

Operation and Maintenance Manual

72H Pipelayer

PLR1-Up

Important Safety Information

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

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

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

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

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

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

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

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

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

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

WARNING

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

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

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

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Foreword

Literature Information

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

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

The information contained in the section entitled "Pipelayer Attachment Kit" of this manual is limited to the pipelayer attachment and specific modifications made to the tractor unit. Refer to the section entitled "D6T LGP (OEM)" for complete information regarding the tractor unit.

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. The latest version of this publication is available for download from the internet at www.plmcat.com. Read, study and keep this manual with the machine.

Whenever a question arises regarding your machine, or this publication, please consult PipeLine Machinery International for the latest available information.

Machine Description

The sideboom equipment is attached to a Caterpillar D6T LGP tractor. The primary use of this machine is for petroleum-product pipeline-construction in the 20" to 30" (510 to 765 mm) pipeline range.

The operator should read, understand, and follow both the tractor and the pipelayer operating and maintenance instructions. The operator must comply with all pipelayer procedures, regulations, and safety precautions.

This equipment is to be operated by qualified personnel only.

The daily service/inspection procedure should be performed before start-up.

Operate all pipelayer controls with no load, until familiar with machine operation.

Note: Refer to the Caterpillar operation manual for detailed information on the specific operation of the tractor unit

Safety

The section entitled "Pipelayer Attachment Kit" of this manual contains a safety section, and the section entitled "D6T LGP (OEM)" contains a safety section. The safety sections list basic safety precautions. In addition, these sections identify the text and locations of warning signs and labels used on the machine.

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

Operation

The section entitled "Pipelayer Attachment Kit" of this manual contains an operation section, and the section entitled "D6T LGP (OEM)" contains an operation section. The operation sections are references for the new operator and a refresher for the experienced operator. These sections include 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 section entitled "Pipelayer Attachment Kit" of this manual contains a maintenance section, and the section entitled "D6T LGP (OEM)" contains a maintenance section. The maintenance sections are guides to equipment care. The Maintenance Interval Schedules (MIS) list 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 Schedules list the page number for the step-by-step instructions required to accomplish the scheduled maintenance. Use the Maintenance Interval Schedules as an index or "one safe source" for all maintenance procedures.

Maintenance Intervals

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

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

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

California Proposition 65 Warning

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

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

Certified Engine Maintenance

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

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

Machine Capacity

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

Caterpillar Product Identification Number

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

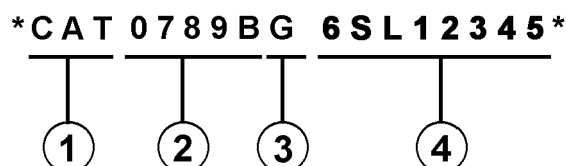


Illustration 1

Where:

1. Caterpillar's World Manufacturing Code (characters 1-3)
2. Machine Descriptor (characters 4-8)
3. Check Character (character 9)
4. Machine Indicator Section (MIS) or Product Sequence Number (characters 10-17). These were previously referred to as the Serial Number.

Machines and generator sets produced before First Quarter 2001 will maintain their 8 character PIN format. Components such as engines, transmissions, axles, etc. and work tools will continue to use an 8 character Serial Number (S/N).

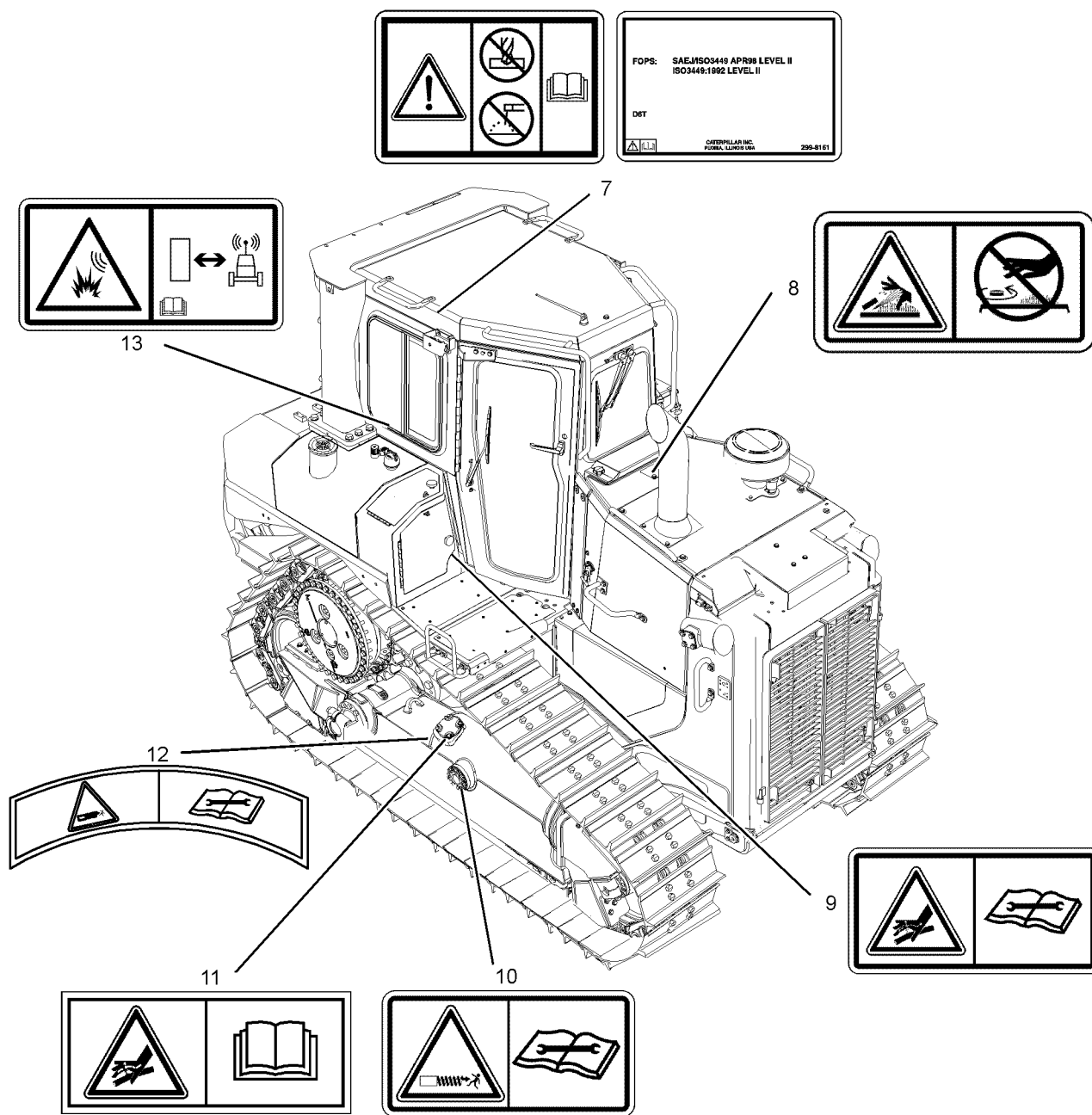


Illustration 3

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 of the safety messages are legible. Clean the safety messages or replace the safety messages if you cannot read the words. Replace the illustrations if the illustrations are not 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 of the machine that is replaced, install a safety message on the replacement part. Any Caterpillar dealer can provide new safety messages.

Do Not Operate 1

Safety message (1) is positioned on the upper ledge of the left-hand console of the operator station.



WARNING

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

Seat Belt (2)

Safety message (2) is located on the right console to the right of the dozer control.



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.

Do Not Weld on the ROPS (3)

Safety message (3) is positioned on the vertical support of the outside left ROPS post.



WARNING

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

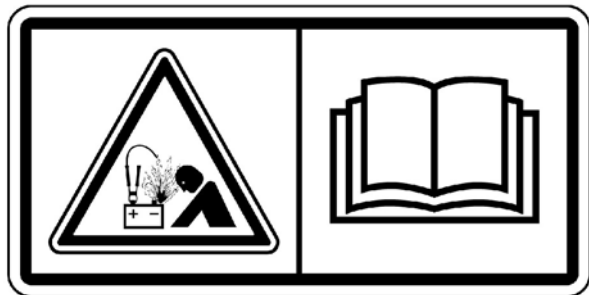
This machine has been certified to the standards that are listed on the certification plate. The maximum mass of the machine, which includes the operator and the attachments without a payload, should not exceed the mass on the certification plate.

A typical example of the certification plate is shown above.

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

Improper Connections for Jump Start Cables (4)

Safety message (4) is located on the bottom side of the battery box cover.

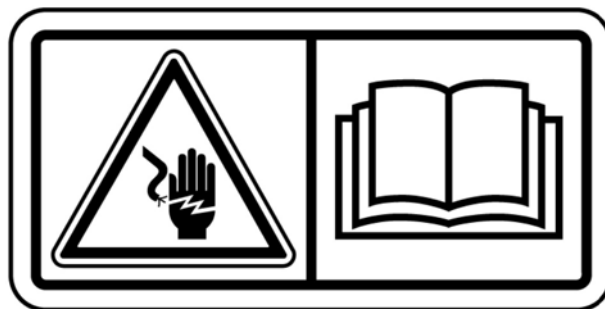


WARNING

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.

Electrical Shock Hazard (5)

Safety message (5) is located on the inside of the fuse panel door that is inside the battery box on the left side of the machine.

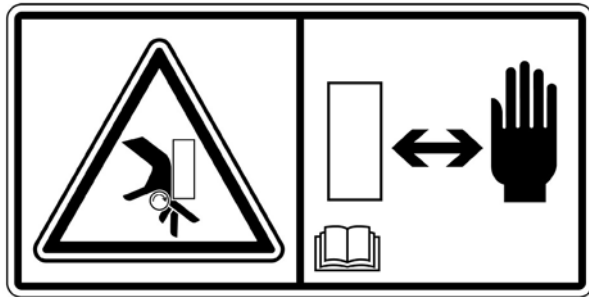


WARNING

WARNING! Shock/Electrocution Hazard! Read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could cause serious injury or death.

Rotating Shaft (6)

This safety message (6) is located on top of the guard which is covering the drive shaft for the PTO pump. The film is visible by removing the floorplate of the cab.

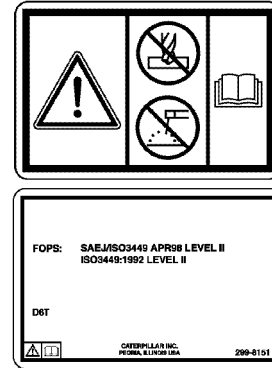


WARNING

Rotating shaft pinch hazard. The shaft under this cover is rotating anytime the engine is running. Contact with a rotating shaft could cause injury or death. Keep hands away.

Do Not Weld on the FOPS (7)

Safety message (7) is positioned on the right side of the cab roof.



WARNING

Structural damage, an overturn, modification, alteration, or improper repair can impair this structure's protection capability thereby voiding this certification. Do not weld on or drill holes in the structure. This will void the certification. Consult your Cat 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.

A typical example of the certification plate is shown above.

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

Hot Fluid Under Pressure (8)

Safety message (8) is located on the bottom side of the radiator access cover.

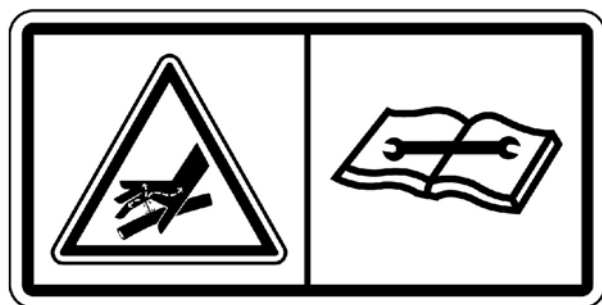


WARNING

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.

Hydraulic System Accumulator (9)

Safety message (9) is located inside the enclosure on the right-hand platform.

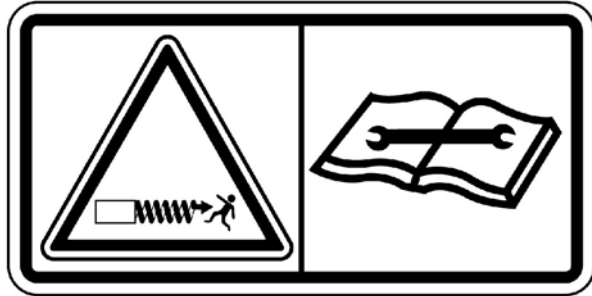


WARNING

Hydraulic accumulator contains gas and oil under high pressure. Improper removal or repair procedures could cause severe injury. To remove or repair, instructions in the service manual must be followed. Special equipment is required for testing and charging.

High Pressure Recoil Spring (10)

Safety message (9) is located inside the cover for the twister resister on both track roller frames.

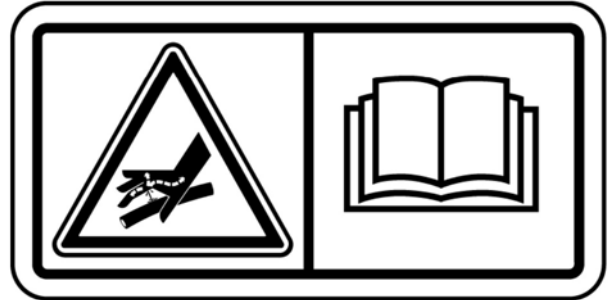


WARNING

Recoil spring force, if not relieved, can result in personal injury or death. Relieve spring force before removing the threaded retainer, performing repairs on the recoil spring housing, or removing the recoil spring. Consult a Caterpillar dealer for disassembly instructions.

High Pressure Cylinder (11)

Safety message (11) is located on the access cover on both track roller frames.



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.

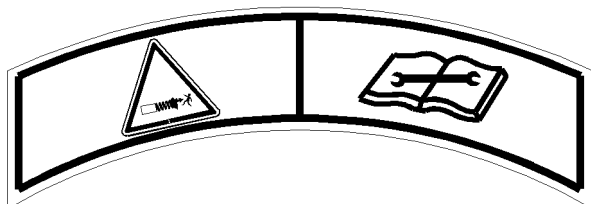
Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve one turn only.

If track does not loosen, close the relief valve and contact your Caterpillar dealer.

Compressed Recoil Spring (12)

Safety message (12) is located inside both track roller frames. The safety message is located on the front frame of the rear track roller frame.



WARNING

Personal injury or death can result from a compressed recoil spring being released suddenly using incorrect disassembly procedures.

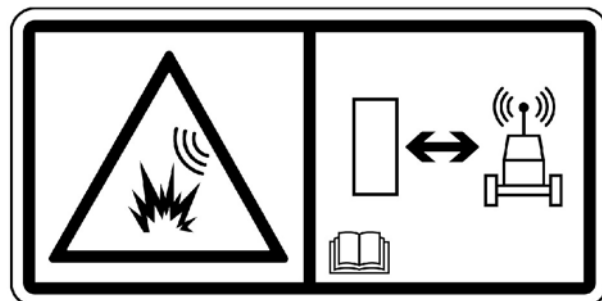
A recoil spring that is still held in compression can result in the recoil spring being released unexpectedly with extreme force which could cause serious injury or death.

Make sure that the correct disassembly procedure is used, if a front track roller frame that has a crack in the parent metal or weld connection (or a tubular section that has separated from the front of the frame assembly) when the recoil spring is still held in compression.

Refer to Special Instruction, SMHS8273 which contains the disassembly procedure that must be used to decrease the possibility of injury while performing service on the track roller frame.

Product Link (13)

Safety message (13) is located on the console to the right of the operator seat. Refer to Operation and Maintenance Manual, SEBU7351 “Product Link” for information about this service tool.



WARNING

This machine is equipped with a Caterpillar Product Link communication device. When electric/electronic detonators are used, this communication device should be deactivated within 12 m (40 ft) of a blast site, 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.

Additional Messages

There are several specific 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 messages.

Make sure that all of 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 message. Loose adhesive will allow the message 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.

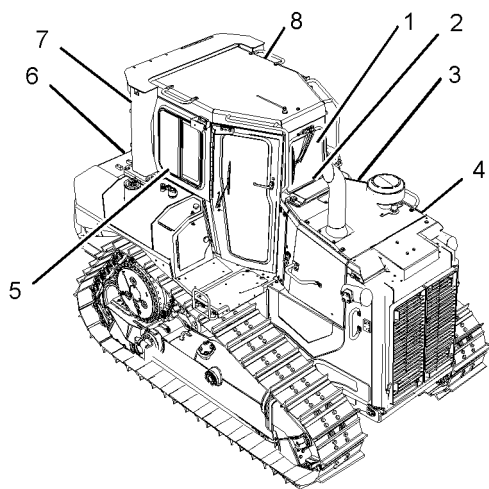


Illustration 4

Steering Control (1)

This message is located on the left side console outward from the differential steering control.

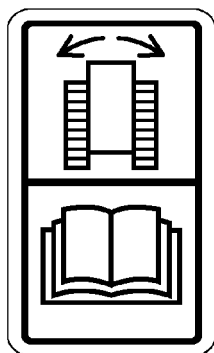


Illustration 5

NOTICE

When the steering lever is moved with the transmission in NEUTRAL or in gear, and the engine is running, the machine will turn. Engage the steering control lock by engaging the parking brake in order to prevent machine movement.

Air Conditioner (2)

This message is located in the cab on the left side of the instrument panel, if equipped.

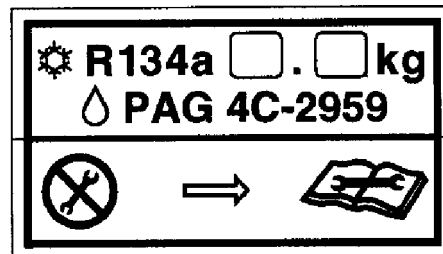


Illustration 6

This message for the air conditioner has the appropriate information for the following services: the air conditioner lubricant, the refrigerant charge and the refrigerant capacity. Also, this safety message instructs the usage of the proper safety information.

Follow instruction in order to avoid engine damage.

Air Cleaner (3)

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

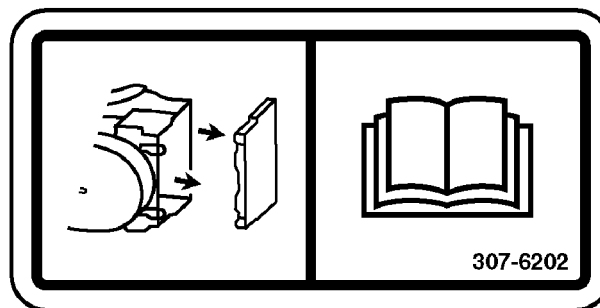


Illustration 7

To avoid engine damage, use only Caterpillar radial seal air filters as replacement filters. Refer to the following topics for correct replacement instructions:

- Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace"
- Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace"

Required Engine Oil (4)

This message is located on the engine oil filler tube.

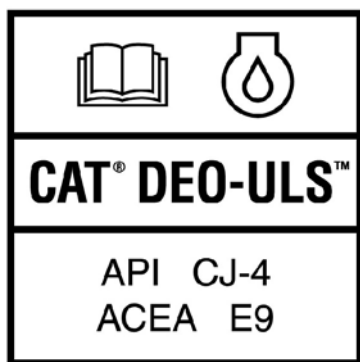


Illustration 8

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

The engine must be shut off before any maintenance is performed. Use a wand in order to clean debris from the fan and baffle assembly.

Product Link (5)

This message is located beneath the left window inside the cab.



Illustration 9

The Product Link System is a 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 receiving station. Information can also be sent to the Product Link System. The information is used to improve Caterpillar products and Caterpillar services.

The Product Link is also available in cellular format.

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

Reference: See Operation and Maintenance Manual, "Maintenance Interval Schedule" for all maintenance recommendations.

Diesel Fuel Requirements (6)

One of the following messages is located next to the fuel filler cap.

