3. Remove dust and debris from all of the core fins and from the screens.

   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.
4. Close the access doors.

i05805860

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.

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.

i05252968

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040; 7325-040

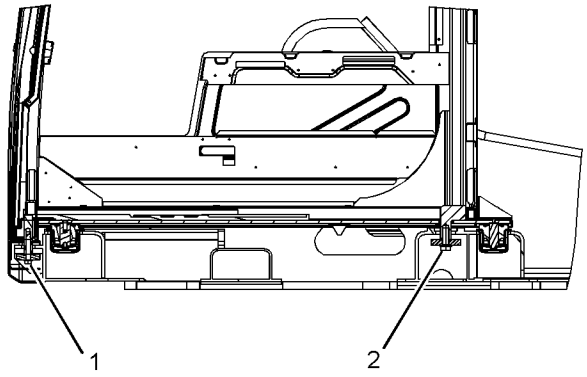


Illustration 557 g02008734

Inspect the ROPS for loose bolts or for damaged bolts. Replace any damaged bolts or missing bolts with original equipment parts only.

- Tighten the M16 bolt (1) to125 ± 20 N·m (92 ± 15 lb ft).
- Tighten the M24 bolt (2) to 425 ± 50 N·m (315 ± 40 lb ft).

Do not straighten the ROPS. Do not repair the ROPS by welding reinforcement plates to the ROPS.

Consult your Cat dealer for inspection of any potential damage or repair of any damage to any operator protective structure. (Including ROPS, FOPS, TOPS, OPS, and OPG) Refer to Special Instruction, SEHS6929 , “Inspection, Maintenance, and Repair of Operator Protective Structures (OPS) and Attachment Installation Guidelines for All Earthmoving Machinery”

i04423622

Seat Belt - Inspect

SMCS Code: 7327-040

Always inspect the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.

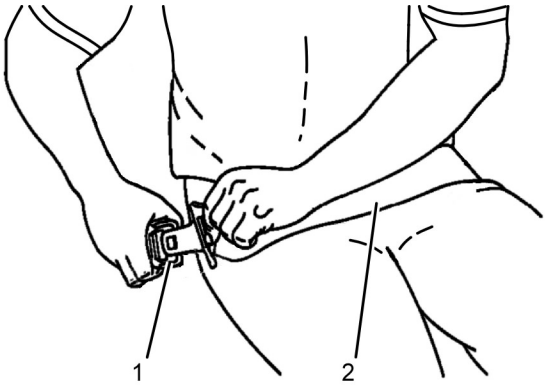


Illustration 558 g02620101

Typical example

Inspect buckle (1) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect seat belt (2) for webbing that is worn or frayed. Replace the seat belt if the webbing is worn or frayed.

Inspect all seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

Contact your Cat dealer for the replacement of the seat belt and the mounting hardware.

Note: The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

i06891605

Seat Belt - Replace

SMCS Code: 7327-510

The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

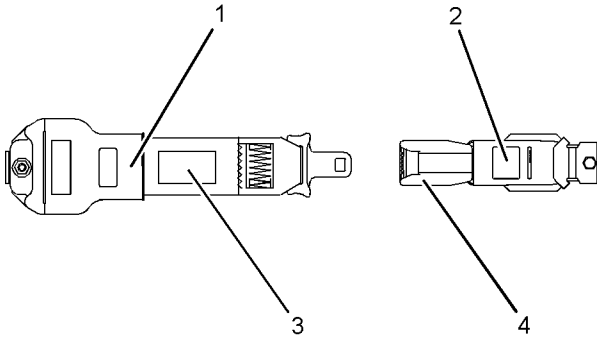


Illustration 559 g01152685

Typical Example

(1) Date of installation (retractor)
(2) Date of installation (buckle)
(3) Year of manufacture (tag) (fully extended web)
(4) Year of manufacture (underside) (buckle)

Consult your Cat dealer for the replacement of the seat belt and the mounting hardware.

Determine age of new seat belt before installing on seat. A manufacture label is on belt webbing and imprinted on belt buckle. Do not exceed install by date on label.

Complete seat belt system should be installed with new mounting hardware.

Date of installation labels should be marked and affixed to the seat belt retractor and buckle.

Note: Date of installation labels should be permanently marked by punch (retractable belt) or stamp (non-retractable belt).

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i03867596

Swing Bearing - Lubricate

SMCS Code: 7063-086

Note: Caterpillar recommends the use of multipurpose lithium grease NLGI Grade 2 for lubricating the swing bearing. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more information on multipurpose lithium 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 bearings.

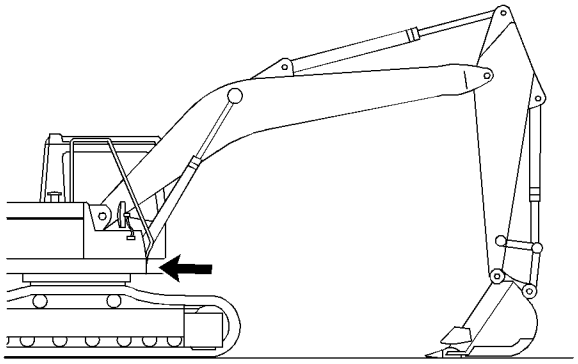


Illustration 560 g02110713

The swing bearings are under the base of the boom.

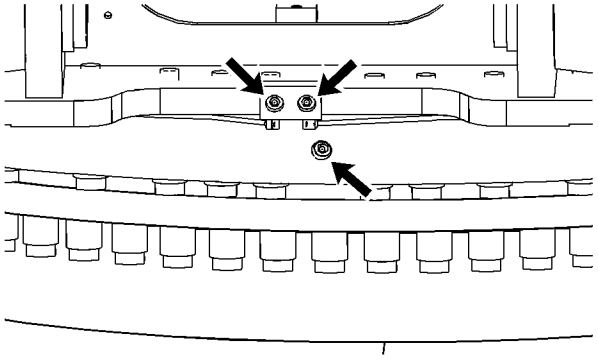


Illustration 561 g01106319

Apply lubricant through the fittings until the lubricant overflows the bearing seals.

i03867537

Swing Drive Oil - Change

SMCS Code: 5459-044

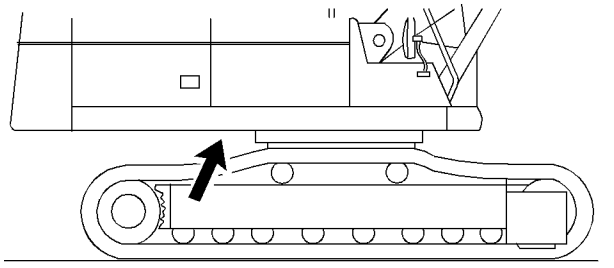


Illustration 562 g02110675

The oil drain hose is under the center of the upper structure.