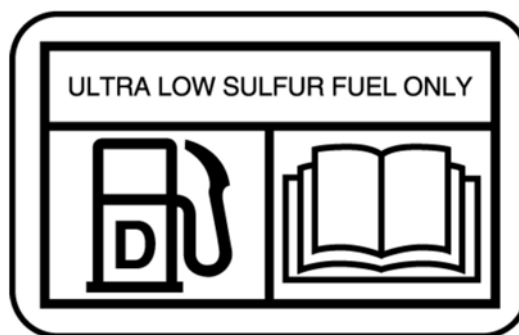


Illustration 10

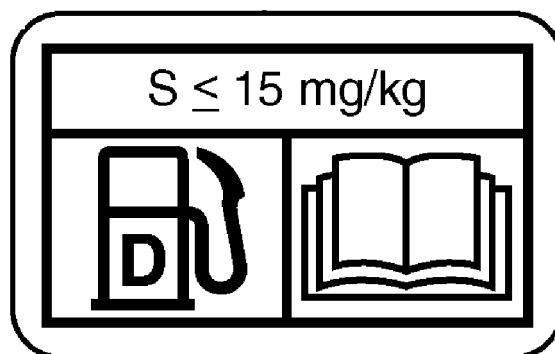


Illustration 11

Use only Ultralow Sulfur Diesel (ULSD) fuel.

Note: In Europe, diesel fuels that are identified as meeting "European Standard EN590:2004" requirements for ≤ 10 ppm sulfur fuel (typically referred to as "sulfur-free") generally meet Cat requirements for ULSD fuel.

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

FCC Compliance (7)

This message is located on the product link module on the back right ROPS of the cab.

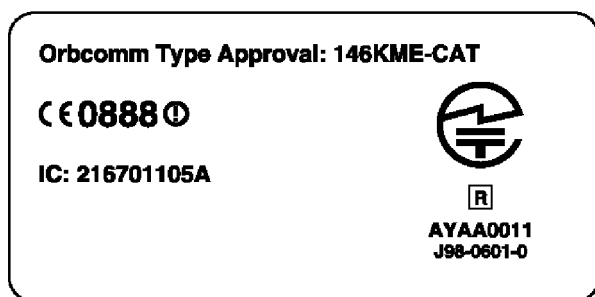


Illustration 12

Consult your Cat dealer with any questions that concern the operation of the Product Link in a specific country.

“No Weld/No Drill” (8)

This message is located on the left-hand ROPS post.



Illustration 13

General Hazard Information

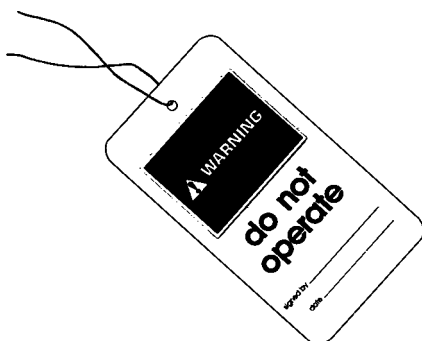


Illustration 14

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

WARNING

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

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

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

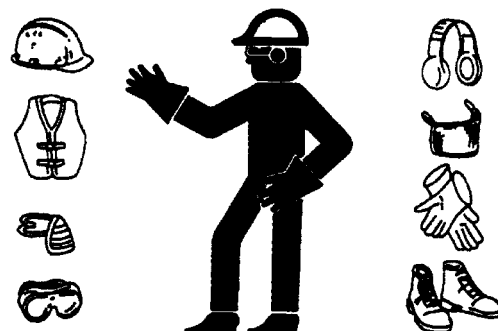


Illustration 15

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

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

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

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

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

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

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

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

Obey all local regulations for the disposal of liquids.

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

Do not allow unauthorized personnel on the equipment.

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

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

Pressurized Air and Water

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

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

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

Trapped Pressure

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

Fluid Penetration

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

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

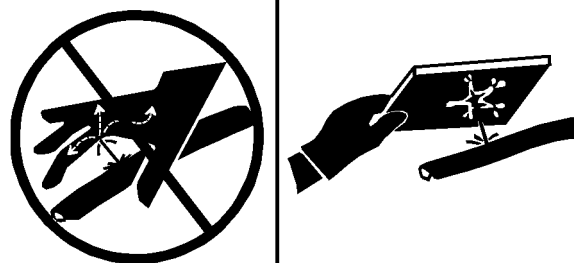


Illustration 16

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

Containing Fluid Spillage

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

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

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

Obey all local regulations for the disposal of liquids.

Inhalation

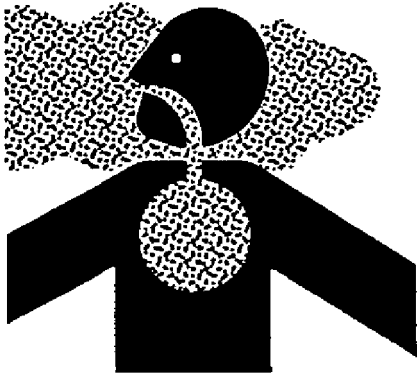


Illustration 17

Exhaust

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

Asbestos Information

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

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

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

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

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

Dispose of Waste Properly

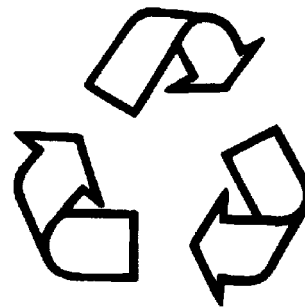


Illustration 18

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

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

Crushing Prevention and Cutting Prevention

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

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

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

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

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

Stay clear of all rotating and moving parts.

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

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

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

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

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

Burn Prevention

Do not touch any part of an operating engine. Allow 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.

Exhaust Gas Recirculation Cooler

The exhaust gas recirculation (EGR) 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 that is formed. The sulfuric acid may spill from the EGR cooler during service of the engine. The sulfuric acid will burn the eyes, skin, and clothing on contact. Always wear eye shields, rubber gloves, and protective clothing when you may come in contact with fluids that may spill from the EGR cooler. If fluid contacts the eyes, immediately flush with water and seek medical help.

Coolant

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

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

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

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

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

Oils

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

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

Batteries

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

Fire Prevention and Explosion Prevention



Illustration 19

Regeneration

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

General

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

To minimize the risk of fire or explosion, the following actions are recommended.

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 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 20

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

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

Battery and Battery Cables

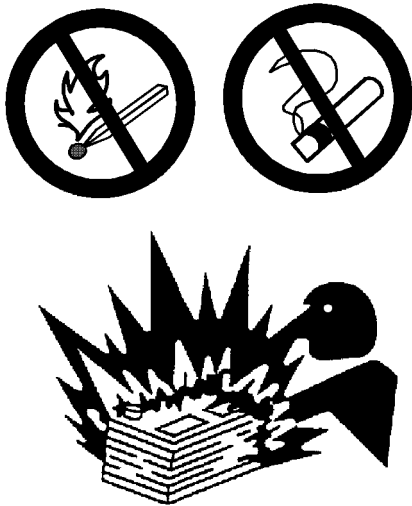


Illustration 21

The following actions are recommended 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 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 action may cause an explosion.

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

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

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 action 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 action 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.

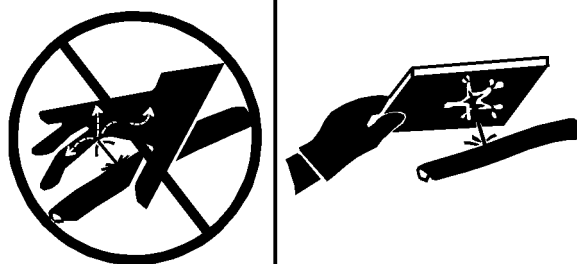


Illustration 22

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 action will help to prevent vibration, rubbing against other parts, excessive heat, and failure of lines, tubes, and hoses.

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

Ether

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

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

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

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

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

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

Fire Extinguisher

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

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

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

Fire Safety

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

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

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

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

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

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

Notify emergency personnel of the fire and your location.

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

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

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

1. Pull the pin.
2. Aim the extinguisher or nozzle at the base of the fire.

3. Squeeze the handle and release the extinguishing agent.
4. Sweep the extinguisher from side to side across the base of the fire until the fire is out.

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

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

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

Fire Extinguisher Location

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. Obey the recommendations on the instruction plate.

Mount the fire extinguisher in the accepted location per local regulations.

If your machine is equipped with a ROPS structure, strap the mounting plate to the ROPS in order to mount the fire extinguisher. If the weight of the fire extinguisher exceeds 4.5 kg (10 lb), mount the fire extinguisher near the bottom of the ROPS. Do not mount the fire extinguisher at the upper one-third area of the ROPS.

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

Consult your Cat dealer for the proper procedure for mounting the fire extinguisher.

Track Information

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.

Electrical Storm Injury Prevention

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

- Mount the machine.
- Dismount the machine.

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

Before Starting Engine

Start the engine only from the operator's compartment. Do not short across the battery terminals and do not short across the batteries. Bypassing the engine neutral start system can damage the electrical system.

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

Adjust the seat so that full pedal travel can be achieved. Make sure that the operator's back is 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 lights are working properly. Before you start the engine or before you move the machine, make sure that no one is working on the machine, working underneath the machine or working close to the machine. Make sure that the area is free of personnel.

Engine Starting

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

Move all hydraulic controls to the HOLD position before starting the engine. Move the direction control (switch) to NEUTRAL.

Engage the parking brake switch.

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

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.

Before Operation

Clear all personnel from the machine and from the area.

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

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

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

Reference: Refer to Operation and Maintenance Manual, "Daily Inspection" in this manual.

Fasten the seat belt securely.

Visibility Information

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

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

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

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

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

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

Restricted Visibility (If Equipped)

The size and the configuration of this machine may result in areas that cannot be seen when the operator is seated. Illustration 23 provides an approximate visual indication of areas of significant restricted visibility. Illustration 23 indicates restricted visibility areas at ground level inside a radius of 12 m (40 ft) from the operator on a machine without the use of optional visual aids. This illustration does not provide areas of restricted visibility for distances outside a radius of 12 m (40 ft).

This machine may be equipped with optional visual aids that may provide visibility to some areas with restricted visibility. Refer to this Operation and Maintenance Manual, "Mirror" for more information on additional visibility. If your machine is equipped with cameras, refer to this Operation and Maintenance Manual, "Camera" for more information on additional visibility. For areas that are not covered by the optional visual aids, the job site organization must be utilized to minimize hazards of this restricted visibility. See Operation and Maintenance Manual, "Visibility Information" for more information regarding job site organization.

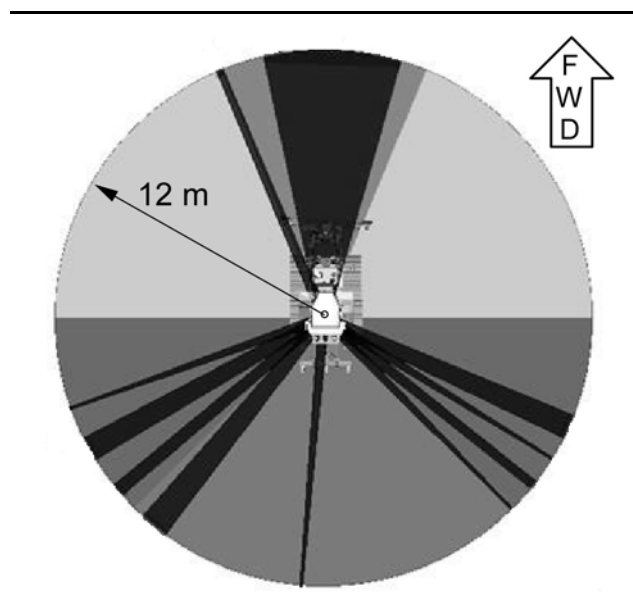


Illustration 23

Top view of the Track-Type Tractor machine

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

Operation

Machine Operating Temperature Range

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

Machine Operation

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.

Before you move the machine, make sure that no one will be endangered.

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

Do not allow riders on the machine unless the machine has the following equipment:

- additional seat

- additional seat belt
- Roll over Protective Structure (ROPS)

Never use the work tool as a work platform.

Report any needed repairs that were noted during operation.

Do not go close to the edge of a cliff, an excavation, or an overhang.

If the machine begins to sideslip, perform the following procedure:

- Discard the load.
- Turn the machine downhill.

Be careful to avoid any condition which could cause the machine to tip. The machine can tip when you work on hills, banks, and slopes. Also, the machine can tip when you cross ditches, ridges, or other obstacles.

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

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

Be sure that the towing eyes and towing devices are adequate.

Towing eyes and towing devices should only be used to recover the machine.

Connect trailing equipment to a drawbar or to a hitch only.

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

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

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

Know the maximum dimensions of your machine.

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

Lifting Capacities

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

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

Limitations on Lifting Loads That Exceed the Working Range

Do not load the boom beyond the maximum load capacity. See Operation and Maintenance Manual, "Lifting Capacities" for the load capacity of the boom.

When the load capacity is exceeded, refer to "American National Standards A.N.S.I. B3014".

Also, follow the procedures that are listed below:

- Inspect the wire cable for defects prior to the lift operation.
- Inspect the wire cable for defects after the lift operation.
- Do not exceed the load capacity of the boom.
- The load must be handled safely in order to minimize tipping effects.
- The lift operation and the inspections must be made under controlled conditions by an authorized person.

Electrical Power Lines



Serious injury or death by electrocution can result if the machine or attachments are not kept the proper distance from electrical power lines.

Use the following charts in order to determine the safe distance from high voltage wires during these conditions:

- machine operation
- machine transportation

Table 1

| When Operating Near High Voltage Power Lines | |
|--|----------------------------|
| Normal Voltage (Phase to Phase) | Minimum Clearance Required |
| 0 Volts to 50 kVolts | 3.05 Meters (10 Feet) |
| Over 50 kVolts to 200 kVolts | 4.60 Meters (15 Feet) |
| Over 200 kVolts to 350 kVolts | 6.10 Meters (20 Feet) |
| Over 350 kVolts to 500 kVolts | 7.62 Meters (25 Feet) |
| Over 500 kVolts to 750 kVolts | 10.67 Meters (35 Feet) |
| Over 750 kVolts to 1000 kVolts | 13.72 Meters (45 Feet) |

| While In Transit Near High Voltage Power Lines | |
|--|----------------------------|
| Normal Voltage (Phase to Phase) | Minimum Clearance Required |
| 0 Volts to .75 kVolts | 1.22 Meters (4 Feet) |
| Over .75 kVolts to 50 kVolts | 1.83 Meters (6 Feet) |
| Over 50 kVolts to 345 kVolts | 3.05 Meters (10 Feet) |
| Over 345 kVolts to 750 kVolts | 6.10 Meters (20 Feet) |
| Over 750 kVolts to 1000 kVolts | 7.62 Meters (25 Feet) |

Parking

Park on a level surface. If you must park on a grade, use blocks to prevent the machine from rolling.

Apply the service brake in order to stop the machine. Move the transmission control lever to NEUTRAL position and move the engine speed switch to the LOW IDLE position. Engage the parking brake.

Lower the boom to the ground and fully retract the counterweight.

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

Turn the key for the battery disconnect switch to the OFF position. Remove the key when you exit the machine for an extended period of time.

Turning the battery disconnect switch to the OFF position will provide the following benefits:

- Prevent battery discharge that is caused by a battery short circuit.
- Prevent battery discharge that is caused by some of the components.
- Prevent battery discharge that is caused by vandalism.

Slope Operation

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Engine Stopping

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

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

Equipment Lowering with Engine Stopped

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.

Sound Information and Vibration Information

Sound Level Information

The operator Equivalent Sound Pressure Level (Leq) is 81 dB(A) when "ANSI/SAE J1166 OCT 98" is used to measure the value for an enclosed cab. This proceeding is a work cycle sound exposure level. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

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

The average exterior sound pressure level is 86 dB(A) when the "SAE J88Apr95 - Constant Speed Moving Test" procedure is used to measure the value for the standard machine. The measurement was conducted under the following conditions: distance of 15 m (49.2 ft) and "the machine moving forward in an intermediate gear ratio".

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

The dynamic operator sound pressure level is 79 dB(A) when "ISO 6396:1992" is used to measure the value for an enclosed cab. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

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

Vibration Data for Track-Type Tractors

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 tractors.

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 3 in order to calculate the daily vibration exposure. A simple evaluation of the machine application can be used.

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

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

Table 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 Tractors | dozing | 0,74 | 0,58 | 0,70 | 0,31 | 0,25 | 0,31 |
| | ripping | 1,25 | 1,19 | 1,02 | 0,40 | 0,41 | 0,28 |
| | transfer | 0,87 | 0,80 | 0,97 | 0,43 | 0,40 | 0,34 |

Table 3

| "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 |
| Pipelayers ⁽¹⁾ | work cycle | 0,21 | 0,23 | 0,24 | 0,09 | 0,11 | 0,14 |

(1) If equipped

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. This seat is tested with the input "spectral class EM6". The seat has a transmissibility factor of "SEAT<0.7".

The whole body vibration level of the machine varies. There is a range of values. The low value is 0.5 meter per second squared. The machine meets the short term level for the design of the seat in "ISO 7096". The value is 1.61 meter per second squared for this machine.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

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

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer's recommendations.
3. Keep the terrain in good condition.
 - a. Tire pressures
 - b. Brake and steering systems
 - c. Controls, hydraulic system and linkages
4. Use a seat that meets "ISO 7096". Keep the seat maintained and adjusted.
 - a. Adjust the seat and suspension for the weight and the size of the operator.
 - b. Inspect and maintain the seat suspension and adjustment mechanisms.
5. Perform the following operations smoothly.
 - a. Steer
 - b. Brake
 - c. Accelerate.
 - d. Shift the gears.
6. Move the attachments smoothly.
7. Adjust the machine speed and the route in order to minimize the vibration level.
 - a. Drive around obstacles and rough terrain.

- b.** Slow down when it is necessary to go over rough terrain.
- 8.** Minimize vibrations for a long work cycle or a long travel distance.
 - a.** Use machines that are equipped with suspension systems.
 - b.** Use the ride control system on Track-Type Tractors.
 - c.** If no ride control system is available, reduce speed in order to prevent bounce.
 - d.** Haul the machines between workplaces.
- 9.** Less operator comfort may be caused by other risk factors. The following guidelines can be effective in order to provide better operator comfort:
 - a.** Adjust the seat and adjust the controls in order to achieve good posture.
 - b.** Adjust the mirrors in order to minimize twisted posture.
 - c.** Provide breaks in order to reduce long periods of sitting.
 - d.** Avoid jumping from the cab.
 - e.** Minimize repeated handling of loads and lifting of loads.
 - f.** Minimize any shocks and impacts during sports and leisure activities.

Sources

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

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

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

Refer to Operation and Maintenance Manual, 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 in order to find your local dealer:

Caterpillar, Inc.
www.cat.com

Operator Station

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

Guards (Operator Protection)

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

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

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

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

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

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

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

Other Guards (If Equipped)

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

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

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

- Demolition applications
- Rock quarries
- Forestry products

Additional guards may be required for specific applications or work tools. The Operation and Maintenance Manual for your machine or your work tool will provide specific requirements for the guards. Consult your Caterpillar dealer for additional information.

Product Information Section (D6T LGP (OEM))

General Information Specifications

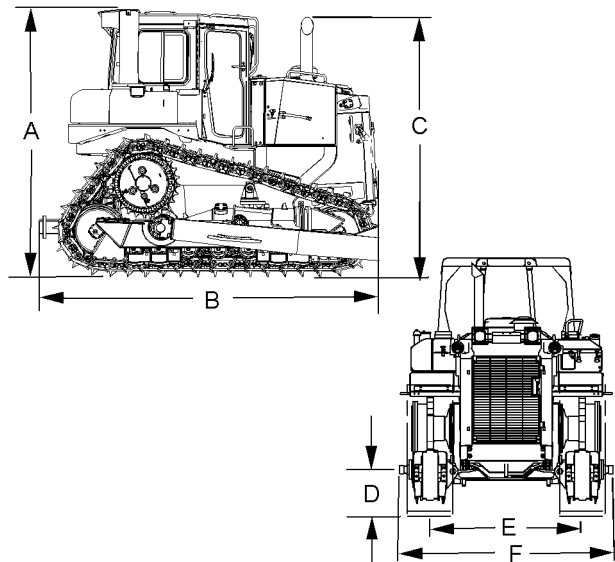


Illustration 24

The basic machine specifications are listed below.

Table 4

| D6T Track-Type Tractor | |
|--|------------------------------|
| | LGP |
| Engine Power | 200 hp std |
| Engine (Make and Model) | Caterpillar C9.3 |
| Engine Displacement | 9.3 L (567 in ³) |
| Engine Rated Speed | 2010 RPM ⁽¹⁾⁽²⁾ |
| Engine (No. of Cylinders) | 6 |
| Height (Top of ROPS) (A) | 3233 mm (127.3 inch) |
| Length of the Machine ⁽³⁾ (B) | 4089 mm (161.0 inch) |
| Height to Top of Exhaust Stack(C) | 3193 mm (125.7 inch) |
| Ground Clearance (D) | 396 mm (15.6 inch) |
| Track Gauge (E) | 2286 mm (90.0 inch) |
| Width Over Trunnions (F) ⁽⁴⁾ | 3479 mm (137.0 inch) |
| Height of the Drawbar | 511 mm (20.1 inch) |
| Width of Track Shoe | 660 mm (26 inch) |
| Length of Track on Ground | 3243 mm (127.7 inch) |
| Shipping Weight ⁽⁵⁾ | 19527 kg (43050 lb) |
| Drawbar (Length) | 165 mm (6.5 inch) |

(1) NACD Engine Rated Speed (North America)

(2) Non-NACD Engine Rated Speed is 1920 RPM

(3) The length of the machine is measured from the front of the machine to the end of the drawbar. Add 145 mm (5.7 inch) for long drawbar assembly.

(4) VPAT trunnions are attached at the case and frame.

(5) The weight includes the machine and the following items: 10% tank of fuel, all lubricants, coolant, hydraulic controls, the rops/fops structure and and the standard track.

Restrictions to Application and Configuration

Maximum approved operating weight is 29484 kg (65000 lb).

Maximum towing force of a drawbar is 320 kN (71940 lb).

Maximum vertical load for a drawbar is 137 kN (30800 lb).

The capability of the brake is equal to the ROPS capability of 29484 kg (65000 lb) when the slope is less than 45 degrees.

To obtain the proper lubrication, a maximum slope should not exceed a grade of 100 percent or 45 degrees.

Reference: See “Slope Operation” in this manual for more information.

Do not use the machine in explosive environments.

Special attachments and operating instructions are required for waste handling applications, forestry applications, and other custom configurations.

Identification Information

Plate Locations and Film Locations

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.

Illustration 25

The PIN plate is attached to the ROPS mounting pad on the transmission.

Machine PIN _____

Year of Manufacture _____

Illustration 26

The Service Information Number Plate is located inside the cab on the left side of the dash.

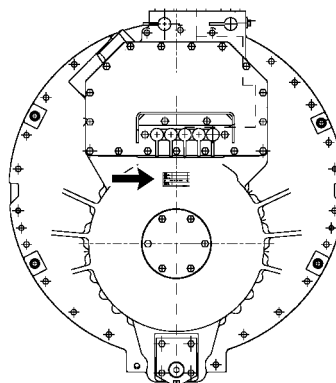


Illustration 27

Transmission Serial Number _____

| CATERPILLAR® | | CAT® | |
|--|--|--------------------|--|
| SERIAL NUMBER | | ARRANGEMENT NUMBER | |
| ENGINE MODEL | | | |
| MADE IN U.S.A. (ALWAYS GIVE ALL NUMBERS) | | | |

Illustration 28

The Serial Number Plate is located on the left side of the cylinder block near the rear of the engine.

The following information is stamped on the Serial Number Plate: engine serial number, model and arrangement number.

Engine Serial Number _____

| | | | |
|-------------------------|----|---------------------|--------------|
| CAT® | | SER. NO. | ENGINE MODEL |
| FULL LOAD RPM | | MAX ALT ROTATION | |
| AR NO. | | FUEL PUMP/GOV | |
| BARE ENG HI IDLE RPM | | INJECTOR | |
| POWER | HP | TURBO | kW |

Illustration 29

The Information Plate is on the engine valve cover. The following information is stamped on the Information Plate: engine maximum altitude, horsepower, high idle, full load rpm, fuel settings and other information.

The serial number plate for the dozer blade is attached to the back side of the dozer, if equipped.

Certification

CE Mark

This plate is positioned on the PIN plate on the left side of the front frame.

For machines that are compliant to “2006/42/EC”, the following information is stamped onto the “CE” plate.

The illustration shows a rectangular CE plate with the following fields: **CE**, **KW**, **KW**, and **kg**. Above the plate, a dashed box indicates its location on the machine frame, with an arrow pointing to the plate itself.

Illustration 30

CE plate

For quick reference, record this information in the spaces that are provided below.

- Engine Power of primary engine (kW) _

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

For machines that are compliant to “1998/37/EC”, the following information is stamped onto the “CE” plate.

The illustration shows a rectangular plate with the following fields: **MODEL NUMBER**, **PRODUCT IDENTIFICATION NUMBER**, **CATERPILLAR®**, **CATERPILLAR®**, **CATERPILLAR INC. PEORIA, IL 61629 USA**, **MADE IN**, **PARTS ORDER**, and **230-6906 1**.

Illustration 31

For quick reference, record this information in the spaces that are provided below.

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

Structure certification (ROPS)

WARNING

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

The protective structure certification is located on the outside of the left post.

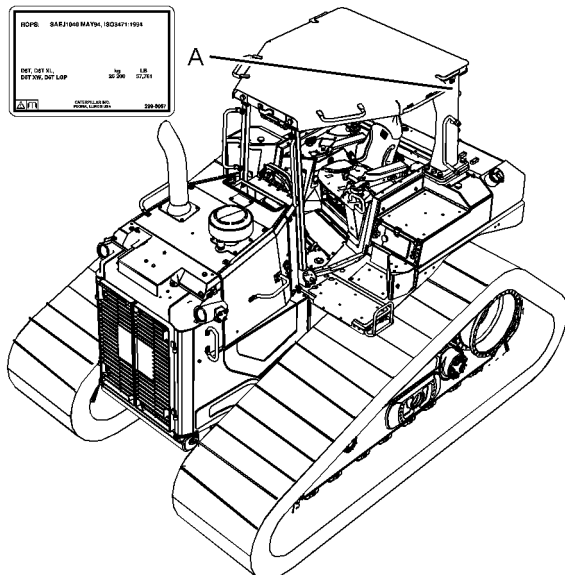


Illustration 32
(A) Film on ROPS support assembly

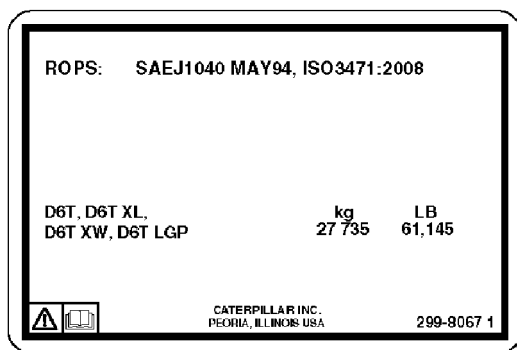


Illustration 33

⚠ 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 payload, should not exceed the mass on the certification plate.

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

ISO Symbols (Model Usage)

The following list contains all of the ISO Symbols that appear in this publication.



On or Start –



Off or Stop –



Electrical Disconnect Switch – Engine On



Engine – Start



Ether Starting Aid – Engine Starting Aid



Battery – Charging Condition



Fuel Level Indicator –



Parking Brake –



Implement Control Shutoff –



Engine – Failure/Malfunction



Transmission – Failure/Malfunction



Braking System – Failure/Malfunction



Engine Filter Element Indicator –



Transmission Filter Indicator –



Engine Oil – Pressure



Engine Oil Temperature –



Engine Coolant – Temperature



Torque Converter Oil – Temperature



Hydraulic Oil – Temperature



Engine Service –



Engine – RPM



Ripper –



Rear Work Light –



Panel Lights Switch –



Flood Lights –



Front Work Light –



Horn –



Backup Alarm –



Seat Back Angle Adjustment –



Seat Adjustment – Fore and Aft



Seat Adjustment – Height



Lumbar Support – Adjustment



Transmission – Forward



Transmission – Reverse



Transmission – Neutral



Ripper – Hold



Winch – Spool-In



Winch – Brake (Neutral)



Winch – Brake Off



Winch – Free Spool



Winch – Spool Out



Fuses –



Alternator –



Power Train ECM –



Engine ECM –



Blower Motor –



Panel Test Switch –



Window Washer –



Regeneration Active (indicator) –



Regeneration Disabled (indicator) –

Diesel Particulate Filter (DPF - indicator)
–

Force Regeneration (switch) –



Disable Regeneration (switch) –

Declaration of Conformity

Table 5

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

EC DECLARATION OF CONFORMITY OF MACHINERY

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

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

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

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

Description: Generic Denomination: Earthmoving Equipment

Function: Steel track dozer

Model/Type: D6T2

Serial Number:

Commercial Name: Caterpillar

Fulfills all the relevant provisions of the following Directives

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

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 August 2011, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

Emissions Certification Film

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

Consult your Cat dealer for an Emission Control Warranty Statement.

This label is located on the engine.

Operation Section (D6T LGP (OEM))

Before Operation

Mounting and Dismounting

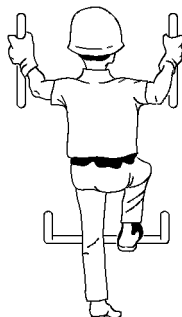


Illustration 34

Typical example

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

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

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

Note: Three-point contact can be 2 feet and one hand. Three-point contact can also be 1 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.

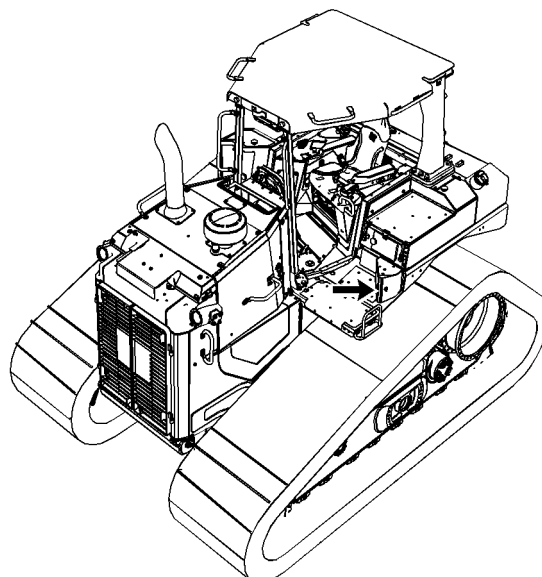


Illustration 35

Location of the ground level service center

After daylight hours end or in periods of darkness, use the platform access lighting. This light illuminates the entrance way to the cab. Open the access door to the ground level service center.



Illustration 36

Ground level service center



Access Lighting – Use the toggle switch for the lighting in order to mount the machine.

Note: When the switch in the ground level service center is activated, the lights remain on for 10 minutes. The time limit of the lights is programmable in the Monitoring System Display with “Machine Setup” in the Settings Menu. Toggling the switch a second time will deactivate the lights. The toggling of the switch will also turn off the lights if the lights were activated from the cab while exiting the machine.

Delayed Lighting Mode

Enable this function by leaving the Forward ROPS lights in the ON position before turning the machine keyswitch to the OFF position. The lights will remain ON for a configured amount of time (10 minute default). Use the access lighting switch to turn OFF the lights, if necessary.

Daily Inspection

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

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

Inspect the tracks, track roller frames, idlers, and rollers for oil leaks, and excessive wear.

Do not operate the machine until all necessary repairs have been made.

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 if you observe a leak, check the fluid levels more frequently.

Inspect the condition of the work tool and of the hydraulic components. Sound the horn.

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

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

- Operation and Maintenance Manual, "Backup Alarm - Test"
- Operation and Maintenance Manual, "Brakes, Indicators, and Gauges - Test"
- Operation and Maintenance Manual, "Cooling System Coolant Level - Check"
- Operation and Maintenance Manual, "Engine Air Precleaner - Clean"
- Operation and Maintenance Manual, "Engine Oil Level - Check"
- Operation and Maintenance Manual, "Fuel System Water Separator - Drain"
- Operation and Maintenance Manual, "Hydraulic System Oil Level - Check"
- Operation and Maintenance Manual, "Seat Belt - Inspect"
- Operation and Maintenance Manual, "Transmission System Oil Level - Check"
- Operation and Maintenance Manual, "Winch Oil Level - Check"

Tool Storage Area

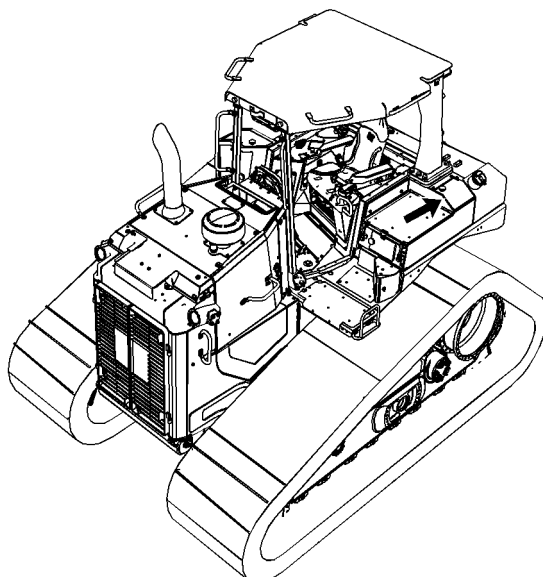


Illustration 37

The tool storage area is located above the left fender. The storage box is directly in front of the fuel tank filler cap.

Machine Operation

Seat

Adjusting the Seat

The operator's seat that is provided with this machine is in compliance with the appropriate class of "ISO 7096".

Note: Adjust the seat for a new operator or at the beginning of each shift.

The operator should be seated against the seat backrest. Adjust the seat so that the operator is allowed full travel of the pedals.

Adjusting the Fore and Aft Position of the Seat



Illustration 38



Fore and Aft Adjustment (1) – Pull up fore and aft lever (1). This will move the seat forward or this will move the seat back to the desired position. Release lever (1) in order to lock the seat in place.

Adjusting the Angle of the Back of the Seat

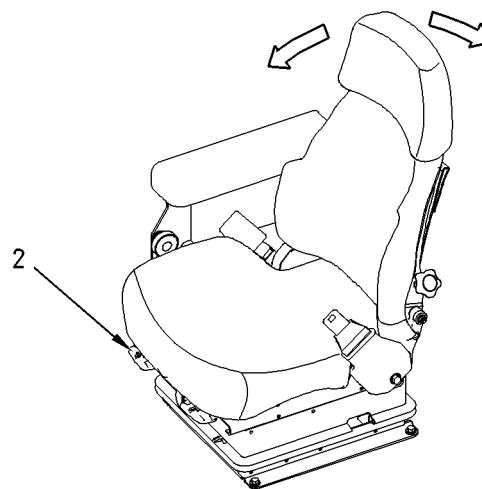


Illustration 39



Back Angle Adjustment (2) – Lift lever (2) and allow the seat back to tilt forward. Push the front of the backrest in order to tilt the seat backward. Release lever (2) at the desired position.

Adjusting the Bottom Seat Cushion

The bottom seat cushion has two positions.

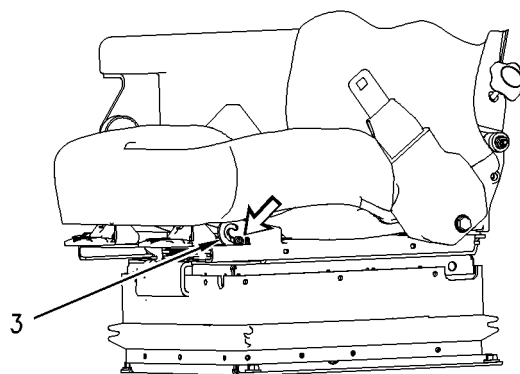


Illustration 40

The bottom seat cushion is shown in the lower or the flattest position.

The bottom seat cushion is in the lower or the flattest position when the end of the rod is in the bottom of the groove in bracket (3). Pull forward and pull upward on the bottom seat cushion in order to change the position of the bottom seat cushion back to the upper position.

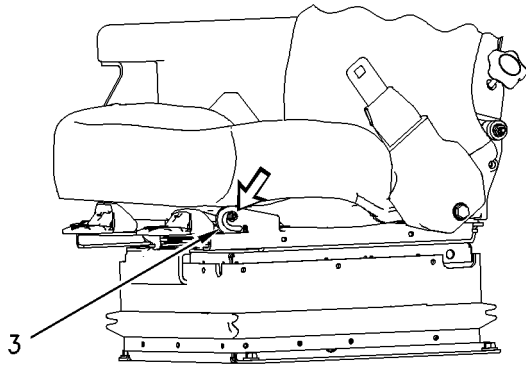


Illustration 41

The bottom seat cushion is shown in the upper position or the angled position.

The bottom seat cushion is in the upper position or the angled position when the end of the rod is in the top of the groove in bracket (3). Pull forward and push down on the bottom seat cushion in order to change the position of the bottom seat cushion back to the lower position.

Adjusting the Height of the Seat

Seats with Mechanical Suspension

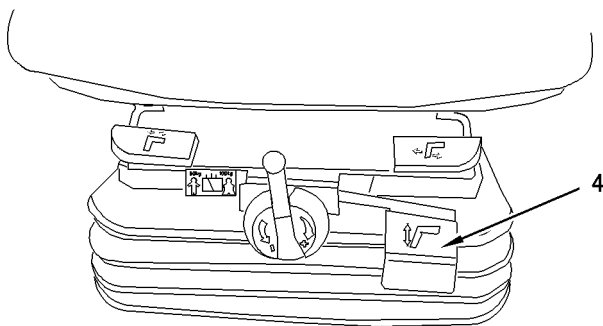


Illustration 42



Adjustment of the Seat Height (4) – Pull up on height adjustment lever (4) and pull up on the seat in order to raise the height of the seat. Pull up on height adjustment lever (4) and push down on the seat in order to lower the height of the seat.

Seats with Air Suspension and Toggle Switch

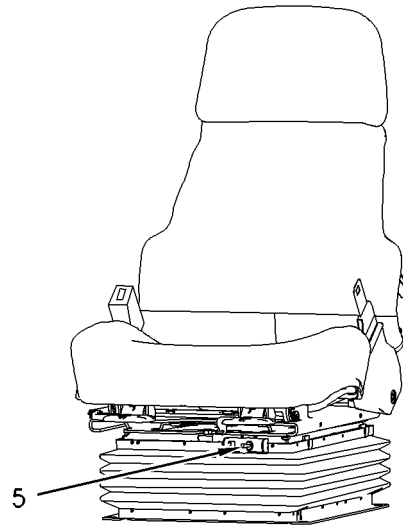


Illustration 43



Adjustment of the Seat Height (5) – Remove the weight from the seat. Hold toggle switch (5) upward in order to raise the seat. Hold toggle switch (5) downward in order to lower the seat. Release the toggle switch at the preferred height.

Seats with Air Suspension and Air Valve Knob

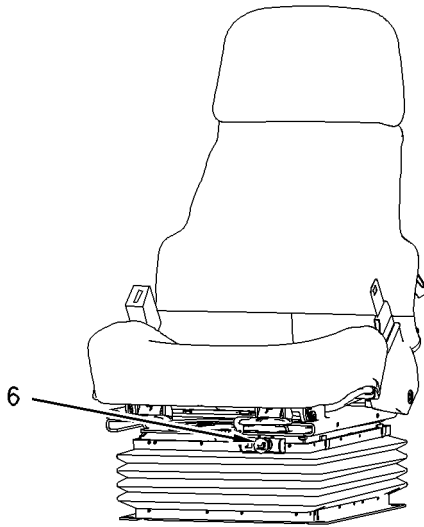


Illustration 44



Adjustment of the Seat Height (6) – Push in on the air valve knob (6) in order to raise the height of the seat. Pull out on the air valve knob (6) in order to lower the height of the seat.