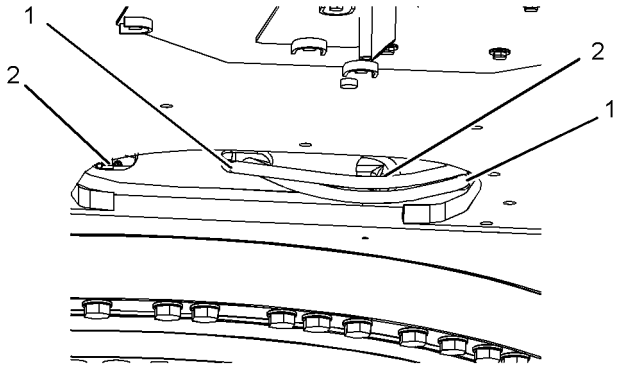


Illustration 563 g01106606

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

1. Remove drain hose (1) from the hole in the upper frame. Face the end of the hose toward the container.

2. Loosen the drain valve in hole (2). Drain the oil into a suitable container.

Note: Dispose of drained fluids according to local regulations.

Note: There are two swing drives that are located between the swivel joint and the main control valve. Perform the same procedure for both swing drives.

3. Tighten the drain valve. Replace the drain hose (1) into the hole in the upper frame.

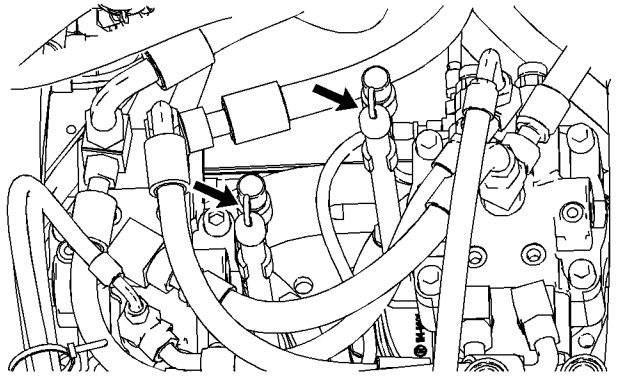


Illustration 564 g01106264

4. Remove the dipstick.

5. Add the specified quantity of oil through the dipstick tube. See Operation and Maintenance, “Capacities (Refill)”.

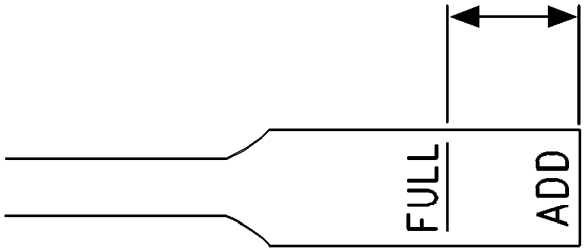


Illustration 565 g01049757

6. Make sure that the oil level is maintained between the marks on the dipstick.

7. Check the oil that has been drained for metal chips or metal particles. Consult your Caterpillar dealer if any metal chips or metal particles are found.

Note: Dispose of drained materials according to local regulations.

i03867532

Swing Drive Oil Level - Check

SMCS Code: 5459-535-FLV

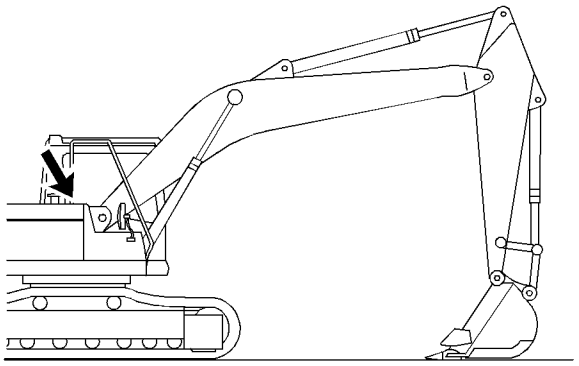


Illustration 566 g02110464

The dipstick for the swing drive oil is on the swing drive at the rear base of the boom.

Note: There are two swing drives that are located between the swivel joint and the main control valve. Perform the same procedure for both swing drives.

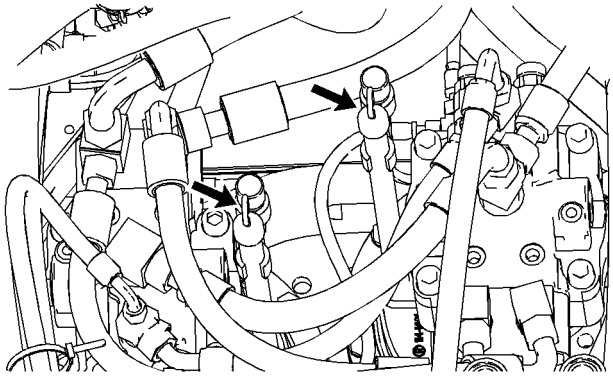


Illustration 567 g01106264

1. Remove the dipstick.

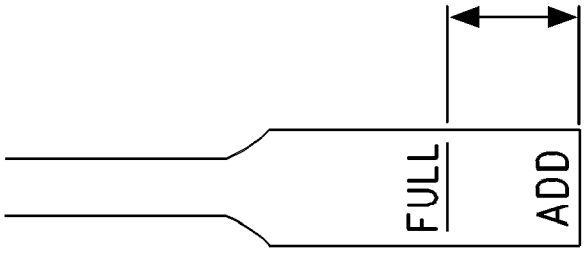


Illustration 568 g01049757

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

2. Check the dipstick. Maintain the oil level between the tip of the dipstick and the “FULL” mark on the dipstick. Add oil through the dipstick tube, if necessary. When the oil level becomes close to the “ADD” mark, add approximately 500 cc of oil. See Operation and Maintenance, “Lubricant Viscosities”.