Weight Adjustment

Seats with Mechanical Suspension

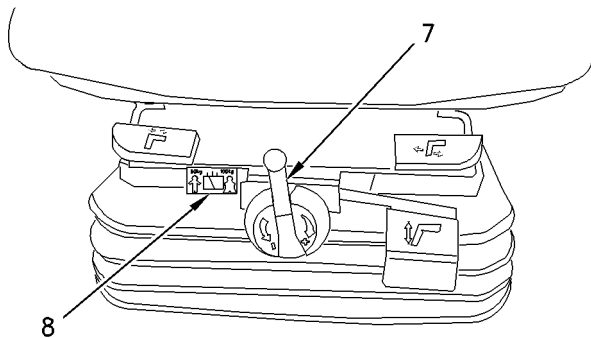


Illustration 45

Weight Adjustment (7) – Rotate knob (7) and observe gauge (8) in order to obtain the proper adjustment for the weight of the operator.

Seats With Air Suspension

The weight adjustment is automatically controlled by adjusting the height of the seat. Observe the gauge on the front of the seat suspension (if equipped) in order to obtain the proper adjustment for the weight of the operator.

Adjusting the Lumbar Support

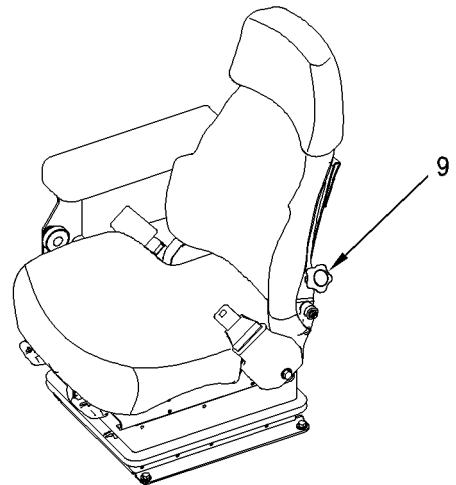


Illustration 46



Adjustment for the Lumbar Support (9) – Rotate the knob (9) clockwise in order to increase support for the lower back. Rotate the knob (9) counterclockwise in order to decrease support for the lower back.

Extension for the Back of the Seat (if equipped)

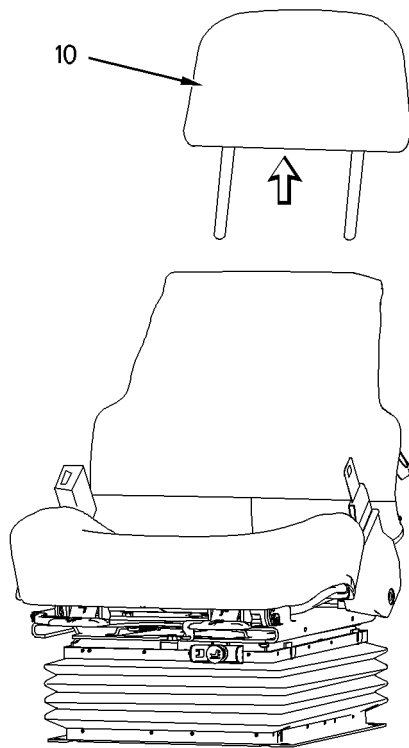


Illustration 47

Extension for the Back of the Seat (10) – Lift up on extension (10) in order to remove the extension.

When you install extension (10) push the extension all the way downward. The extension should touch the top of the seat.

Seat Belt

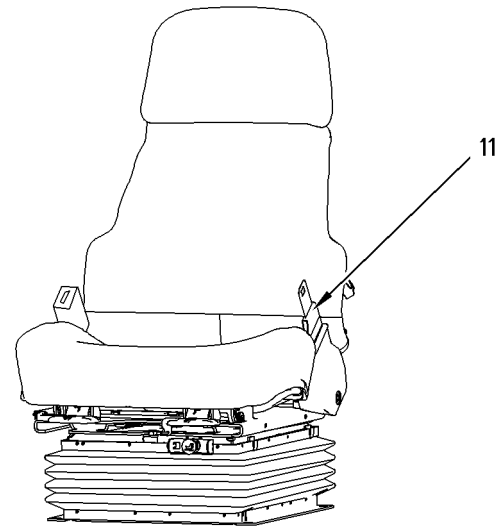


Illustration 48

Retractable Seat Belt (11) – When the seat has been adjusted to fit the operator, secure retractable seat belt (11).

Storage for the Operation and Maintenance Manual

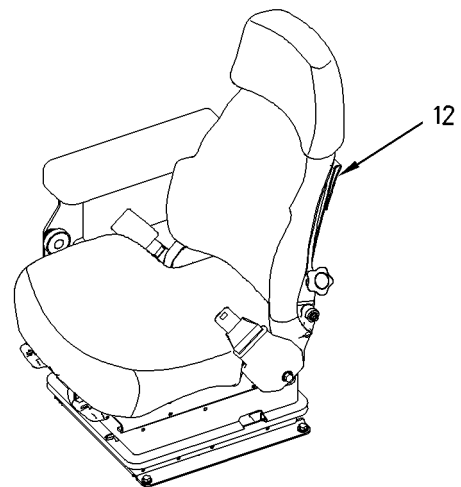


Illustration 49

The Operation and Maintenance Manual, should be stored and secured in the seat storage area (12).

Seat Belt

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

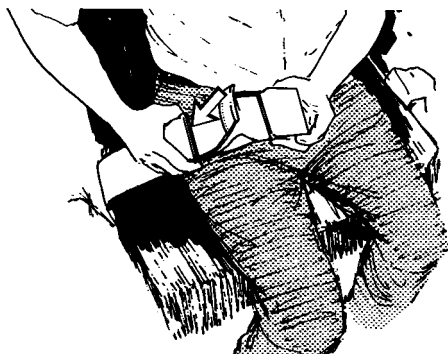


Illustration 50

1. Unfasten the seat belt.

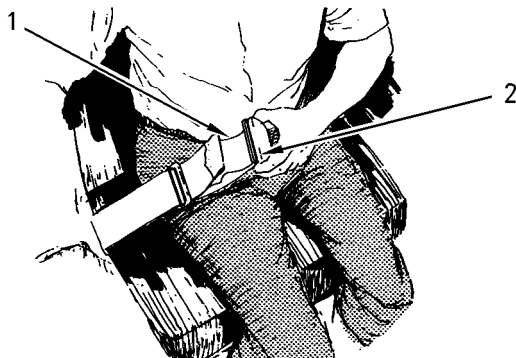


Illustration 51

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

3. Remove the slack from the outer belt loop by pulling on the buckle.
4. Loosen the other half of the seat belt in the same manner. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Shortening the Seat Belt

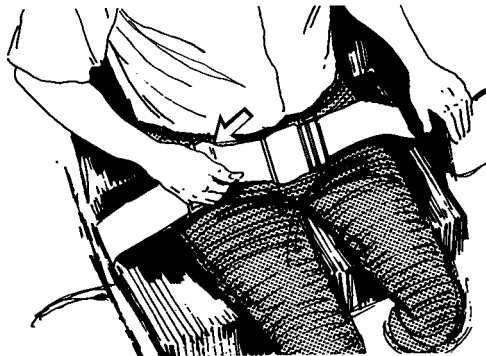


Illustration 52

1. Fasten the seat belt. Pull out on the outer belt loop in order to tighten the seat belt.
2. Adjust the other half of the seat belt in the same manner.
3. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Fastening The Seat Belt

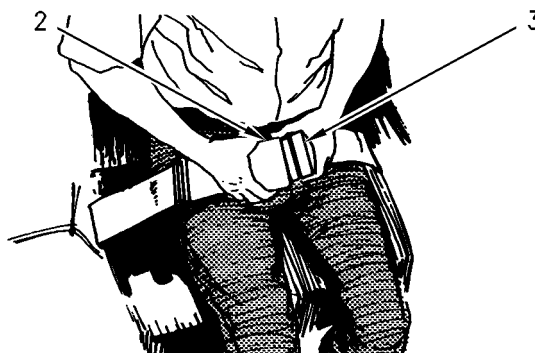


Illustration 53

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

Releasing The Seat Belt

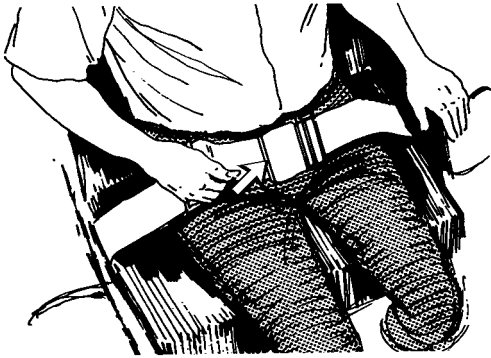


Illustration 54

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

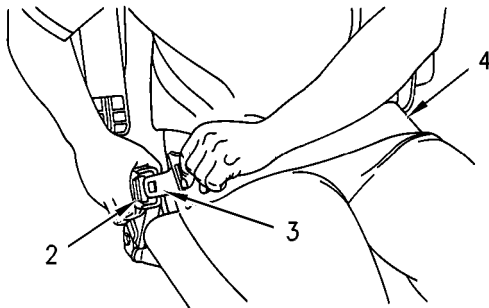


Illustration 55

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

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

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

Releasing The Seat Belt

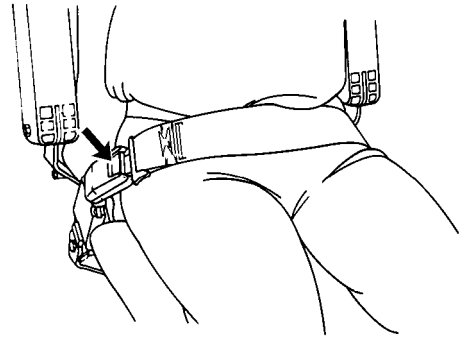


Illustration 56

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.

Operator Controls

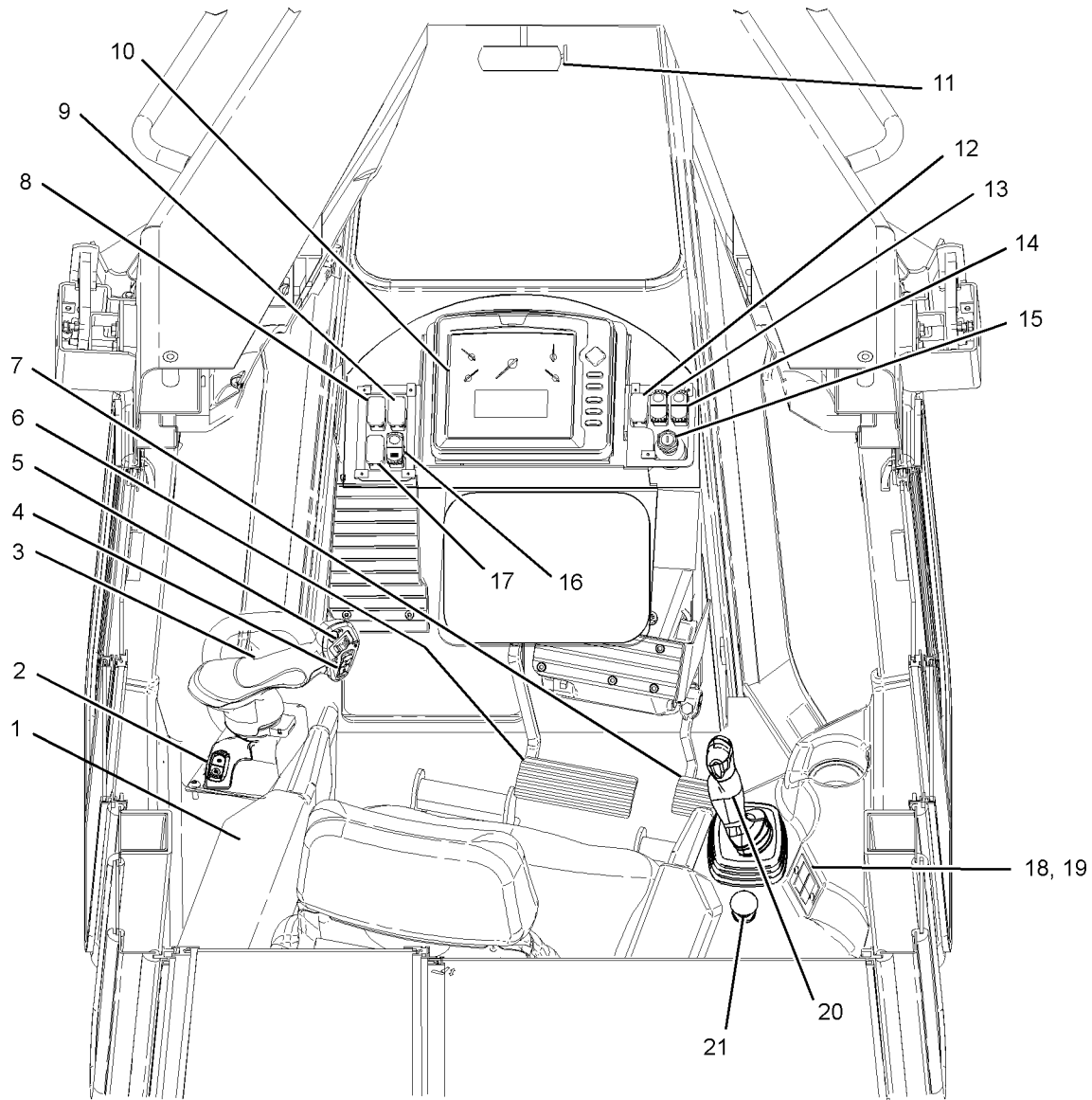


Illustration 57

- (1) Adjustable armrests
- (2) Parking brake control
- (3) Differential steering control
- (4) Transmission direction selector
- (5) Speed range selector
- (6) Service brake
- (7) Decelerator pedal
- (8) Front work lights
- (9) Rear work lights
- (10) Gauges and indicators
- (11) Mirror
- (12) MVP switch
- (13) Autoshift switch
- (14) Auto kickdown switch
- (15) Engine start switch
- (16) Regeneration switch
- (17) Engine fan reverse switch
- (18) Throttle control switch
- (19) Hydraulic lockout control
- (20) Joystick control
- (21) Horn

Adjustable Armrests (1)

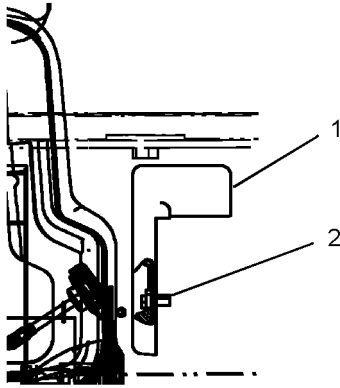


Illustration 58

Use the following procedure in order to adjust the left armrest, if necessary.

1. Loosen the two bolts (2).
2. Move armrest (1) to the desired height.
3. Tighten the bolts (2).

Parking Brake Control (2)

NOTICE

Do not engage the parking brake while the machine is moving unless an emergency exists.

The use of the parking brake as a service brake in regular operation causes severe damage to the parking brake system.

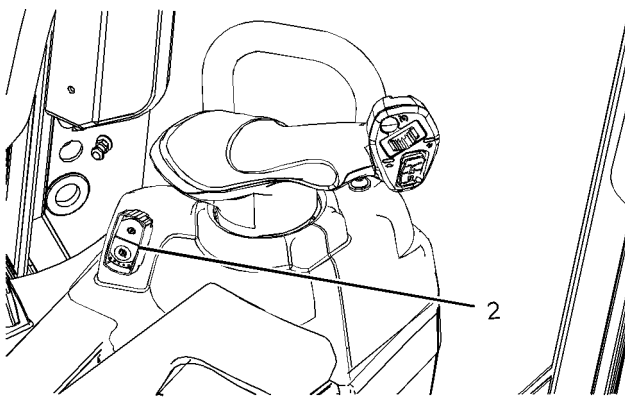


Illustration 59



Parking Brake (2) – Use this switch to engage the parking brake and lock the transmission in the NEUTRAL position.

When the parking brake switch is engaged, the parking brake indicator on the dashboard will light and the machine should not move. After the parking brake switch is disengaged, the parking brake indicator on the dashboard turns off. A direction is ready to be chosen. Do not use the parking brake to stop the machine.



Engaged – Push switch (2) away from the operator in order to engage the parking brake. The steering control is electronically locked. Also, the transmission controls are electrically disabled. The transmission will be locked in NEUTRAL.



Disengaged – Push switch (2) toward the operator in order to disengage the parking brake.

Differential Steering Control (3)

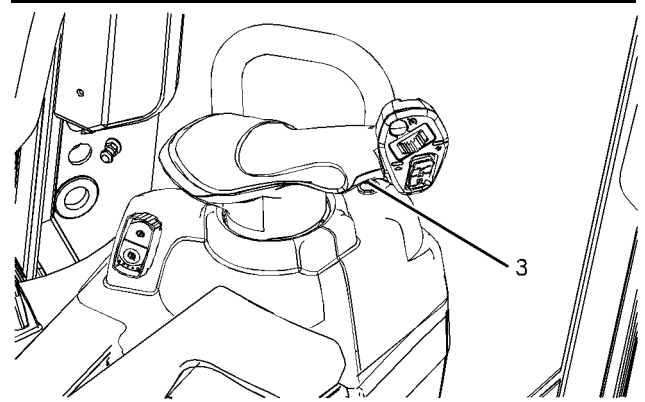


Illustration 60

Steering control lever (3) allows the steering system and the transmission system to be simultaneously controlled. Push down on parking brake switch (2) in order to disengage the parking brake and allow movement of the steering and transmission controls. The steering lever is electronically locked by the parking brake. The transmission controls are electronically disabled.

Steering Control

The machine can be steered with the power train in the NEUTRAL position.

NOTICE

When the steering lever is moved with the transmission in NEUTRAL or in gear, and the engine is running, the machine will turn. Engage the steering control lock by engaging the parking brake in order to prevent machine movement.

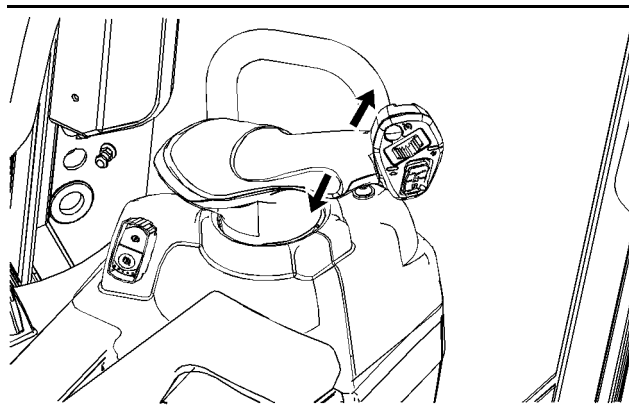


Illustration 61

When the machine is moving forward, push the steering control forward for a left turn. When the machine is moving forward, pull the steering control backward for a right turn. When you move the steering control farther in either direction, the machine will turn faster.

When the machine is moving backward, push the steering control forward for a right turn. When the machine is moving backward, pull the steering control backward for a left turn. When you move the steering control farther in either direction, the machine will turn faster.

To pivot the machine in the clockwise direction, place the power train in NEUTRAL and pull the steering control backward toward the operator.

In order to pivot the machine in the counterclockwise direction, place the power train in NEUTRAL and push the steering control forward.

Table 6

| Machine travel | Movement of steering control | Machine direction (turn) |
|----------------|------------------------------|--------------------------|
| FORWARD | PUSH | LEFT |
| FORWARD | PULL | RIGHT |
| REVERSE | PULL | LEFT |
| REVERSE | PUSH | RIGHT |
| NEUTRAL | PUSH | LEFT |
| NEUTRAL | PULL | RIGHT |

Transmission Control (4)

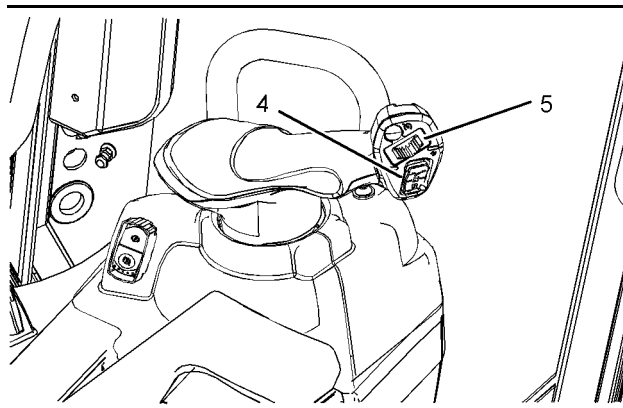


Illustration 62

Direction Control Switch (4)

Use direction control switch (4) in order to change the direction of the machine.



Forward – Push direction control switch (4) in order to change the direction of the machine to FORWARD.



Neutral – Move direction control switch (4) to the center position in order to move the machine into NEUTRAL.



Reverse – Push direction control switch (4) in order to change the direction of the machine to REVERSE.

Speed Control (5)



LOW – Roll thumb wheel (5) to the left when a lower gear is desired.

Note: Thumb wheel (5) allows gear changes via the incremental rotation of the wheel.



HIGH – Roll thumb wheel (5) to the right when a higher gear is desired.

The changes in gear selection will show in the monitoring system display when this information is requested.

When MVP is ON, the following five gears are available in each direction.

- 1.5
- 2.0
- 2.5
- 3.0

- 3.5

If MVP is OFF, then the following three speeds are available in each direction.

- 1
- 2
- 3

Service Brake Control (6)

Push down on the brake pedal in order to apply the service brakes. Use pedal (6) for slowing the machine and for stopping the machine. Use the service brakes on a downgrade in order to prevent overspeed. The service brakes are especially needed when you change directions on a steep slope.

Release pedal (6) in order to allow the machine to move. Release pedal (6) in order to increase the ground speed.

Decelerator Pedal (7)

Engine speed may also be reduced below the maximum operating speed by pushing down on the decelerator pedal. Push down on pedal (7) in order to override the throttle control. This action will reduce the engine speed. Use pedal (7) in order to reduce engine speed for directional shifts. Also, use pedal (7) in order to reduce engine speed when you maneuver in tight locations.

Note: The sensitivity of the decelerator pedal changes according to the setting of the throttle switch. At partial throttle settings, the modulation of the pedal is increased. This increase in modulation allows more precise control of the engine speed.

Light Switches (8, 9)



Front Work Lights (8) – This switch is a three- position switch. The positions are: OFF, front work lights, and the front work lights with ROPS lights.



Rear Work Lights (9) – Move the switch to this position in order to turn on the rear work lights.

Gauges and Indicators (10)

Monitoring System Display

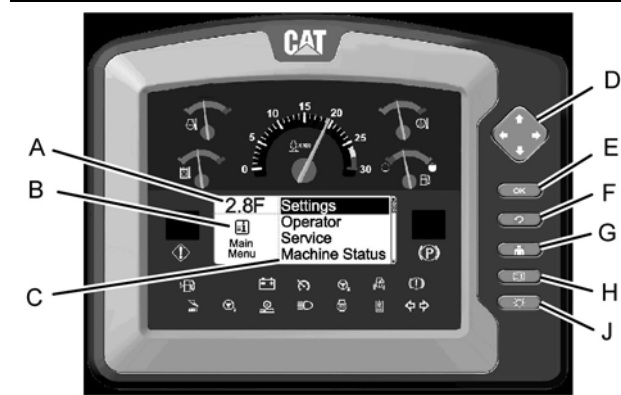


Illustration 63

Main menu display

- (A) Speed and direction
- (B) Main menu
- (C) Display menu
- (D) Left / Up and Right / Down button
- (E) OK button
- (F) Back to the previous screen
- (G) Return to operator menu
- (H) Return to main menu
- (J) Backlight adjustment

The monitoring system display is located in gauge and instrument module (11) of the front console. The monitoring system display communicates with the machine electronic control modules, sensors, and the instrument module. The monitoring system display provides various machine information to the operator and the service technician.

Items (A), (B), and (C) on the screen display system data at all times.

Some functions of the monitoring system display are password protected. Refer to Operation and Maintenance Manual, "Monitoring System" for more information.

Duration Timer (Lighting)

When "Machine Setup" of Monitoring System Display (C) is in use, select "Lighting Timer Duration". Then, select the amount of duration time for the lights in order to remain on.

Mirror (11)

The operator will adjust the rear view mirror in order to get the best visibility. Adjust the mirror before you operate the machine and after operators change.

Speed Range Control

MVP Switch (12), If Equipped

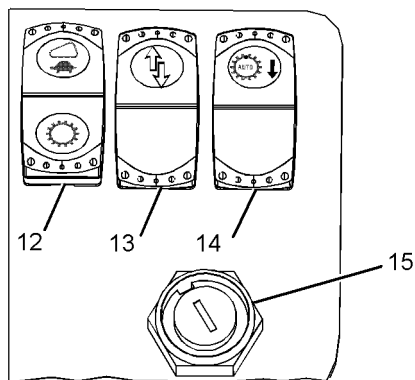


Illustration 64

- (12) MVP switch
- (13) Bidirectional switch (Autoshift)
- (14) Auto kickdown switch
- (15) Engine start switch

Multi-Velocity Program, If Equipped – MVP (12)

Your machine is equipped with one of two versions of speed ranges. The first option is MVP that activates the configuration of five speed ranges. Press the top part of the switch (12) in order to activate the five speed range. The second option is MVP OFF and the three speed ranges. Press the bottom part of the switch (12) in order to activate the three speed range.

The five speed ranges that are provided by MVP allow the operator to find the best match between the following items: machine speed, application, ground conditions and skill of the operator.

The operation of the five speed range is indicated on the display with the following designations: “1.5”, “2.0”, “2.5”, “3.0” and “3.5”. The display also indicates “F” for FORWARD, “N” for NEUTRAL, and “R” for REVERSE. The “2.0” speed range is a limited version (ground speed) of the “2.5” speed range. For “2.0”, the engine speed is reduced below high idle in order to limit ground speed. There is no loss of power operating in the “2.0” range when power is compared to the “2.5” range. The same condition is true for the “3.0” speed range and the “3.5” speed range.

The operation of the three speed range is indicated on the display with the following designations: “1”, “2” and “3”. The display also indicates “F” for FORWARD, “N” for NEUTRAL, and “R” for REVERSE.

Bidirectional Shift Mode (13)

Autoshift Mode – The bidirectional shift function allows the operator to preset the FORWARD and the REVERSE gear for directional changes and shifts out of NEUTRAL.

Bidirectional shifting can be selected with switch (13). The selected mode is shown on the digital display window. Three different modes can be selected by the operator by toggling this switch.

Note: When the bidirectional shift mode is activated and the transmission direction selector is in the NEUTRAL position, the digital display window shows N only.

Whenever a directional shift or shifting from neutral occurs, the transmission shifts to the selected gear for that direction by the active mode. If the machine is operating in the third gear forward with the autoshift mode at 1F-2R and a directional shift is requested, the machine will shift directly from third gear forward to second reverse gear. If another directional shift is requested, the machine will shift from second reverse gear to first gear forward.

When the machine powers up and the autoshift function is previously enabled, the mode selection always begins in the default OFF mode.



Bidirectional Shift (13) – The bidirectional autoshift function allows selection from two fixed settings and one configurable setting.

Table 7

| Autoshift Mode ⁽¹⁾ | | |
|-------------------------------|------------------------|--|
| | 1F-3.0R ⁽²⁾ | |
| | 1F-2R | |
| | 2F-2R | |
| | OFF | |

(1) Active setting

(2) Configurable setting in the monitoring system display

For the best results, change the options with the transmission in NEUTRAL.

1F-3.0R Configurable setting – This active setting can be configured with the “Monitoring System Display” for use in directional shift mode with first speed forward to reduced Eco Reverse .

1F-2R – This setting is the active setting when first speed forward to second reverse speed is the directional shift mode.

2F-2R – This setting is the active setting when second speed forward to second reverse speed is the directional shift mode.

The lights will display the desired mode. For the best results, change the options with the transmission in NEUTRAL. If the autoshift functions are not desired, the machine can be operated in the manual mode. The modes of the autoshift function are listed sequentially in the next topic.

Setting the Bidirectional Autoshift with Monitoring System Display

Use the “Message Display” on the instrument module in order to set the configurable setting and the installation status.

Table 8

| MVP Active Setting | MVP Inactive Setting |
|--------------------------|------------------------|
| 1.5F-3.0R ⁽¹⁾ | 1F-3.0R ⁽¹⁾ |
| 1F-3R ⁽²⁾ | 1F-3R ⁽²⁾ |

(1) Configurable setting when the Eco Reverse Mode is ON.

(2) Setting when the Eco Reverse Mode is OFF.

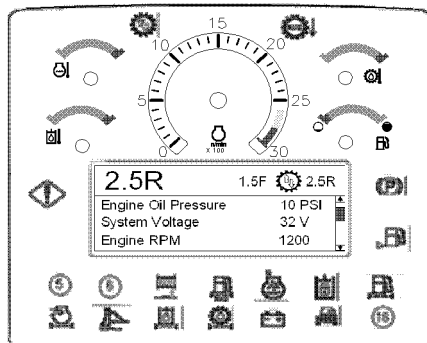


Illustration 65

The configurable setting for the autoshift function will be adjusted through the “Settings” menu in the Message Display. The diagram below shows the location of Bidirectional settings for Autoshift mode in the Message Display.

Onboard Display

MAIN MENU SELECTION

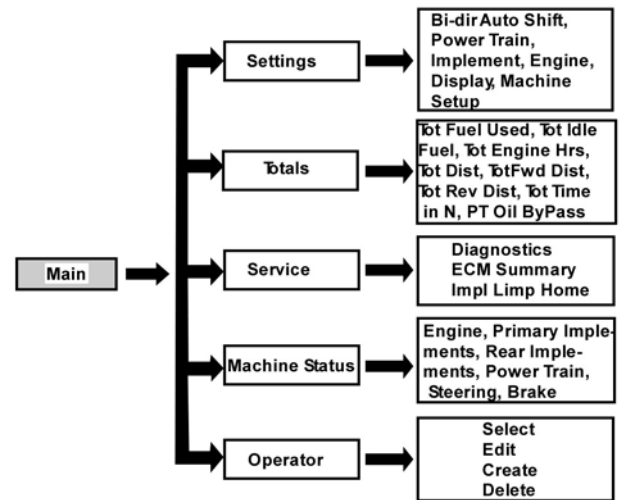


Illustration 66

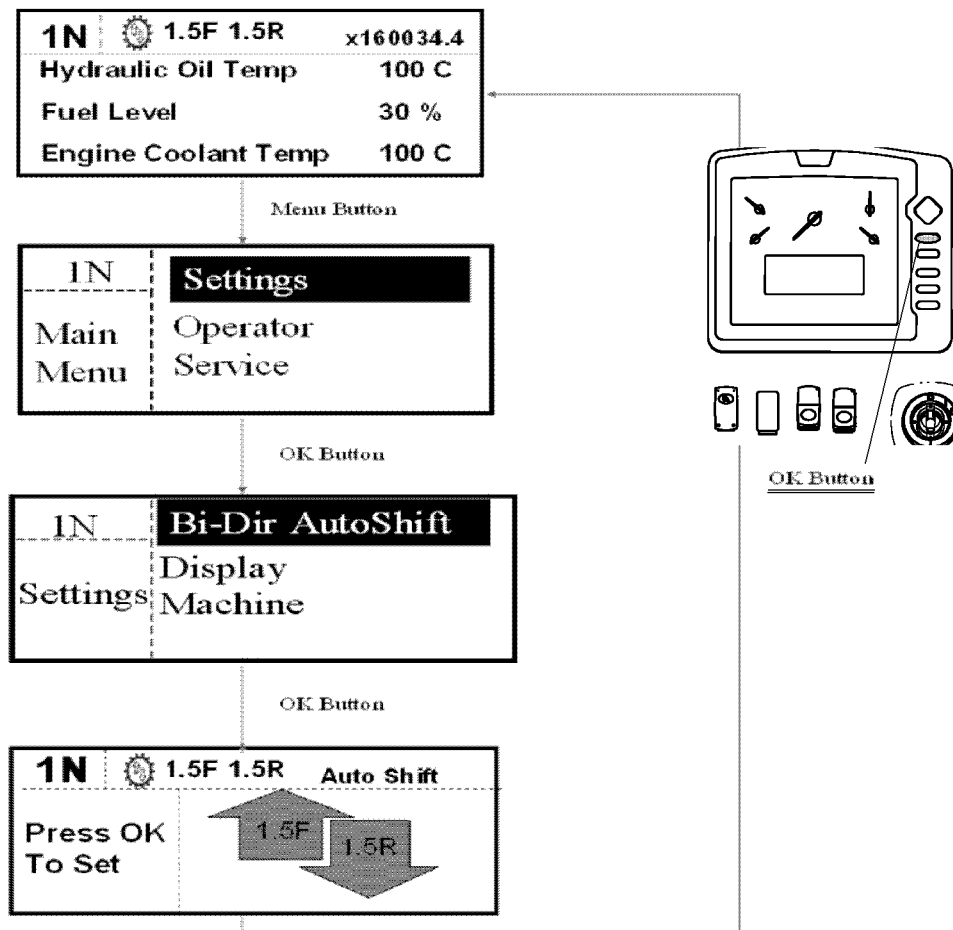


Illustration 67

Typical information panels of the "Message Display"

SETTINGS MENU

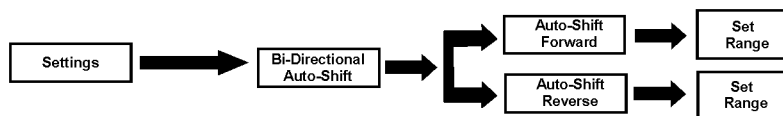


Illustration 68

For the complete list of options in the "Settings Menu", see "Monitoring System" in this manual.

Selecting the bidirectional Autoshift function will take the user directly to the interface for the bidirectional Autoshift modes. The interface will have up arrows and down arrows in the lower right section of the LCD screen. The up arrow will represent the forward gear and the down arrow will represent the reverse gear. The following text is displayed on the LCD screen: and “Press OK to Set”. The LCD will display the following information from left to right: and gear and lever position current “Bidirectional Autoshift” settings and “Autoshift” text. A screen that is an example of the interface for the “Bidirectional Autoshift” is shown in illustration 68.



Illustration 69

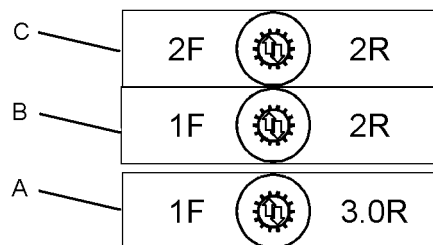


Illustration 70

First speed forward to third reverse directional shift mode (Configurable setting) (A) – Push button (13) once for the autoshift function. A directional shift to the FORWARD position will always shift to the first physical gear (or operator configured gear). A directional shift to the REVERSE position will always shift to the third physical gear (or operator configured gear). This mode allows a direct shift from the FIRST SPEED FORWARD position to the THIRD SPEED REVERSE position. With the transmission in the NEUTRAL position, the display for the transmission indicates “N”. Speed shifting is manual. Use the thumb roller for upshift requests and downshift requests. When MVP is active, the autoshift mode “1.5F-3.0R” is active (or the operator-selected mode is active).

First speed forward to second reverse directional shift mode (fixed setting) (B) – Push the button for the autoshift function (13) twice. When you shift the transmission to the FORWARD position, the transmission will always shift into the first physical gear. When you shift the transmission to the REVERSE position, the transmission will always shift into the second physical gear. The speed shift mechanism is manual. Use the buttons in order to upshift or use the buttons in order to downshift. When MVP is active, the autoshift mode “2.5F-2.5R” is active.

Second speed forward to second reverse directional shift mode (fixed setting) (C) – Push the button for autoshift function (13) three times. When you shift the transmission to the FORWARD position, the transmission will always shift into the second physical gear. When you shift the transmission to the REVERSE position, the transmission will always shift into the second physical gear.

Use the autoshift button on the dash to cycle through the three autoshift modes and the ON/OFF. The switch cycles in order from the top setting to the bottom setting in the table below.

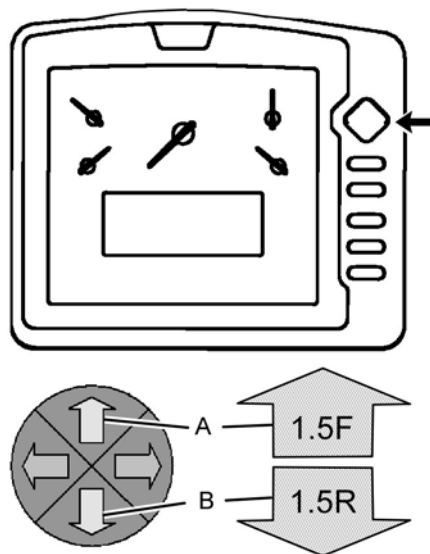


Illustration 71

Bidirectional Keypad

- (A) Arrow that adjusts the FORWARD gear
 (B) Arrow that adjusts the REVERSE gear

The “Message Display” on the instrument module changes with a hand control keypad with up/down arrow keys. The arrow keys will be used to adjust the “Bidirectional Autoshift” settings. The up arrow will adjust the forward gear in the up arrow on the LCD screen. The down arrow will adjust the reverse gear in the down arrow on the LCD screen.

The "Message Display" on the instrument module with the hand control keypad will scroll through a set of gears. The scrolling feature for gears will be cyclical. The diagrams below show the scrolling feature for MVP Active status and MVP Inactive status.

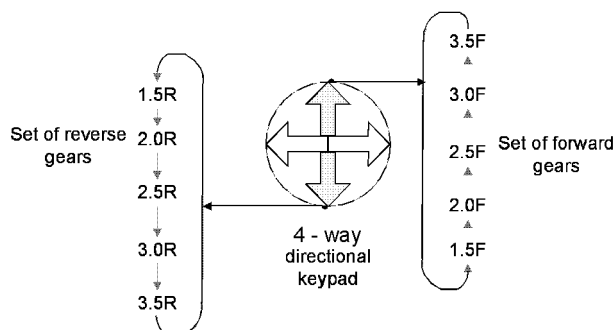


Illustration 72

Scrolling feature with an MVP active status

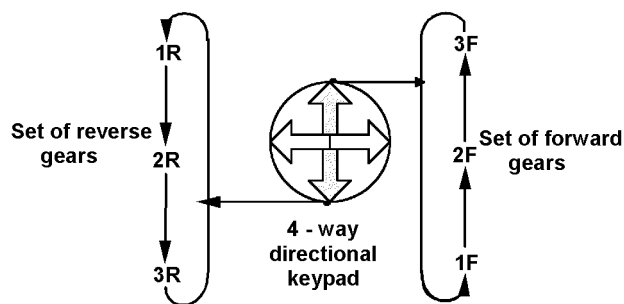


Illustration 73

Scrolling feature with MVP inactive status

Auto Kickdown Mode (14)



Auto Kickdown – This feature provides the operator with an auto kickdown mode of operation. Once the feature has been activated by the operator, the transmission will automatically downshift to a lower speed range when a significant load increase is detected. Once the load on the machine has been reduced, the operator can return to the desired speed range by manually upshifting. The auto kickdown will only downshift the transmission. The feature will not automatically upshift the transmission. The auto kickdown functions in FORWARD and REVERSE speed range.

To activate the auto kickdown mode of operation, push switch (14) that is located on the right side of the dashboard. An indicator light on the upper display module will illuminate when the auto kickdown is active. When the machine is started, the transmission is in the previously selected mode. If you start up the machine, and the auto kickdown is not selected, push switch (17). If the auto kickdown is active, the light is illuminated. In order to achieve the best results, select the auto kickdown with the transmission in NEUTRAL. If the autoshift function is not desired, the machine can be operated in the manual mode.

Autokickdown mode selection is done using the setting screen in the monitoring system display (message module).

The auto kickdown can be used in the following modes:

Manual shift in Auto Kickdown Mode. Automatic auto kickdown mode allows the transmission to downshift automatically. After a manual upshift, the auto kickdown is prevented for 2 seconds. The operator can make manual shifts at any time.

Auto Kickdown OFF. Push switch (14) and release switch (14) until the auto kickdown indicator is off. The manual shift mode is active if no autoshift indicators are on.

Auto Kickdown LOW. This mode utilizes the low shifting points.

Auto Kickdown MEDIUM. This mode utilizes the middle shifting points.

Auto Kickdown HIGH. This mode utilizes higher downshift points. The higher downshift points result in a quicker response as load is applied.