3. Insert the dipstick.

4. Check the dipstick again.

5. Reinsert the dipstick.

i04787571

Swing Drive Oil Sample - Obtain

SMCS Code: 5459-008-OC; 5459-OC; 5459-008; 5459-554-OC; 7542-008

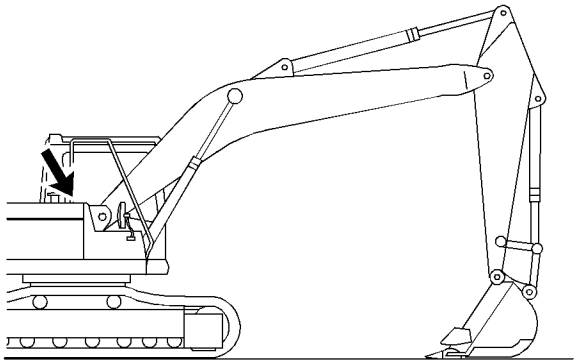


Illustration 569 g02110464

The dipstick for the swing drive oil is on the swing drive at the rear base of the boom.

Note: There are two swing drives that are located between the swivel joint and the main control valve. Perform the same procedure for both swing drives.

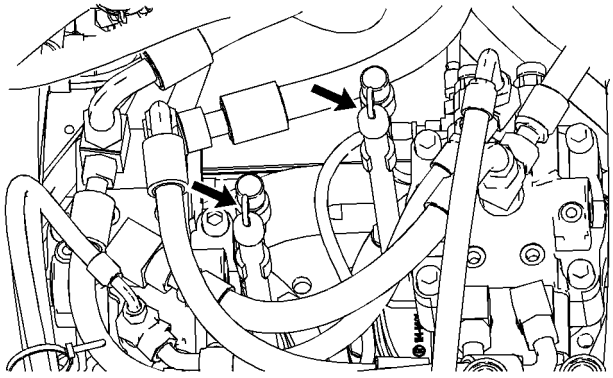


Illustration 570 g01106264

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.

i03804517

Swing Gear - Lubricate

SMCS Code: 7063-086

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.

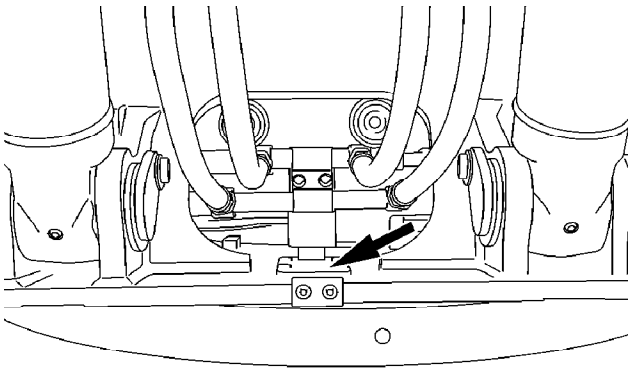


Illustration 571 g00834990

Remove the inspection cover that is located near the boom base. Inspect the grease.

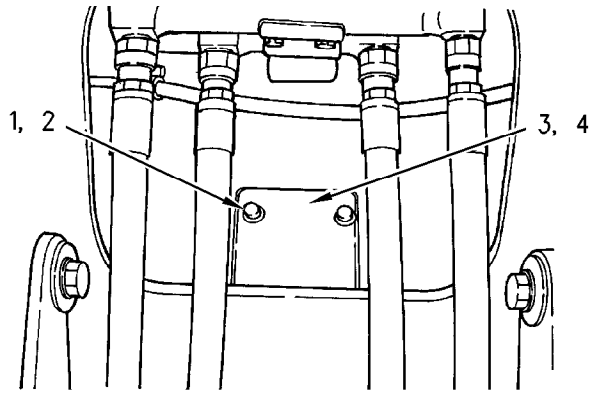


Illustration 572 g00688056

1. Remove bolts (1) and washers (2). Remove cover (3) and gasket (4).

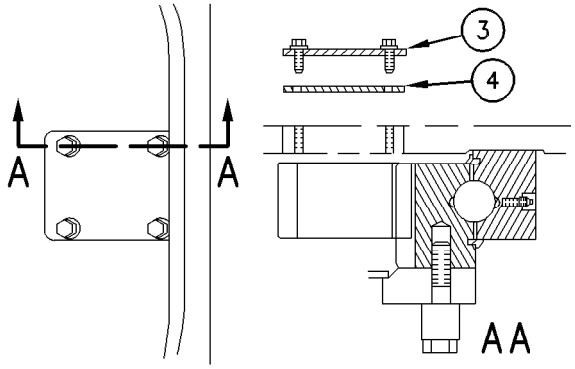


Illustration 573 g00115464

2. Inspect gasket (4). Replace the gasket if damage is evident.

3. Check the level of the grease. The grease should be evenly distributed on the floor of the pan.

Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the capacity of the swing gear.

Add grease, as needed. Remove grease, as needed. Too much grease will result in the deterioration of the grease that is caused by excessive movement of the grease. Too little grease will result in poor lubrication of the swing gear.

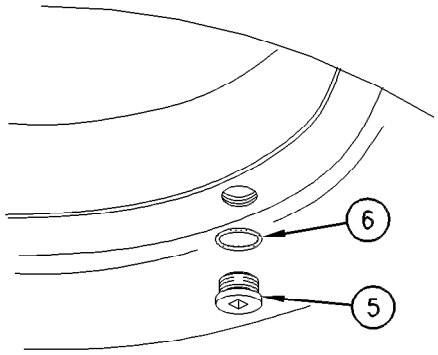


Illustration 574 g00101653

4. Check for contamination and for discolored grease.

5. If the grease is contaminated or discolored with water, change the grease. Remove plug (5) in order to allow the water to drain. When you reinstall plug (5), inspect O-ring seal (6). Replace the O-ring seal if damage is evident.

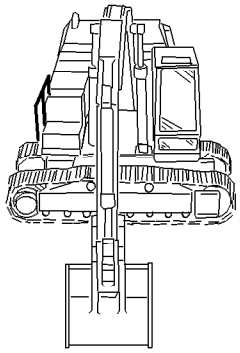


Illustration 575 g00101644

6. Raise the boom and turn the upper structure by 90 degrees. Lower the bucket to the ground.

7. Repeat Step 6 at every 90 degrees in 4 places. Add grease, as needed.

i05647259

Track Adjustment - Adjust

SMCS Code: 4170-025

⚠ WARNING

Personal injury or death can result from grease under pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve one turn only.

If track does not loosen, close the relief valve and contact your Caterpillar dealer.

NOTICE
Keeping the track properly adjusted will increase the service life of the track and drive components.

Note: The track tension must be adjusted according to the current operating conditions. Keep the track as slack as possible if the soil is heavy.

Measuring Track Tension

1. Operate the machine in the direction of the idlers.

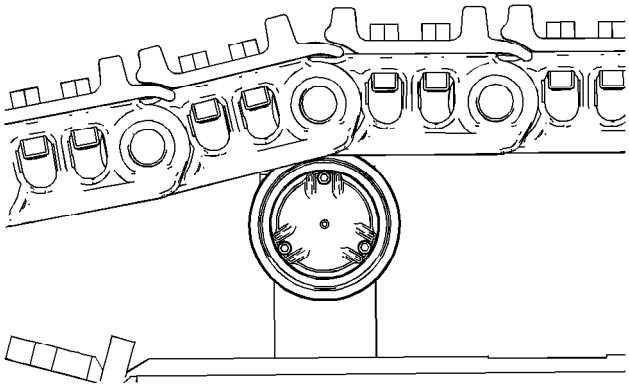


Illustration 576 g01103855

2. Stop with one track pin directly over the front carrier roller. Park the machine and turn off the engine.

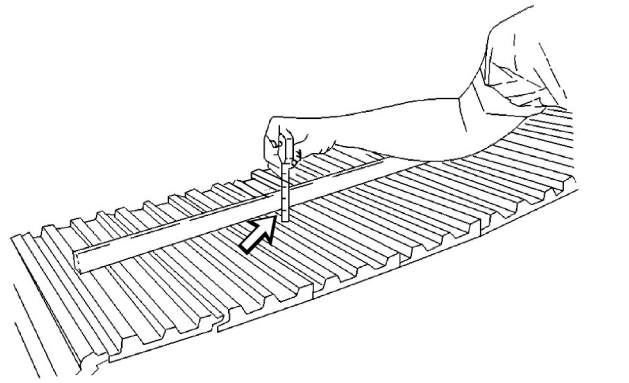


Illustration 577 g03472827

3. Place a straight edge on top of the track grousers between the front carrier roller and the idler. The straight edge should be long enough to reach from the front carrier roller to the idler.

Note: If your machine is equipped with three carrier rollers, place a straight edge on the tracks between the carrier rollers. The straight edge should be long enough to reach from one carrier roller to another carrier roller.

4. Measure the maximum amount of sag in the track. The sag is measured from the highest point of the track grouser to the bottom of the straight edge. A track that is properly adjusted will have a sag of 40.0 to 55.0 mm (1.57 to 2.17 inch).

5. If the track is too tight, or if the track is too loose, adjust the track tension according to the appropriate procedure below.

Adjusting Track Tension

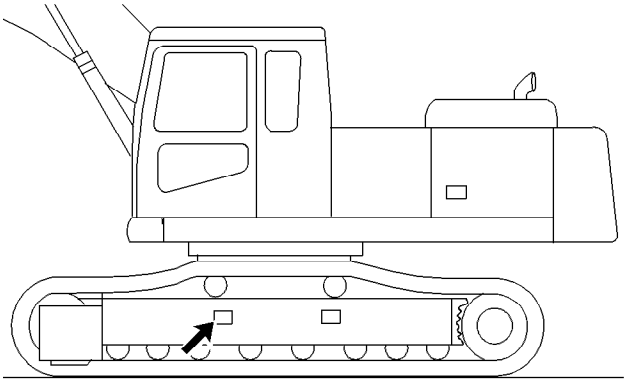


Illustration 578 g00270405

Typical example

The track adjuster is located on the track frame.

Tightening the Track

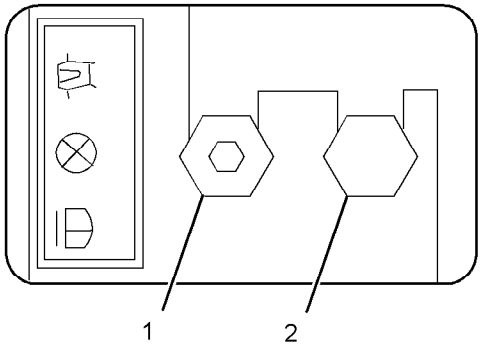


Illustration 579 g01091134

(1) Grease fitting
(2) Relief valve

Wipe the fitting before you add grease.

1. Add grease through grease fitting (1) until the correct track tension is reached.

2. Operate the machine back and forth in order to equalize the pressure.

3. Check the amount of sag. Adjust the track, as needed.

Loosening the Track

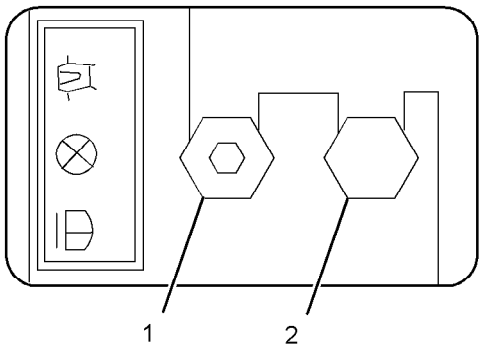


Illustration 580 g01091134

(1) Grease fitting
(2) Relief valve

1. Loosen relief valve (2) carefully until the track begins to loosen. One turn should be the maximum.

2. Tighten relief valve (2) to 34 ± 5 N·m (25 ± 4 lb ft) when the desired track tension is reached.

3. Operate the machine back and forth in order to equalize the pressure.

4. Check the amount of sag. Adjust the track, as needed.

i01590290

Track Adjustment - Inspect

SMCS Code: 4170-040

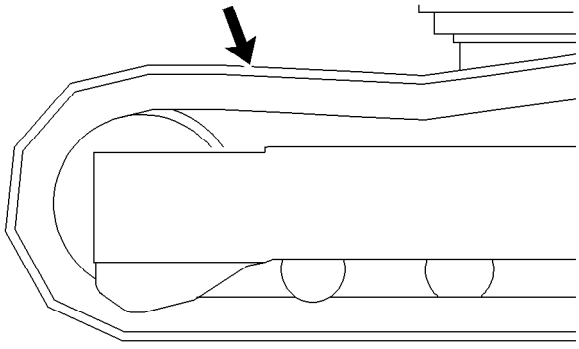


Illustration 581 g00824541

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

If the track appears to be too tight or too loose, refer to Operation and Maintenance Manual, “Track Adjustment - Adjust”.

i04571216

Travel Alarm - Test
(If Equipped)

SMCS Code: 7429-081

Move the machine in order to test the travel alarm.