Engine Start Switch (15)

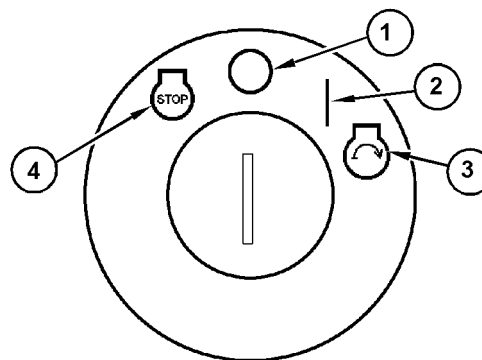


Illustration 74



OFF (1) – Inserting the engine start switch key and removing the key must only be done from the OFF position. In the OFF position, there is no power to

most electrical circuits in the cab. The cab lights, the panel lights, the tail lights, and the dome light are operational even when the start switch is in the OFF position.

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



ON (2) – Turn the start switch key clockwise to the ON position in order to activate all cab circuits.



START (3) – Turn the start switch key clockwise to the START position in order to crank the engine. Release the key after the engine starts. The key will return to

the ON position.



Emergency Shutdown Override (4) – Turn the engine start switch key to this position. This position overrides the delayed engine shutdown or the key off

regeneration in an emergency. The engine shuts down without delay.



Illustration 75

"Warning category 2s" displays for 15 seconds after the engine shutdown occurred. (The action lamp flashes.)

Note: The engine can be restarted at the discretion of the operator for the allowance of system cooling.

Regeneration Switch (16)

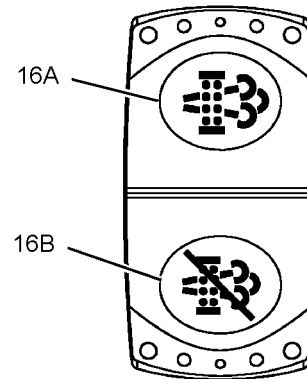


Illustration 76

ARD disable switch

The MIDDLE position of the regeneration switch is the default position for automatic regeneration.

(16A) Enable the aftertreatment regeneration device system. Press top of the switch and hold for 2 seconds.

(16B) Disable the aftertreatment regeneration device system. Press the bottom of the switch and hold for 2 seconds.



Illustration 77

Soot level indicator

The soot level threshold to enable a manual regeneration is 15%. Push the top of regeneration switch (16) for a manual regeneration. Then, the high exhaust system temperature indicator (HEST lamp) illuminates during the regeneration cycle. The high exhaust system temperature indicator (HEST lamp) will deactivate when the regeneration cycle is completed.

Regeneration Indicators



DPF – DPF lamp indicates when a regeneration cycle is needed. This indicator will illuminate when the soot level reaches 90%. This lamp turns off during an active regeneration.



High Exhaust System Temperature – HEST lamp indicates that a regeneration cycle using the Aftertreatment Regeneration Device (ARD) is active.



Regeneration Disabled – The display will indicate when a regeneration cycle is disabled.

Reference: See Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration” for additional information.

Engine Fan Reverse Switch (17) (If equipped)

If the machine is equipped with the reverse fan function (attachment), the fan can reverse the direction of air flow from forward to the rearward direction. This function enables the fan to purge debris from the radiator, aftercooler cores, and engine access doors. The purge cycle will begin automatically when the purge interval expires or the purge cycle can begin manually with a switch(17) on the left dash.



Reversing Fan Control (17) – In order to initiate the fan purge cycle, press fan control switch (17) while the machine is in NEUTRAL and the parking brake is

released or when the machine is in REVERSE. In order to initiate the continuous purge cycle, press fan control switch (17) while the machine is in NEUTRAL and the parking brake is ON and hold for 3 seconds. The fan will remain in a continuous purge cycle until the switch is pressed again or the parking brake is released.

The setting range for the duration of the fan purge cycle is 5 - 60 seconds. The setting range for fan purge interval is 5 - 120 minutes.

If the purge interval expires, a purge cycle will begin when the track-type tractor is in a REVERSE gear or in NEUTRAL and the parking brake is released. If the purge interval expires and the track-type tractor is in a FORWARD gear, starting a purge cycle is prevented. If the purge interval expires and the track-type tractor is in NEUTRAL with the parking brake engaged, starting a purge cycle is prevented. A purge cycle is prohibited until there is a shift into REVERSE gear or the parking brake is released in NEUTRAL.

If the purge button is manually depressed, a purge cycle will begin when the track-type tractor is in a REVERSE gear or in NEUTRAL and the parking brake is released. If the purge button is manually depressed, the request for a purge cycle will be ignored when the track-type tractor is in a FORWARD gear or in NEUTRAL and the parking brake is engaged.

When a purge cycle is in progress and the cancellation of the purge cycle is set to OFF, the indicator light for the reverse fan function in monitoring system display (10) will light. After a purge cycle begins, the purge cycle is canceled if there is a shift to forward gear.

When a purge cycle begins and the cancellation of the Purge Cycle is set to ON, the purge cycle will stop automatically once the machine is put into FORWARD gear. If the cancellation of the Purge Cycle occurs after 15 seconds of purge time, the purge interval timer is kept at zero. Then, the system is able to purge the cooling system and the purge cycle starts automatically at the next time. After three successive attempts fail to complete more than 15 seconds of purge time, the purge interval timer is reset to the purge interval.

The purge interval timer is reset upon full completion of every purge cycle regardless of an automatic start or manual start. The reverse fan function is disabled when the hydraulic oil temperature is below 0 °C (32 °F). The fan purge cycle will not operate when the engine coolant temperature equals 109° C (228.2° F) or the engine coolant exceeds that temperature.

Throttle Control Switch (18)

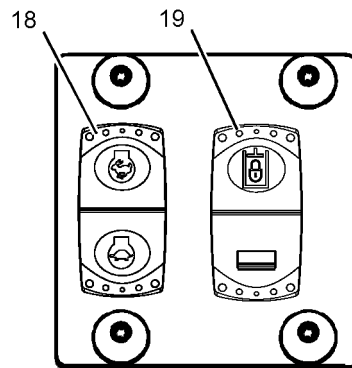


Illustration 78

Throttle control switch (18) is located on the right-hand console.



High Idle – For high idle, press the throttle control switch on the top of switch(18), if equipped. The engine speed immediately moves to high idle.

Your machine has a high idle engine speed of 2000 rpm.



Low Idle – For low idle, press the throttle control switch on the bottom of the switch(18). The engine speed immediately moves to low idle.

Engine speed may also be reduced by pushing down on decelerator pedal (7).

Set the maximum operating speed at a point less than high idle in one of the following manners:

1. Set the engine speed to high idle. Push the decelerator pedal until the desired speed is reached.
2. When this desired speed is reached, push the top of switch (18) and hold for 2 seconds. This movement will electronically set the engine speed as the maximum operating speed.
3. The decelerator will function normally in order to reduce engine speeds below this maximum speed.
4. In order to return to high idle as maximum speed, press the top part of switch (18).

An optional method performs in the following manner.

1. Press and hold the top of throttle switch (18) for 2 seconds.
 - a. The engine speed will ramp up until the switch is released.
 - b. The engine speed will ramp up until the high idle point is reached.
2. Press and hold the bottom of throttle switch (18) for 2 seconds.
 - a. The engine speed will ramp down until the switch is released or the low idle speed is reached.

Hydraulic Lockout Control (19)

Note: Disengage the locking tab on the switch to use the hydraulic lockout control.

The hydraulic lockout control is designed to deactivate the control levers. Press the top of switch (19) to the lock position in order to deactivate the control levers. Deactivate the control levers before you exit the seat or before you service the machine. The control levers should always be deactivated when the machine is left unattended. Press the bottom of switch (19) to the unlocked position in order to activate the control levers.

Joystick Control (20)

Lift Control

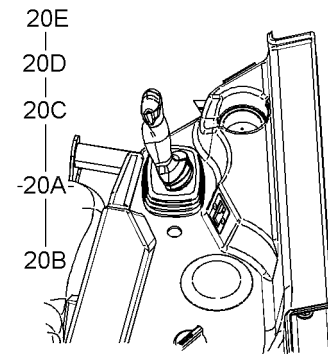


Illustration 79



HOLD (20A) – The lever will return to the HOLD position when you release the lever from the RAISE position or from the LOWER position. Also, the movement of the bulldozer blade stops in the up and down direction.



RAISE (22B) – Pull back on the lever in order to raise the blade. Faster movement of the lever increases the moving speed of the blade. Releasing the lever will return the lever to the HOLD position.



LOWER (22C) – Push the lever forward in order to lower the blade. Faster movement of the lever increases the moving speed of the blade. Releasing the lever will return the lever to the HOLD position.



QUICK DROP (22D) – Push the lever beyond the Lower position to activate the blade quick-drop function. The blade will be allowed to drop to the ground. Releasing the lever returns the lever to the HOLD position.



FLOAT (22E) – Push the lever forward past the detent in order to activate the blade FLOAT function. The float function is not deactivated when the lever is released into the NEUTRAL position. When in float, the blade moves up and down with the ground contour. Float will be deactivated if the lever is moved through the NEUTRAL position to the RAISE position or the LOWER position.

Note: The control moves through the quick drop range as you go from the LOWER position to the FLOAT position.

Note: Hydraulic lockout control (24) is designed to deactivate the control levers. Disengage the locking tab on the switch to use the hydraulic lockout control. Press the top switch (24) to the lock position in order to deactivate the control levers. The action indicator for the attachment control will ensure that the control is locked. Deactivate the control levers before you exit the seat or before you service the machine. The control levers should always be deactivated when the machine is left unattended.

Reference: You may lower the attachments after you stop the engine. Refer to Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped" for more information.

Tilt Control

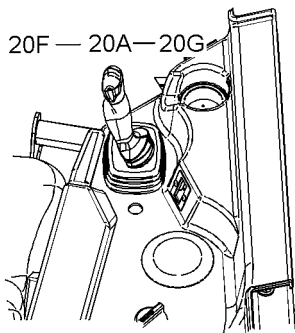


Illustration 80



Hold (20A) – When you release the lever, the lever returns to the HOLD position. The movement of the bulldozer blade stops in the TILT direction.



Tilt Left (20F) – Pull the tilt lever toward the left in order to lower the left side of the bulldozer blade. Faster movement of the lever increases the moving speed of the blade. Releasing the lever will return the lever to the HOLD position.



Tilt Right (20G) – Push the tilt lever toward the right in order to lower the right side of the bulldozer blade. Faster movement of the lever increases the moving speed of the blade. Releasing the lever will return the lever to the HOLD position.

Horn (21)



Horn – Push the knob downward in order to sound the horn. Use the horn to alert the personnel. Use the horn to signal the personnel.

Additional Operator Controls

Ground Level Service Center

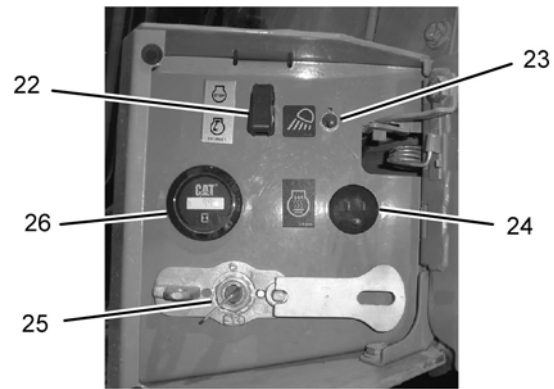


Illustration 81

Secondary Engine Shutdown (22)



Engine Stop – Move the toggle switch to this position in order to stop the engine from ground level.



Engine Run – With the toggle switch in this position the machine engine continues to operate.

Access Light (23)



Platform Access Lighting – Use this toggle switch to operate the access lighting when mounting the machine.

Note: When the switch in the ground level service center is activated, the lights remain on for 10 minutes. The time limit of the lights is programmable. Toggling the switch a second time will deactivate the lights. The toggling of the switch will also turn off the lights if the lights were activated from the cab while exiting the machine.

Delayed Lighting Mode

This function is enabled by leaving the lights in the ON position before turning the machine keyswitch to the OFF position. The lights will stay on for a configured amount of time to light the machine for safe exit. The default is 10 minutes. The lights may be turned off using the ground level "Access Lighting" switch.

Jacket Water Heater (24)



Engine Starting Aid – Use this outlet to operate the engine coolant heater, if equipped.

Battery Disconnect Switch (25)

NOTICE

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



On – Insert the key, and turn the key clockwise in order to activate the electrical system. The switch must be ON before you start the engine.



Off – Turn the key counterclockwise in order to shut off the entire electrical system.

See “Battery Disconnect Switch” in this manual for more information.

Service Hour Meter (26)



Elapsed Operating Hours – Use the service hour meter to determine the service hour maintenance intervals, if equipped.

Diesel Particulate Filter Regeneration

Regeneration

Regeneration is the removal of soot from the Diesel Particulate Filter (DPF). The Caterpillar Regeneration System (CRS) is used to regenerate the DPF. The DPF traps both soot and ash. The ash is removed through a 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 – This indicator will illuminate in order to show that the CRS 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 needed. This indicator will illuminate when the soot level reaches 90%.



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

Regeneration Switch



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



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

Note: The MIDDLE position of the regeneration switch is the default position for automatic regeneration.

Note: You may return to normal operation at any point during a regeneration.

Note: To re-enable automatic regeneration, cycle the engine start switch key or press and hold down the force regeneration switch for 2 seconds. If the soot level is above 15%, 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 through the disable regeneration switch, press and hold the disable regeneration switch for 2 seconds to reinitiate the disable regeneration.

Soot Level Monitoring



Illustration 82

The soot level monitor indicates the level of soot that has accumulated within the DPF. The five marks on the monitor represent a percentage of soot within the DPF. The first mark indicates 0% soot level. The second mark indicates 25% soot level. The middle mark indicates 50% soot level. The fourth mark indicates 75% soot level. The last mark indicates 100% soot level. The soot level monitor can be used to optimize DPF regenerations based upon the work cycle of your machine. If machine conditions do not allow for an automatic regeneration, a manual regeneration should be performed before the soot level gauge indicates 100%.

Modes of Regeneration

Automatic: The engine 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 for any reason, it is permissible to press the disable regeneration switch or turn off the engine.

Note: Automatic adjustments of engine speed may be noticed during automatic 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 an automatic regeneration is started while the engine is at low idle and the machine is taken back to work, this may stop the regeneration. The engine 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 is allowed when the soot level is equal to or greater than 15%. 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.

Regeneration System Warning Indicators

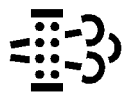


Illustration 83

Indicator will illuminate when DPF soot load is greater than 90%

Regeneration should be performed as soon as possible. Machine operation may not allow an automatic regeneration to take place. A manual regeneration should be performed as soon as possible.

Indicator will turn off once DPF regeneration has started.

Note: In some situations, the DPF indicator may stay illuminated when the soot load is below 90%. The illuminated DPF indicator indicates that a complete regeneration has **not** been performed. A complete regeneration is when the soot level is reduced to 0%. If the DPF indicator stays illuminated, perform a regeneration without interruption until the soot level is reduced to 0%. A complete regeneration will reset the DPF indicator.

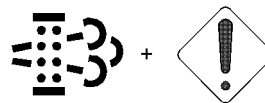


Illustration 84

If the amount of soot collected in the DPF has reached a level that a regeneration is **required**, the DPF indicator and an action lamp will illuminate. Stop the machine and apply the parking brake. With the engine at low idle, initiate a manual regeneration. Engine power will be slightly derated if the machine continues to operate.

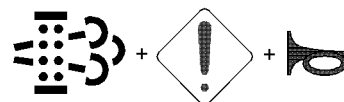


Illustration 85

After a certain period, if no action is taken to regenerate an action alarm will activate. After 5 minutes with the action alarm active, the engine will automatically be taken to low idle.

A manual regeneration is required at this time. A complete regeneration will unlock the forced low idle speed. Cycling the engine start switch key will unlock the forced low idle speed.

Once the engine has been in the forced low idle strategy for approximately 10 minutes, regeneration will be locked out. At this time, a regeneration can only be done through Caterpillar Electronic Technician (ET), by an authorized Cat dealer.

After a certain amount of time, engine will automatically shut down. Engine can be restarted but will only run for 30 seconds before shutting down again.

Finally, if the engine is still allowed to run through multiple forced engine shutdowns, all types of regenerations are locked out. The DPF must be replaced. Consult your local Cat dealer if the DPF needs to be replaced.

Key Off Regeneration

The use of the Key Off Regeneration feature and the Delayed Engine Shutdown feature allows the engine to run for a time when the engine start switch is turned to the OFF position. The 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 transmission, apply the parking brake, lower work tools to the ground, and deactivate all work tools.

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

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

Key off regeneration allows for regeneration when the engine start switch key has been removed. To begin a key off regeneration, the soot level must be between 15% and 100% on the soot level monitor and/or a regeneration is in progress. The following steps outline the procedure of a key off regeneration:

1. Turn the engine start switch to the OFF position.
2. The engine will continue to run for 15 seconds. During this 15 second interval, if a regeneration is desired, press and hold the force regeneration switch for 2 seconds.

Note: If a regeneration is not desired, the machine will initiate the delayed engine shutdown.

3. The key off regeneration will activate and the key off regeneration will last for up to 15 minutes.

Note: If at anytime the regeneration needs to be stopped, press and hold the disable regeneration switch.

4. Once the key off regeneration is complete, the machine will initiate the delayed engine shutdown.
5. The delayed engine shutdown will last for 5 minutes.
6. After the delayed engine shutdown has been completed, the engine will shut down.

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 the machine system components. The engine start switch 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 transmission, apply the parking brake, lower work tools to the ground, and deactivate all work tools.

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 for a minimum of 30 seconds and will continue to run until the engine and machine system components are cooled. The maximum run time is 10 minutes,

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.

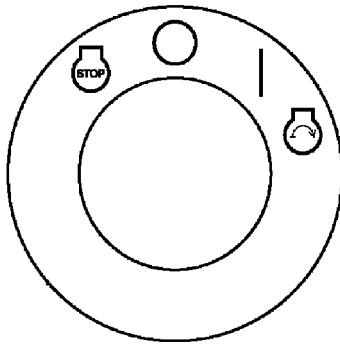


Illustration 86

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.

Monitoring System

The monitoring system informs the operator of the status of the machine systems. The monitoring system informs the operator of problems or of an impending problem.

Functional Test

When the engine key start switch is turned ON, the monitoring system will conduct a self test. The self test consists of the following characteristics: full sweep of the gauge needles from the minimum position to the maximum position, activation of all indicators and activation of the audible alarm for level three warnings for one second. The operator must observe the self test to verify that the monitoring system is working properly.

The self testing feature verifies that the modules of the monitoring system are properly operating.

The operator must observe the outputs in order to determine if the modules are operating properly. This self testing feature is 3 seconds long.

WARNING

If the action alarm does not sound during this test or machine monitoring displays are not functioning, do not operate the machine until the cause has been corrected. Machine operation with faulty action alarms or displays could result in injury or death as any Warning Category 3 notifications will not be relayed to the operator.

During the self test, all status indicators light.

- The action light stays illuminated.
- The action alarm sounds once.

The monitoring panel is then in the normal operating mode.

Action Lamp

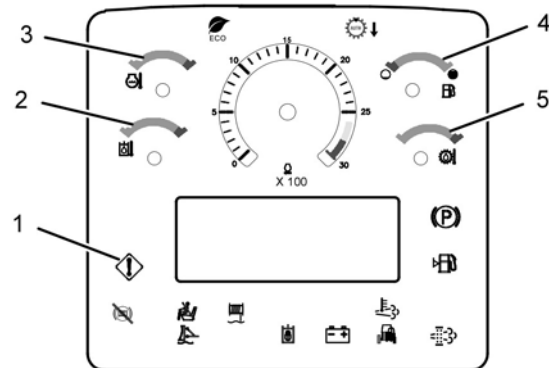


Illustration 87

Monitoring system display



Action Lamp (1) – There are two action lamps. One action lamp (1) is on the gauge cluster. The other action lamp is located on the right console. The rearward action lamp is viewed when the operator is facing rearward.

Gauges



Hydraulic Oil Temperature (2) – The gauge indicates the temperature of the hydraulic oil in the hydraulic oil sump for the steering and implement circuits. If the gauge needle enters the red zone, the hydraulic system oil is approaching 95° C (203° F). The monitoring system display will display a warning. If necessary, reduce the load that is on the machine until the hydraulic oil temperature decreases.