1. Start the engine. Move the hydraulic lockout control to the UNLOCKED position.

2. Raise the work tool in order to avoid any obstacles. Make sure that there is adequate overhead clearance.

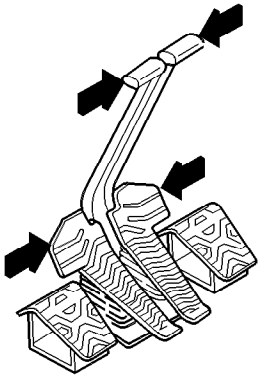


Illustration 582 g00560313

3. Use the travel levers or the travel pedals to move the machine forward. The travel alarm should sound.

4. Release the travel levers and the travel pedals in order to stop the machine.

5. Use the travel levers and the travel pedals to move the machine backward. The travel alarm should sound.

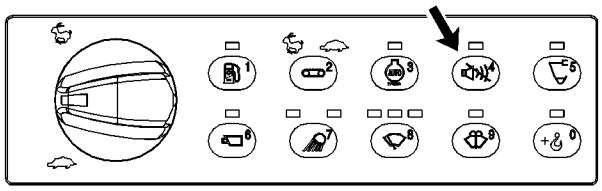


Illustration 583 g02730938

6. Push the alarm cancel switch. The travel alarm should shut off.

7. Stop the machine. Lower the work tool to the ground. Move the hydraulic lockout control to the LOCKED position. Stop the engine.

i03934011

Undercarriage - Check

SMCS Code: 4150-535

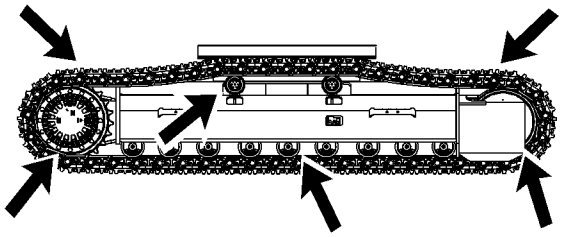


Illustration 584 g02154815

1. Check the carrier rollers, the track rollers, and the idler wheels for possible leakage.

2. Check the surface of the track, the carrier rollers, the track rollers, the idler wheels, the track shoes, and the drive sprockets. Look for signs of wear and loose mounting bolts.

3. Listen for any abnormal noises while you are moving slowly in an open area.

4. If abnormal wear exists or abnormal noises or leaks are found, consult your Caterpillar dealer.

i02186587

Window Washer Reservoir - Fill

SMCS Code: 7306-544-KE

NOTICE
When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.

1. Open the front access door on the left side of the machine.

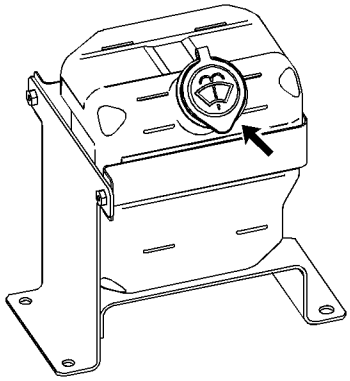


Illustration 585 g01105820

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.

i05867976

Windows - Clean

SMCS Code: 7310-070; 7340-070

Clean the outside of the windows from the ground, unless handholds are available.

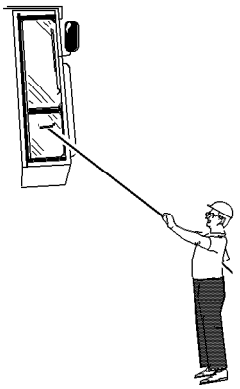


Illustration 586 g00566124
Typical example

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 in order to clean polycarbonate windows.

Wash polycarbonate windows with mild soap and warm water that does not exceed 50° C (122° F). Use a soft sponge, or damp cloth. Never use a dry cloth or paper towels on polycarbonate windows. Rinse the windows with a sufficient amount of clean cold water.

Note: Naphtha or kerosene can be used in order to remove labels, films, paint, or marking pen from polycarbonate windows.

Note: Do not use abrasive, or highly alkaline cleaners. Do not use sharp instruments, such as squeegees or razor blades on polycarbonate windows. Do not clean polycarbonate windows in the hot sun or at elevated temperatures.

Warranty Section

Warranty Information

i06044323

Emissions Warranty Information

SMCS Code: 1000

The certifying engine manufacturer warrants to the ultimate purchaser and each subsequent purchaser that:

1. New non-road diesel engines and stationary diesel engines less than 10 liters per cylinder (including Tier 1 and Tier 2 marine engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the United States and Canada, including all parts of their emission control systems (“emission related components”), are:

a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed by the United States Environmental Protection Agency (EPA) by way of regulation.

b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

2. New non-road diesel engines (including Tier 1 and Tier 2 marine propulsion engines < 37 kW and Tier 1 through Tier 4 marine auxiliary engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the state of California, including all parts of their emission control systems (“emission related components”), are:

a. Designed, built, and equipped so as to conform, at the time of sale, to all applicable regulations adopted by the California Air Resources Board (ARB).

b. Free from defects in materials and workmanship which cause the failure of an emission-related component to be identical in all material respects to the component as described in the engine manufacturer's application for certification for the warranty period.

3. New non-road diesel engines installed in construction machines conforming to the South Korean regulations for construction machines manufactured after January 1, 2015, and operated and serviced in South Korea, including all parts of their emission control systems (“emission related components”), are:

a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed in the Enforcement Rule of the Clean Air Conservation Act promulgated by South Korea MOE.

b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

The aftertreatment system can be expected to function properly for the lifetime of the engine (emissions durability period) subject to prescribed maintenance requirements being followed.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in a supplemental Special Publication. Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty and to obtain a copy of the applicable Special Publication.

Reference Information Section

Reference Materials

i07422648

Reference Material

SMCS Code: 1000; 7000

Additional literature regarding your product may be purchased from your local Cat dealer or by visiting publications.cat.com. Use the product name, sales model, and serial number to obtain the correct information for your product.

publications.cat.com

i07743978

Decommissioning and Disposal

SMCS Code: 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations.

Improperly disposing of waste can threaten the environment. Obey all local regulations for the decommissioning and disposal of materials.

Utilize appropriate personal protective equipment when decommissioning and disposing product.

Consult the nearest Cat dealer for additional information. Including information for component remanufacturing and recycling options.