Engine Coolant Temperature (3) – The water temperature regulator regulates the coolant temperatures. If the gauge needle just enters the red zone, the coolant temperature is 112 °C (234 °F). Increased temperatures will sound the warning alarm. Continued operation of the machine during the sounding of the warning alarm or the gauge needle in the red zone may damage the engine. Stop the machine in a safe place and investigate the cause.



Fuel Level (4) – The fuel level gauge indicates the amount of fuel that remains in the fuel tank. A gauge needle in the red zone indicates a low fuel level. (This proceeding indicates a remaining fuel level of approximately 10 percent.)

NOTICE

Running out of fuel can cause engine damage. Do not continue to operate the machine when critically low on fuel.



Torque Converter Oil Temperature (5) – This gauge indicates the temperature of the oil in the torque converter. If the gauge needle reaches the red zone, increased temperatures will sound the warning alarm. Continued operation of the machine during the sounding of the warning alarm or the gauge needle in the red zone may damage the transmission and or the torque converter. Reduce the load that is on the machine until the torque converter oil temperature decreases.

Status Indicators

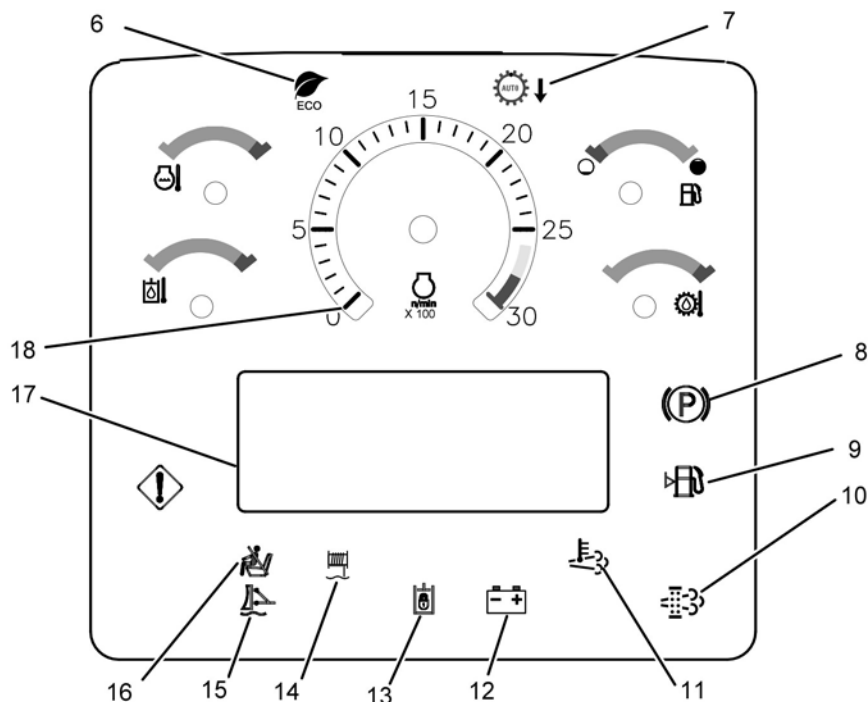


Illustration 88



Eco Reverse Mode (reverse travel) (6) – This indicator is illuminated when the fuel economy mode is active during reverse travel in the unlocked third gear.



Auto kickdown (7) – This indicator is illuminated when the auto kickdown mode is active.



Parking Brake (8) – This status indicator indicates that the parking brake is engaged. If this indicator is illuminated, disengage the parking brake before attempting to move the machine.



Fuel Level (9) – This status indicator is illuminated when the fuel level is low.



DPF Filter (10) – This indicator illuminates when the amount of soot that is collected in the DPF is above 90%.



High Temperature Indicator Lamp (11) – An illuminated HEST lamp shows that the aftertreatment regeneration device (ARD) is active.



Battery Charging (12) – This indicator is illuminated when the charging system is not OK.



Implement Lockout (13) – This indicator is illuminated when the implement lockout switch is activated.



Winch Freespool (14) – This indicator indicates that the freespool mechanism is latched and active.



Float (15) – This status indicator is illuminated when the float mode is active.

Operator Seat (16)



The Operator is Not in Seat (16) – This status indicator is illuminated when the engine is running and the operator leaves the seat unoccupied.

Operator in Seat (Sensor)

The sensor unit that is mounted under the operator seat prevents movement of the machine or implements if the operator is out of the seat.

When the sensor unit indicates that an operator is present in the seat, the Machine ECM will enable specific system operation. The operation of the travel system of the machine and the implement control system is now active.

Note: When the machine is moving and the operator raises from the seat, the electric power train systems and the implement operation will not shut down until the machine is stopped.

After the machine is stopped, the Machine ECM will again require the sensor unit to indicate that an operator is in the seat. This seating of the operator must occur before the travel and implement systems will be enabled.

Note: The parking brake will not disengage and the implements will not respond unless the operator is seated.

Digital Display Window (17)

See “Monitoring System Display” in this section for more information on the digital display window.

Tachometer (18)

The following range marks for engine speed are displayed on the tachometer (18): White zone, Yellow zone and Red zone.



Engine Speed (White zone) – 0 - 2300 RPM



Engine Overspeed (Yellow zone) – “2300 RPM - 2600 RPM” is a visual warning. This zone indicates that the machine is approaching the maximum

recommended speed. The monitoring system display will display a level ii warning above 2600 RPM.



Engine Overspeed (Red zone) – +2600 RPM is a visual warning that the engine is overspeeding. Both the alert indicator and the action lamp flash. The monitoring

system display will display a level III warning above 3000 RPM.

Do not allow the engine to exceed 2900 rpm. Severe engine damage may result.

Warning Categories

The operator will be warned of immediate problems with a machine system or impending problems with a machine system by digital display window.

The monitoring system display provides three warning categories. The first category requires only operator awareness. The second warning category informs the operator of the machine that the operator should change machine operation. The third warning category states that the machine must be shut down immediately.

The monitoring system display will show a text message for the current highest level active event.

Table 9

| WARNING OPERATION | | | | | |
|-------------------|----------------------------------|-----------------------|---------------------------|---|--|
| Warning Category | Status Indicators ⁽¹⁾ | | | "Operator Action Required" | "Possible Result" ⁽²⁾ |
| | "Action Lamp Flashes" | "Action Alarm Sounds" | Monitoring System Display | | |
| 1 | | | X ⁽³⁾ | No immediate action is required. The system needs attention soon. | No machine damage occurs. Minor reductions in machine performance may occur. |
| 2 | X ⁽⁴⁾ | | X | Change machine operation or perform maintenance to the system. | Severe damage to components can occur. |
| 3 | X ⁽⁵⁾ | X ⁽⁶⁾ | X | Immediately perform a safe engine shutdown. ⁽⁷⁾ | Injury to the operator or severe damage to components can occur. |

(1) The active status indicators are marked with an X.

(2) This is the possible result, if the operator takes no action.

(3) Some level I warnings will be logged only.

(4) The front action lamp flashes amber. The rear action lamp flashes red.

(5) Both action lamps flash red.

(6) The action alarm sounds.

(7) Engine overspeed does not require engine shutdown. Engine overspeed requires applying the travel control pedal in order to reduce the track speed immediately. This action reduces the engine speed immediately.

If a fault indication occurs, the message will override any screen that was displayed on the monitoring system display. For example, a steering malfunction is indicated on the message display. The message display prompts the operator with the Limp Home Mode (screen) in order to continue to move the machine with limited operation to a safe place.

Reference: See Systems Operation, KENR8246, "D7E Track-Type Tractor Monitoring System" for more information.

Monitoring System Display

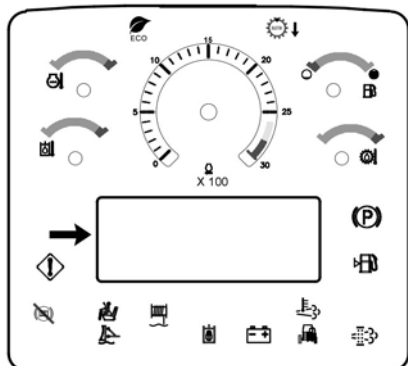


Illustration 89

The monitoring system display is located in the front operator console.

The monitoring system display monitors the machine operations, diagnostic events, and modes of operation. The monitoring system display is used to change the preferred operator inputs and operation parameters. This exercise allows additional means for the operator to increase machine efficiency.



Monitor alert indicator – The monitoring system display indicates a detected fault by the monitoring system.

If a fault indication occurs, the message will override any screen that was displayed on the monitoring system display.

Note: You may snooze the fault display from the screen by pushing the OK button.

Display Readout

The digital display window provides readouts for the Monitoring System Display.

“Performance” Screens

PERFORMANCE MENU SELECTION

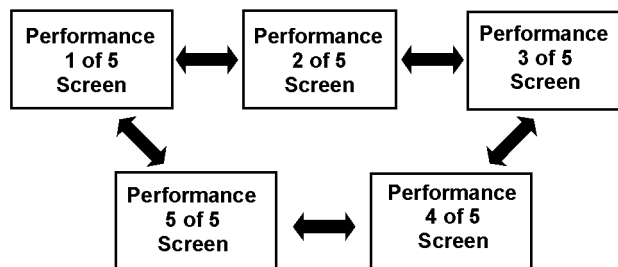


Illustration 90

The “Performance” screens allow the operator or the technician to view five pages of information. These pages of information monitor critical data from the machine systems during machine operation. This information can only be viewed. The “Performance” menu uses five screens for the real-time monitoring of the following information:



Illustration 91

The up/down arrow buttons switch the page from one screen to another screen.

The page that displays “Performance 1 of 5” screen is the default setting after the operator preference is completed. (Key ON).

Table 10

| “Performance” Screen 1 of 5 | |
|-----------------------------|---------------------------------|
| Description | Units |
| DPF Soot level | 25, 50, 75, 100% ⁽¹⁾ |

(1) Bar scale

Table 11

| “Performance” Screen 2 of 5 | | | |
|--|-----------------------------|----------|--------|
| Description | Value | Status | Units |
| Regen mode (control mode) | Disabled, Manual, Automatic | Inactive | Status |
| Regen mode (ARD status) ⁽¹⁾ | Active | Active | Status |
| Machine hours | XXXXXX.X | | Hours |
| Remaining Fuel Level | XXX | | % |

(1) Aftertreatment regeneration device system

Table 12

| “Performance” Screen 3 of 5 | |
|-----------------------------|------------|
| Description | Units |
| Engine Oil Pressure | kPa or psi |
| System Voltage | V |
| Engine Speed | RPM |

Table 13

| “Performance” Screen 4 of 5 | |
|-----------------------------|----------|
| Description | Units |
| Engine Coolant Temperature | °C or °F |
| Hydraulic Oil Temperature | °C or °F |
| TC Oil Temperature | °C or °F |

Table 14

| “Performance” Screen 5 of 5 | |
|-----------------------------|----------------------------|
| Description | Units |
| Engine Load Factor | % |
| Fuel Consumption | L or Gal |
| Air Filter Restriction | kPa or IN-H ² O |

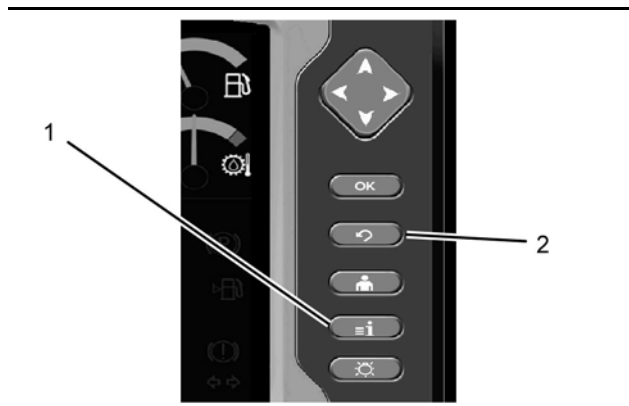


Illustration 92

Note: The “Main Menu” can be displayed from any screen by pressing Main button (1).

Press back button (2) the required number of times in order to return to the “Performance” screen.

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

Engine Monitoring Mode

The monitoring system display interfaces with the engine ECM. Also, this interaction displays the emissions data of the present engine operating state. The information about the engine aftertreatment system is displayed.



Illustration 93

“Performance 1 of 5”



Soot level (DPF filter) – The soot level of the aftertreatment regeneration device (ARD) displays the level of active soot.

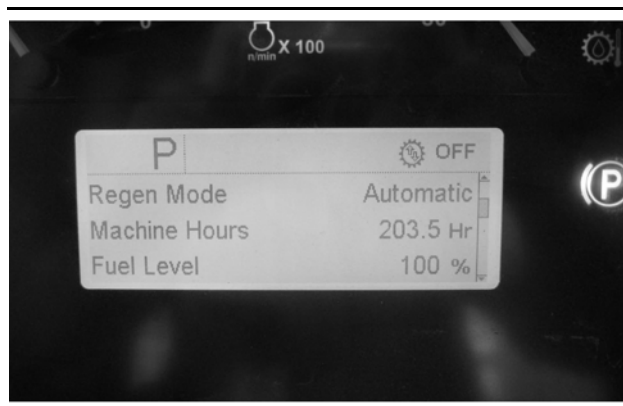


Illustration 94

The aftertreatment regeneration device system is set to the automatic regeneration mode.

Reference: See Operation and Maintenance Manual, “Diesel Particulate Filter Regeneration” for additional information on aftertreatment regeneration.

Delayed Engine Shut Down



Illustration 95

This message display alerts the operator that an engine cooldown is active. The engine key start switch is in the OFF position.

Emergency Shutdown Override



Illustration 96

This message alerts the operator that a hot engine shutdown has occurred. The engine key start switch is in the fourth position. A level III warning is active for 15 seconds after the engine shutdown.

Note: The operator may allow the engine system to cool by restarting.

Engine Idle Shutdown

This function shuts down the engine after the operator is not operating the machine for a configured time. This function does shut down other electrical systems, such as the A/C (air conditioning), lights, and others that are powered by the main power relay. This function can be enabled or disabled by using the onboard display.

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 parking brake is applied or the transmission is in neutral.
- The service brake is released.
- The throttle pedal is released.
- The implement controls are not active.

At 20 seconds before the engine shuts down the control limits engine speed to 1000 rpm and turns on the action lamp and action alarm. An operator can move one of the controls in order to cancel a shutdown. Using the service brake pedal to cancel a shutdown is the recommended option for the operator.

Display Module



Illustration 97

- (A) Gear and Direction
- (B) Menu option
- (C) Display menu
- (D) "Four way" button
- (E) OK button
- (F) Back to previous screen
- (G) Operator menu
- (H) Return to main menu
- (J) Backlight adjustment

Requested gear (A) – This display area shows the requested gear and the current direction of the machine.

Menu Option (B) – This display area shows the selected menu.

Display Menu (C) – This display area shows the numerous menus and submenus in order to navigate from one screen to another screen. Also, this display area depends on the menu or the submenu that is selected. Then the display will show the information in the system, system status, and operator warnings.

Five buttons on the right of the Monitoring System Display are the user interface. Use the buttons for the following purposes: navigation, selection menu and data information

Left Button (Up/Down) (D) – This button is used for the following purposes: navigation, data information and a decrease in a setting value.

Right Down (Up/Down) (D) – This button is used for the following purposes: navigation, data information and an increase in a setting value.

OK (E) – This button is used to make selections on the screen. Also, use this button to confirm a password entry or use the button to save an

operator profile.

Back button (F) – This button is used to return to the previous screen.

Navigate to operator menu (G) – This button is used to return to the operator menu.

Return to main menu (H) – This button is used to return to the main menu.

Use the arrow buttons to highlight the desired selection in order to navigate through the menus and submenus. Then press the OK button. Also, use the arrow buttons to highlight a mode or parameter setting. Then, press the OK button in order to select that option.

Note: When the diagnostic message is acknowledged, a predetermined length of time passes before the message screen will appear on the monitoring system display again. This interval is dependent upon the severity of the warning level. Consult the appropriate warning category for the proper instruction.

After all screens with warning messages are acknowledged, the first performance monitor screen will appear. This screen is the default screen.

Machine Start-up

Upon starting the machine (key ON), the Monitoring System will perform a self test. The first preliminary screen asks the operator to select a name from the saved profiles. Press the OK button, in a timely manner in order to use the active set of customer preferences. If no setting is accepted as “OK” or if “Default” is selected, then the ECM default settings will remain.

Main Menu

As many as five items are available for setup.

MAIN MENU SELECTION

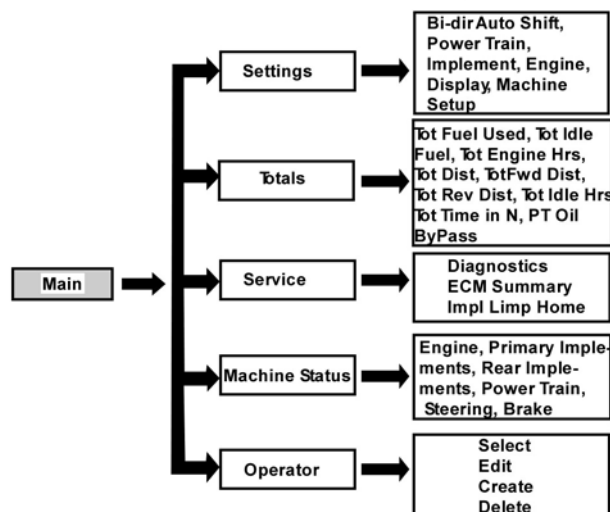


Illustration 98

Menu for the Operator Profile

Access the Operator Profile (menu) by pressing the button for the operator menu. Also, you may navigate to the Operator Profile (menu) by pressing the following buttons: Menu button, Operator.

Operator Profile



Illustration 99

The “Operator Profile” menu option is entered by selecting “Operator” from the “Main” menu. Press the up arrow button or the down arrow button until “Operator” is highlighted. Then press the “OK” button.

Note: The “Main Menu” can be displayed from any screen by pressing the Main Menu button.

The following explains the usage of each menu option.

“Select” Profile – This option allows the selection of a saved profile and the associated settings. The operator is given this option in order to edit the settings. (See Illustration 100.)

“Edit” Profile – This option allows the operator to edit the settings of the active operator profile. Press the “OK” button in order to edit the settings for the currently selected profile. When all settings have been modified, select the “EXIT” button and press the “OK” button in order to save the settings.

“Create” Profile – This option defines a profile name. When this step is completed, the “Settings” screen for the operator profile is displayed. Now, the operator can edit the settings. When the new profile is exited, the settings are saved to the Profile. As many as 20 operator profiles may be entered.

“Delete” Profile – The operator can delete an existing profile. Highlight the profile that will be deleted. Then press the “OK” button in order to delete that profile.

Note: The selected profile must be inactive in order to delete the profile.

Using Operator Preferences

Upon the next restart, the user will be prompted to recall a saved profile. Press the “OK” button within 15 seconds in order to recall the profile settings. If 15 seconds pass by the start-up, no profile settings are applied.

If the message display fails to apply any settings included in the operator profile, a message communicating 'Operator XXXXX Settings Error' will be displayed. Where XXXXX is the name of the profile being applied.

The following information indicates the typical procedure for start-ups, if the operator has saved a set of preferences by “Name”.

1. Turn the key ON. Highlight the “Name” (1) in order to use the saved preferences. Then, press the “OK” button. If you do not select the “Name” (1) within 15 seconds, no profile setting will activate.

Note: The “Default” profile name (2) is a selection that allows the most appropriate settings for the machine and the recent working conditions.