Index

A

Access Door and Cover Locations 265
Engine Hood 265
Left Front Access Door 266
Left Rear Access Door 266
Right Access Door 266
Additional Messages 21
Adjustable Gauge Undercarriage Frame 244
Extending 246
Retracting 245
Air Conditioner/Cab Heater Filter (Recirculation) - Inspect/Replace 287
Air Conditioning and Heating Control 177
English Versus Metric Toggle 179
Alternate Exit 116
FOGS (If Equipped) 117
Front Window (If Equipped) 116
Right Side Window 116
Roof Hatch (If Equipped) 116–117
ARD Spark Plug - Clean 287

B

Battery - Clean 288
Battery - Recycle 288
Battery Disconnect Switch 141
Battery Hold-Down - Tighten 288
Battery or Battery Cable - Inspect/Replace 288
Before Operation 41, 113
Before Starting Engine 38
Belt - Inspect/Adjust/Replace 289
Variable Fan (If Equipped) 289
Boom Base Pins - Lubricate 289
Boom, Stick and Bucket Linkage - Lubricate 290
Grease Block on the Stick 292
Boom, Stick and Bucket Operation 208
Digging 208
Lifting Objects 209
Machines that are Equipped with a Long Reach Configuration 211
Boom/Stick/Bucket Combinations 64
Fixed Gauge 67, 69
Variable Gauge 65
Bucket - Remove and Install 223
Bolted Flag 225
Captured Flag 223
Crossbolt 227
Bucket Linkage - Inspect/Adjust 292
Bucket Tips - Inspect/Replace 293
Bucket Tips (Cat® Advansys) - If Equipped 294
Installation 293
Removal 293
Side Cutters (If Equipped) 295
Side Protectors (If Equipped) 295
Burn Prevention 31
Batteries 32
Coolant 32
Induction System 32
Oils 32

C

Cab Air Filter (Fresh Air) - Clean/Replace 296
Cab Door 182
Camera 147
Rear View Camera (If Equipped) 147
Side View Camera (If Equipped) 147
Camera - Clean (If Equipped) 297
Camera Harness - Disconnect and Connect 247
Connection of the Harness for the Rear View Camera 248
Disconnection of the Harness for the Rear View Camera 247
Capacities (Refill) 275
Circuit Breakers - Reset 298
Condenser (Refrigerant) - Clean 298
Cooling System Coolant (ELC) - Change 298
Cooling System Coolant Extender (ELC) - Add 300
Cooling System Coolant Level - Check 302
Cooling System Coolant Sample (Level 1) - Obtain 303
Cooling System Coolant Sample (Level 2) - Obtain 304
Counterweight Removal and Installation 248
Counterweight Removal and Installation for Standard Machines 248
Machines Equipped with Counterweight Removal System 250
Counterweight Removal Chain - Clean (If Equipped) 304
Counterweight Removal Chain - Inspect (If Equipped) 305

Counterweight Removal Chain - Lubricate (If Equipped) 305
Crushing Prevention and Cutting Prevention.. 31

D

Daily Inspection 113
Daily Basis 113
First 100 Hours 113
Severe Applications 113
Declaration of Conformity 111–112
Decommissioning and Disposal 364
DEF Filler Screen - Clean ((Emission Related Component)) 306
DEF Manifold Filters - Replace (Emission Related Component) 306
Demolition 46
Diesel Exhaust Fluid - Fill 308
Diesel Exhaust Fluid Filter - Replace 309
Diesel Exhaust Fluid Injector - Replace (Emission Related Component) 310
Diesel Particulate Filter - Clean (Emission Related Component) 311
Diesel Particulate Filter Regeneration 123
Delayed Engine Shutdown 124
Modes of Regeneration 123
Regeneration 123
Regeneration Indicators 123
Regeneration Switch 123
Regeneration System Warning Indicators 124
Regeneration Triggers 124

E

Electrical Storm Injury Prevention 38
Emissions Certification Film 110
Emissions Warranty Information 363
Engine Air Filter Primary Element - Clean/ Replace 311
Cleaning Primary Air Filter Elements 312
Inspecting the Primary Air Filter Elements 313
Engine Air Filter Secondary Element - Replace 314
Engine and Machine Warm-Up 196
Dynamic Cool Engine Elevated Idle (DCEEI) 197
Hydraulic System 196
Improve Cold Weather Performance 197
Engine Oil and Filter - Change 316
Fast Fill 317
Engine Oil Level - Check 314
Engine Oil Sample - Obtain 315
Engine Starting 41, 195
Engine Starting (Alternate Methods) 262
Engine Starting with Auxiliary Start Receptacle (If Equipped) 263
Engine Starting with Jump Start Cables (If Equipped) 262
Engine Stopping 46
Engine Valve Lash and Fuel Injector Timing - Check 318
Engine Valve Rotators - Inspect 318
Equipment Lowering with Engine Stopped 48, 200
Machines Equipped with a Boom Lowering Control Valve 201
Machines without a Boom Lowering Control Valve 201
Pressure Release of Auxiliary Lines 203
Ether Starting Aid Cylinder - Replace (If Equipped) 318

F

Film (Product Identification) - Clean 320
Cleaning of the Films 320
Final Drive Oil - Change 321
Final Drive Oil Level - Check 321
Final Drive Oil Sample - Obtain 322
Fire Extinguisher Location 36
Fire Prevention and Explosion Prevention 32
Battery and Battery Cables 34
Ether 35
Fire Extinguisher 35
General 33
Lines, Tubes, and Hoses 35
Regeneration 33
Wiring 34
Fire Safety 36
Foreword 5
California Proposition 65 Warning 5
Certified Engine Maintenance 6
Literature Information 5
Machine Capacity 6
Maintenance 5
Operation 5
Product Identification Number 6
Safety 5
Freezing Conditions 235
Frozen Ground Conditions 200
Fuel System - Prime 322

Fuel System Primary Filter (Water Separator) Element - Replace 323
Fuel System Secondary Filter - Replace 324
Fuel System Water Separator - Drain 325
Fuel Tank Cap and Strainer - Clean 325
Fuel Tank Shutoff and Drain Control 193
Fuel Tank Water and Sediment - Drain 326
Fuel Transfer Pump (Refueling) (If Equipped) 169
Fuel Transfer Pump (Refueling) (If Equipped) 170
Fumes Disposal Filter Element - Replace (If Equipped) 326
Fuses - Replace 327, 329
Relays 329, 331

G

General Hazard Information 28
Containing Fluid Spillage 30
Dispose of Waste Properly 31
Fluid Penetration 29
Inhalation 30
Pressurized Air and Water 29
Trapped Pressure 29
General Information 53
Guards 51
Guards (Operator Protection)
Other Guards (If Equipped) 52
Rollover Protective Structure (ROPS), Falling Object Protective Structure (FOPS) or Tip Over Protection Structure (TOPS) 51

H

High Intensity Discharge Lamp (HID) - Replace (If Equipped) 332
High Pressure Fuel Lines 37
Hydraulic System Oil - Change 332
Cat HYDO Advanced 10 Oil Change interval 332
Fast Fill 336
Procedure to Change the Hydraulic Oil 332
Hydraulic System Oil Filter (Case Drain) - Replace 336
Hydraulic System Oil Filter (Pilot) - Replace 338
Hydraulic System Oil Filter (Return) - Replace 340
Hydraulic System Oil Level - Check 345
Hydraulic System Oil Sample - Obtain 347

I

Identification Information 108
Important Safety Information 2
Indicators and Gauges - Test 347

J

Joystick Controls 185
Joystick Controls (Cat Grade With Assist System) 186
Cat Grade Control System Configuration 187
Cat Grade With Assist System Configuration 188
Joystick Controls (Medium Pressure (If Equipped)) 184
Rotating Tool Control 185
Joystick Controls Alternate Patterns 189
Changing Machine Control Pattern By Four-Way Valve (If Equipped) 189
Changing Machine Control Pattern by Two-Way Valve (If Equipped) 190

L

Leaving the Machine 238
Lifting and Tying Down the Machine 254
Lifting the machine 255
Lifting the Machine Segments 257
Tying Down the Machine 256
Lifting Capacities 73, 86
Fixed Gauge (Long Reach Boom)(900 MM TG Shoe) 83
Fixed Gauge (Mass Boom)(600 MM DG Shoe) 75, 88
Fixed Gauge (Mass Boom)(900 MM TG Shoe) 77
Fixed Gauge (Reach Boom)(600 MM DG Shoe) 92
Fixed Gauge (Reach Boom)(900 MM TG Shoe) 79
Symbols Found in the Lifting Capacity Charts 74, 87
Variable Gauge (Long Reach Boom)(900 MM TG Shoe) 84
Variable Gauge (Mass Boom)(600 MM DG Shoe) 96
Variable Gauge (Reach Boom)(600 MM TG Shoe) 104
Variable Gauge (Reach Boom)(750 MM TG Shoe) 100

Variable Gauge (Reach Boom)(900 MM TG Shoe) 85
Lifting Objects 46
Lubricant Viscosities (Fluids Recommendations) 267
Biodiesel 273
Coolant Information 274
Diesel Exhaust Fluid 271
Diesel Fuel Recommendations 270
Engine Oil 267
Fuel Additives 273
General Information for Lubricants 267
Hydraulic Systems 268
Other Fluid Applications 269
Selecting the Viscosity 267
Special Lubricants 270
Lubricant Viscosities and Refill Capacities ... 267

M

Machine Operation 116
Machine Security System (If Equipped) 145
Basic Operation 146
Operation Section 145
Regulatory Compliance Section 146
Security Management 146
Maintenance Access 265
Maintenance Interval Schedule 284
Every 10 000 Service Hours 286
Every 10 Service Hours or Daily 284
Every 10 Service Hours or Daily for First 100 Hours 284
Every 10 Service Hours or Daily for Machines Used in Severe Applications 285
Every 100 Service Hours of Continuous Hammer Use 285
Every 1000 Service Hours of Partial Hammer Use (50% of Service Hours) 286
Every 1000 Service Hours or 6 Months 285
Every 12 000 Service Hours or 6 Years 286
Every 2000 Service Hours 286
Every 2000 Service Hours or 1 Year 286
Every 250 Service Hours 285
Every 250 Service Hours for Machines Used in Severe Applications 285
Every 250 Service Hours of Partial Hammer Use (50% of Service Hours) 285
Every 250 Service Hours or Monthly 285
Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture 286
Every 50 Service Hours or Weekly 285
Every 500 Service Hours 285
Every 500 Service Hours or 3 Months 285
Every 5000 Service Hours 286
Every 600 Service Hours of Continuous Hammer Use 285
Every 6000 Service Hours or 3 Years 286
Initial 250 Service Hours 285
Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems) 285
When Required 284
Maintenance Section 265
Maintenance Support 277
Mirror (If Equipped) 180
Mirror Adjustment 181
Mirror Installation 243
Operating Position 244
Transport Position 244
Monitoring System 150
Action Lamp (1) 151
Camera View (4) (If Equipped) 152
Changing the Password 165
Clock Bar (2) 151
Current Totals 164
Display Setting 159
Engine Shutdown Setting 165
Gain/Response Control (IF Equipped) 153
Gauges (3) 151
Joystick Control Pattern (If Equipped) 166
Key Pad (7) 152
Language Selection 162
Machine Warnings 154
Main Menu 158
Maintenance Intervals 163
Multi-information Area (6) 152
Other Messages 158
Performance (If Equipped) 162
Power Mode Setting 162
Prestart Monitoring Function 154
Reverse Fan (If Equipped) 167
Selecting the Work Tool 164
Warning Display Area (5) 152
Monitoring System (Monitor with Installed Cat Grade With Assist) 147, 149
Monitor With Installed Cat Grade With Assist With Tilt (If Equipped) 149
Mounting and Dismounting 114
Alternate Exit 115
Machine Access System Specifications 115

O

Oil Filter - Inspect 349
Inspect a Used Filter for Debris 349
Oil Filter (Hydraulic Hammer) - Replace 347
Operating Technique Information 204
Operating Precaution 206
Restricted Operation 204
Operating Techniques 204
Operation 42, 199
Critical Failures 43
Limiting Conditions and Criteria 43
Machine Operating Temperature Range 43
Machine Operation 45
Machine Operation when the Machine is not Completely Assembled 46
Operation Information 199
Lifting Objects 200
Operation Section 113
Operator Controls 130
Air Conditioning and Heating Control (10) 136
Automatic Engine Speed Control (15) 137
Boom Pressure Control (28A) 140
Cat Grade Control (If Equipped) 130
Cat Grade Control Monitor (5) (if equipped) 134
Cat Regeneration System (CRS) Aftertreatment Switch (24) 140
Engine Idle Shutdown 136
Engine Speed Control (12) 136
Engine Start Switch (7) 135
Fine Swing Control (28C) 140
Heavy Lift Control (18) 138
Hydraulic Lockout Control (1) 132
Joystick Controls (6) 134
Light Switch (21) 139
Lower Window Wiper and Window Washer (26-27) (If Equipped) 140
Monitor (4) 134
Operator Controls 131
Operators Seat (9) 136
Overload Warning Device (29) 141
Power Mode (13) 136
Quick Coupler Control (23) 139
Radio (11) 136
Radio Mute Switch (25) 140
Rear/Side View Camera (22) 139
Service Hour Meter (3) 134
Service Port 141
SmartBoom Control (28B) 140
Travel Alarm Cancel Switch (16) 138
Travel Control (2) 133
Travel Speed Control (14) 136
Window Wiper and Window Washer (19-20) 138
Work Tool Control (17) 138
Operator Station 51

P

Parking 47, 235
Plate Locations and Film Locations 108
Electromagnetic Emissions 109
Engine Serial Number 109
Product Identification Number (PIN) and CE Plate 108
Sound Certification 109
Power Receptacle (If Equipped) 145
Product Information Section 53
Product Link 144
Data Broadcasts 144
Operation in a Blast Site for Product Link Radios 145
Product Link (Product Link Japan) 142
Pump Coupling Oil - Change 350
Pump Coupling Oil Level - Check 351

Q

Quick Coupler Operation (Circuit for Universal Coupler (If Equipped)) 220
Operation 220
Releasing the Work Tool 222
Resetting the Quick Coupler Controls 220
Securing the Work Tool 220
Quick Coupler Operation (Hydraulic Pin Grabber Quick Coupler (If Equipped)) 212
General Operation 212
Quick Coupler Operation 213

R

Radiator Core - Clean 352
Radio (If Equipped) 172, 175
Loss of Memory 174
Presetting Radio Stations 173
Radio Reception 174
Radio Reception Area 177
Scan and Auto Memory 174
Receiver Dryer (Refrigerant) - Replace 352
Reference Information Section 364
Reference Material 364
Reference Materials 364

Regulatory Information (Japan) 53
Industrial Safety and Health Act 57
Operation of Construction Equipment and the Governing Laws and Regulations..... 54
Qualifications for Machine Operation 53
Standard Certificate of Transfer 56
Trailer Transportation 53
Restricted Visibility 39
Rollover Protective Structure (ROPS) - Inspect 353
Roof Hatch..... 182

S

S·O·S Information 276
Safety Messages..... 7
Acid Burn Hazard (25) 19
Aerosol Starting Aid (15) 15
Crushing Hazard (12) 14
Crushing Hazard (13) 14
Crushing Hazard (19) 17
Crushing Hazard (2) 10
Crushing Hazard (22) 18
Crushing Hazard (6) 11
Crushing Hazard (9) 13
Crushing Hazard (Counterweight) (21) 18
Crushing Injury (4) 11
Do Not Operate (1) 10
Do Not Weld or Drill on ROPS (7) 12
Electrical Power Lines (5).....11
Falling Object Guard Structure (26) 20
High-Pressure Cylinder (20)..... 17
High-Pressure Gas (18)..... 16
Hot Surface (24) 19
Joystick Controls Alternate Patterns (10).... 13
Jump-Start Cables (16) 15
Lifting Restriction/Counterweight Only (28)..... 20
Overload Warning Device (3) 10
Pressurized System (14) 15
Product Link (11)..... 13
Relieve Hydraulic Tank Pressure (23)..... 18
Rotating Fan (27)..... 20
Seat Belt (8)..... 12
Vapor Explosion (17) 16
Safety Section 7
Seat 119
Heated Seat and Ventilated Seat (If Equipped)..... 120
Seat Belt 120
Extension of the Seat Belt 122
Seat Belt Adjustment for Non-Retractable Seat Belts..... 120
Seat Belt Adjustment for Retractable Seat Belts 122
Seat Belt - Inspect 353
Seat Belt - Replace 353
Securing the Machine..... 241
Selective Catalytic Reduction Warning System..... 125
Definitions 126
Inducement Emergency Override for Cat Engines Equipped with Selective Catalytic Reduction Systems (If Equipped)..... 128
Inducement Strategy for DEF Level 126
Inducement Strategy for DEF Quality, Tampering, SCR System Fault, and Impeded EGR 127
Service Interval Chart..... 277
Severe Service Application 282
Improper Maintenance Procedures (Maintenance Procedures Which May Contribute to a Severe Service Application)..... 282
Severe Environmental Factors..... 282
Severe Operating Conditions 282
Shipping the Machine..... 240
Shipping a Machine that is not Completely Assembled 241
Slope Operation 47
SmartBoom Control (If Equipped)..... 192
SmartBoom Operation (If Equipped).....211
Advantages..... 212
Excavation and Loading 212
Hammering 212
Sound Information and Vibration Information..... 48
Sound Level Information..... 48
Sound Level Information for Machines in European Union Countries and in Countries that Adopt the “EU Directives” 49
Sources..... 51
“The European Union Physical Agents (Vibration) Directive 2002/44/EC”..... 49
Specifications 58
Application/Configuration Restrictions 58
Intended Use 58
Specification Data..... 59
Working Ranges 62
Stopping the Engine 235
Delayed Engine Shutdown (If Enabled) 236
Engine Stop Control 237

Immediate Engine Shutdown (Type 1) 237
Immediate Engine Shutdown (Type 2) 237
Stop the Engine if an Electrical Malfunction Occurs 238
Stopping the Machine 235
Storage Box 169
Exterior Storage Box 169
Sun Screen (If Equipped) 182
Swing Bearing - Lubricate 354
Swing Drive Oil - Change 355
Swing Drive Oil Level - Check 356
Swing Drive Oil Sample - Obtain 357
Swing Gear - Lubricate 357
System Pressure Release 278
Coolant System 278
Hydraulic System 278

T

Table of Contents 3
Towing Information 258
Towing the Machine 258
Lightweight Towing 261
Parking Brake Release 258
Retrieval of Machine 260
Track Adjustment - Adjust 358
Adjusting Track Tension 359
Measuring Track Tension 358
Track Adjustment - Inspect 360
Track Information 37
Transportation Information 240
Travel Alarm - Test (If Equipped) 360
Travel Control (Straight Travel Pedal (If Equipped)) 183
Travel in Water and Mud 206
Procedure for Removing the Machine from Water or Mud 207

U

Undercarriage - Check 361

V

Visibility Information 38

W

Warranty Information 363
Warranty Section 363
Welding on Machines and Engines with Electronic Controls 281
Window (Front) 179
Window Washer Reservoir - Fill 361
Window Wiper - Inspect/Replace 361
Windows - Clean 361
Cleaning Methods 362
Polycarbonate Windows (If equipped) 362
Work Tool Operation (If Equipped) 229
Crusher Operation (If Equipped) 232
Hammer Operation (If Equipped) 229
Shear Operation (If Equipped) 231
Work Tools 42

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:	_____	_____	_____

SEBU8757
©2020 Caterpillar
All Rights Reserved

CAT, CATERPILLAR, LET'S DO THE WORK, their respective logos, "Caterpillar Corporate Yellow", the "Power Edge" and Cat "Modern Hex" trade dress as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.