2. You have now selected the Operator Profile with the set of preferences that was previously saved.

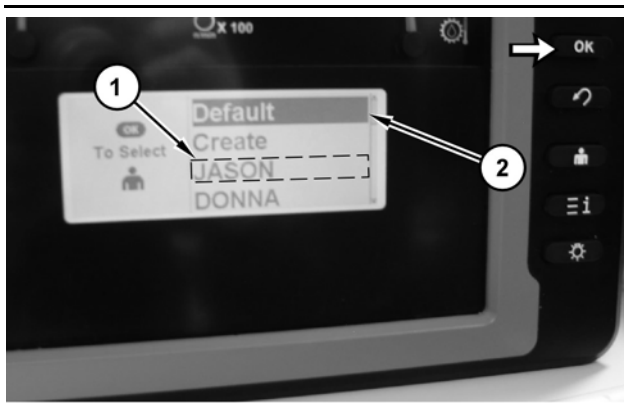


Illustration 100

“Settings” Menu

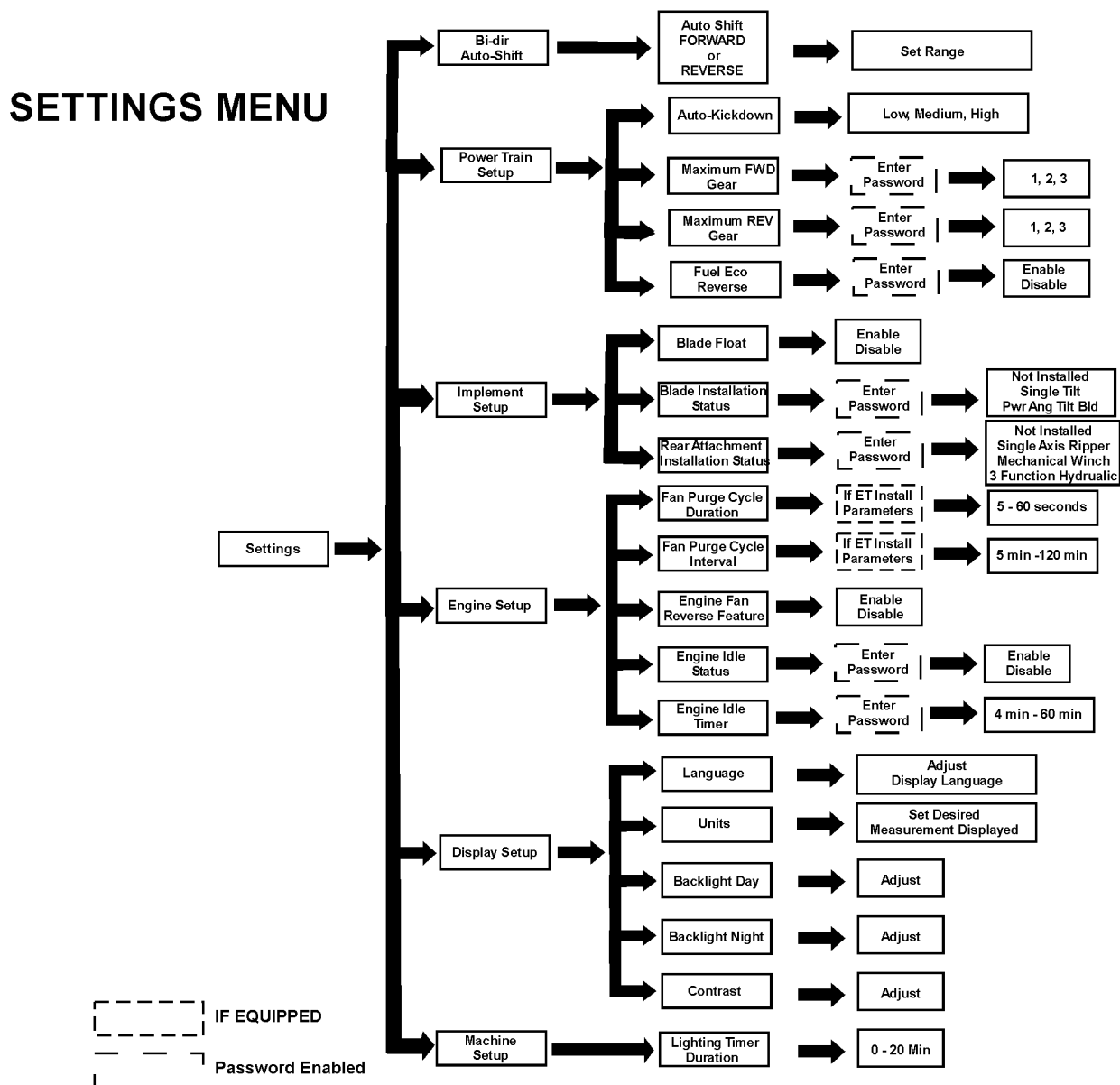


Illustration 101

The “Settings” menu allows the user to adjust parameters for the following categories:

- Bidirectional shift
- Power train operation
- Implement operation
- Engine operation

- Monitoring System Display
- Machine operation

Operating conditions, preferences of the operator and requirements for efficient operation inform the operator that adjustments to the parameters are needed. The setup of the machine determines the display of variable parameters.

The “Settings” menu option is entered by selecting “Settings” from the main menu. Press the “UP” arrow button or the “DOWN” arrow button until “Settings” is highlighted in order to select the “Settings” menu. Then press the “OK” button. Refer to Illustration 103.

Note: Press the main menu button in order to display the “Main Menu”.



Illustration 102

The following screen will now be displayed.



Illustration 103

The “Settings” menu has six categories with adjustable parameters that are listed above. The six categories are “Bidirectional Shift”, “Power Train”, “Implement”, “Engine”, “Display Setup”, and “Machine Setup”.

To adjust to the associated parameters, press the “UP” arrow button or the “DOWN” arrow button until the desired category is highlighted. Then press the “OK” button in order to access the parameters in that category. From this point, follow the screen prompts in order to adjust to the available parameters.

Password Entry Screen

Some of the Settings are password protected. The display will bring up the password screen automatically when a password is needed. Once a password has been entered, the display will remember this password and not ask for one again until the next key cycle.

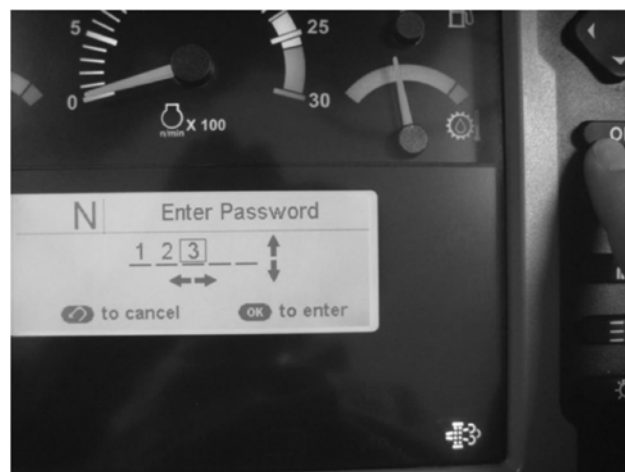


Illustration 104

Password entry screen

The password length can be from 1 to 5 numbers. When entering the password any leading zero's can be ignored. For example if the password is 123 then the password would be entered into the 5-digit entry screen as 1, 2, 3, with the remaining 2 right most spaces left blank. Pressing the OK key submits the entered password. Contact your Cat dealer if you do not know what the password is for your machine or you would like the password changed.

Power Train Settings

Auto Kickdown – If a significant increase in machine load is detected, this function automatically downshifts the transmission. This function works in forward and reverse gears.

“Maximum Forward Gear” – This selection sets the maximum gear that the machine travels in the forward direction.

“Maximum Reverse Gear” – This selection sets the maximum gear that the machine travels in the reverse direction.

Eco Reverse Mode – Select this mode in order to activate the Eco Reverse mode during reverse travel in third gear.

Note: Bidirectional shift can be used to shift to Eco Reverse 3rd reverse automatically.

Implement Settings

All the parameters in this category relate to the operator preferences for the work tool operational modes. The following parameters may be adjusted:

Blade Float – Enabled, disabled

Blade Installation Status – Not installed, Single tilt, Power Angle Tilt Blade

Rear Attachment Installation Status (if equipped) – Not installed, Single axis ripper, three-function hydraulic

Display Settings

From the “Display Setup” menu, use the arrow buttons to highlight the desired parameter. Then press the “OK” button. This exercise will allow access to that parameter screen. Then follow the screen prompts in order to adjust the parameter. All the parameters in this category relate to the operator preferences in regard to the monitoring system display. The following parameters may be adjusted:

Language – Select a language.

Units – Select one of the following options: Metric, English and “Imperial”

Display Backlight – Select the amount of brightness for the digital display window.

Contrast – Select the desired degree of contrast for the digital display window.

Machine Settings

From the “Machine Setting” menu, use the arrow buttons to highlight the desired parameter. Then press the “OK” button. This exercise will allow access to that parameter screen. Then follow the screen prompts in order to adjust the parameter.

Duration Timer (Lighting) – Select the amount of duration time for the lights to remain on.

Service Menu

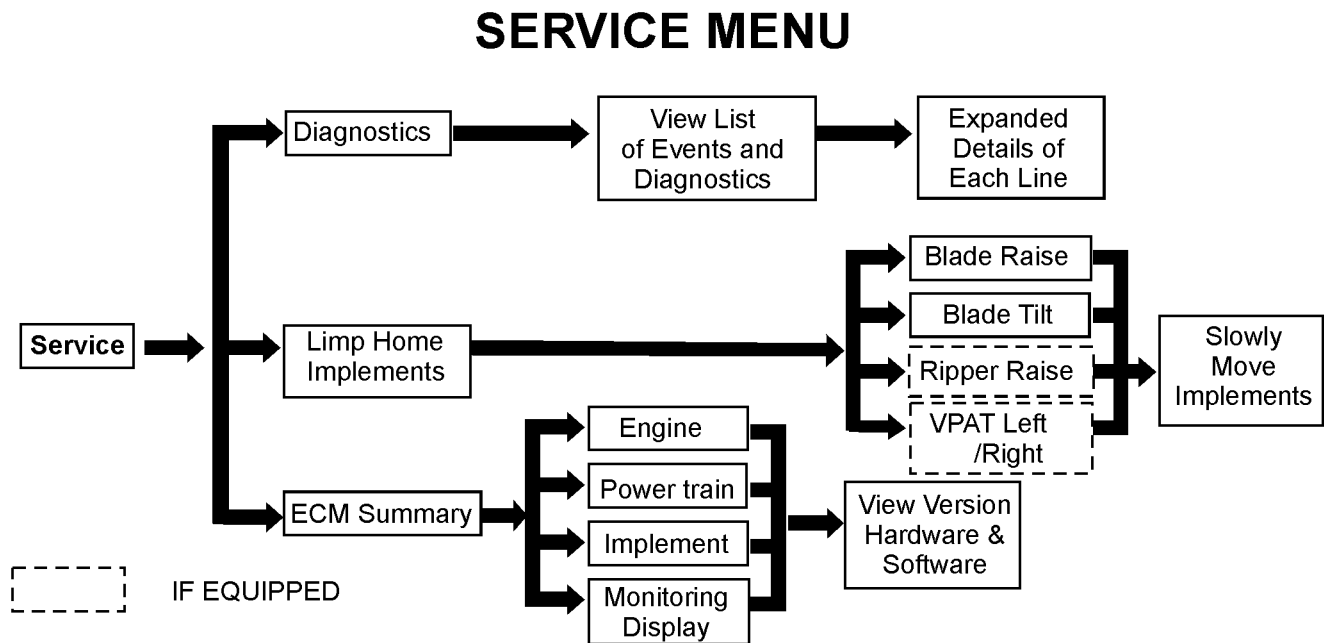


Illustration 105

Access the Service Menu



Illustration 106

The following screen will now be displayed.



Illustration 107

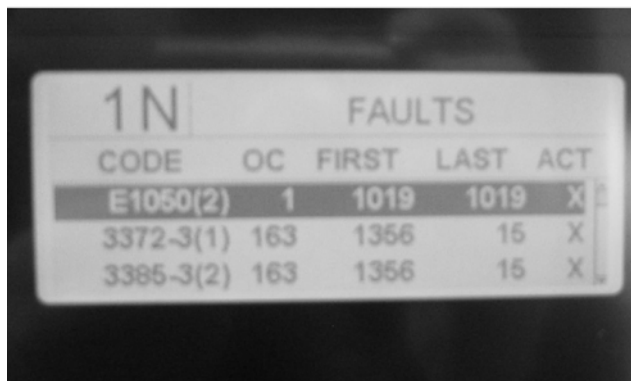
The Service Menu contains the following three categories.

- Diagnostics
- ECM Summary
- Limp Home Mode (Implement)

Codes and events that are contained in the "Diagnostics" option may be viewed at any time. But, logged codes cannot be cleared until the "Service Mode" is enabled.

From the “Service” menu, use the appropriate arrow button to highlight the desired menu option. Then, press the “OK” button in order to display that screen.

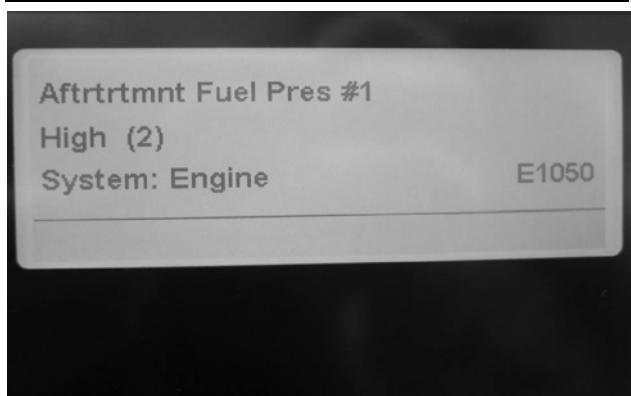
Diagnostic and Event Codes



| CODE | OC | FIRST | LAST | ACT |
|-----------|-----|-------|------|-----|
| E1050(2) | 1 | 1019 | 1019 | X |
| 3372-3(1) | 163 | 1356 | 15 | X |
| 3385-3(2) | 163 | 1356 | 15 | X |

Illustration 108

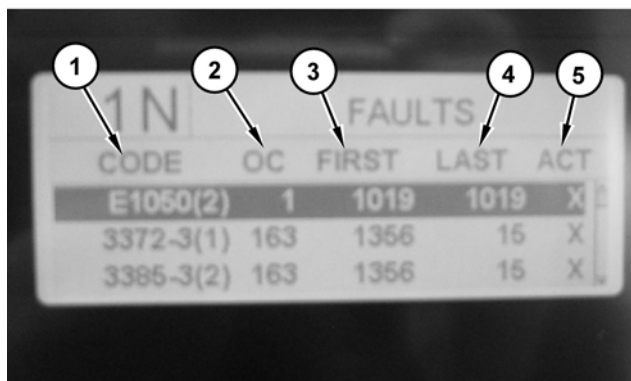
The “Diagnostics” menu option will show a complete list of all active events and logged event codes. Also, the list of active diagnostics and logged diagnostics is shown.



| |
|--------------------------|
| Afttrtrtmnt Fuel Pres #1 |
| High (2) |
| System: Engine |
| E1050 |

Illustration 109

Diagnostic display



| CODE | OC | FIRST | LAST | ACT |
|-----------|-----|-------|------|-----|
| E1050(2) | 1 | 1019 | 1019 | X |
| 3372-3(1) | 163 | 1356 | 15 | X |
| 3385-3(2) | 163 | 1356 | 15 | X |

Illustration 110

Diagnostic message screen

Each line that is listed contains the following information about that event or that code.

Fault Code (1) – Component Identifier or Failure Mode Identifier (CID/EID)

Occ (2) – Number of occurrences

First (3) – Service hour of the first occurrence

Last (4) – Service hour of the last occurrence

Act (5) – “X” means that the event or the code is currently active.

Logged codes and logged events are cleared with password protection only.

Active Faults

A second popup screen appears when active faults or events are reported to the Monitoring System Display by any ECM. Warning information appears on the screen and the operator must acknowledge the warning message by pressing the OK button. Monitoring System Display will scroll through all the warning messages that are generated by active faults or events. The warning messages are not cleared from system memory by pressing the OK button. The message may reoccur after a time according to the severity of the warning information.

ECM Summary



Illustration 111

The “ECM Summary” menu option allows the user to display a list of each ECM with the associated part numbers on the machine.

Limp Home Mode (Implement)



Illustration 112

The “Implement Limp Home” menu option allows slow incremental movement of the following functions.

- Blade raise
- Blade tilt
- Blade angle (if equipped)
- Ripper raise (if equipped)

This movement is done without using the implement control levers. “Implement Limp Home” mode may be selected by the operator or the technician in order to move the implements to a safe position. This exercise may be needed in order to move the machine in the event of a major failure in one of the machine systems. (An example is a failure such as the bulldozer control lever.)

From the “Service” menu, use the appropriate arrow button to highlight the “Implement Limp Home” option. Then press the “OK” button in order to access the “Implement Limp Home” menu. This menu will display a list of implements that may be slowly moved by using the keys on the Monitoring System Display.

To move an implement in this fashion, use the appropriate arrow button to highlight the desired implement function from the menu. Then press the “OK” button in order to access that function. This action will result in a screen that will display instructions for moving the implement. Follow the prompts on the screen and the directions in order to move the implement.

Reference: See Service Manual, KENR5160, “Features” for more information on the “Limp Home Mode”.

Steering Limp Home Mode



Illustration 113

Menu display

If a failure occurs in the machine steering system, a level III event will be activated and the brakes applied.

1. Stop the machine and engage the parking brake.

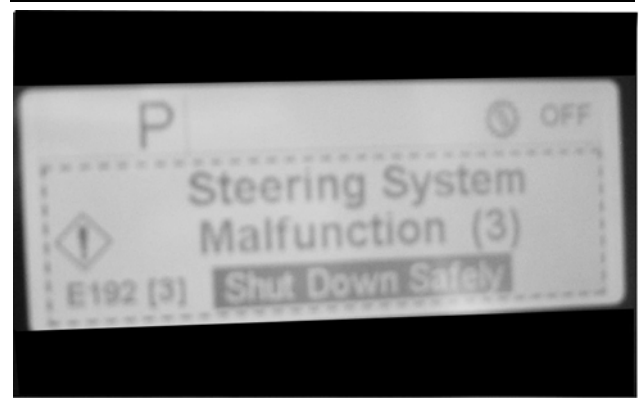


Illustration 114

Note: Shutting down the machine safely is recommended.

2. Snooze the display event screen.



Illustration 115

3. Enter the screen for the limp home mode for steering. Make the desired selection.



Illustration 116

First instruction

4. When the limp home mode is selected, follow the instructions on the monitoring system display. Then, the operator may attempt to drive the machine.

Machine Status

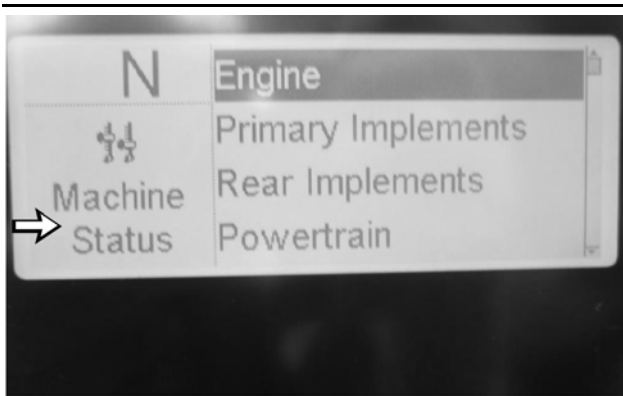


Illustration 117

The “Machine Status” menu option allows the operator or the technician to perform the real-time monitoring of electrical components in the major systems of the machine.

From the Main Menu, use the appropriate arrow button to highlight the “Machine Status”. Then, press the “OK” button in order to access the menu for “Machine Status”. This menu organizes the systems into the following six categories.

- Engine
- Primary Implements
- Rear Implements

- Power Train
- Steering
- Brake

Totals Display (Menu)

The “Totals” menu option allows the operator or the serviceman to access lists of pertinent data about machine systems. This data is useful in order to determine when service work needs to be performed.

- “Total Fuel Used”
- “Total Idle Fuel”
- “Total Engine Hours”
- “Total Distance”
- “Total Forward distance”
- “Total Reverse distance”
- “Total Idle Hours”
- “Total Time in Neutral”
- “Power Train Oil Bypass”

The Cat ET service tool may be used to access the data.



Illustration 118

Use the appropriate arrow button and highlight the Totals display (menu) from the “Main Menu”. Then, press the OK button.



Illustration 119



Illustration 120

Electrical Connector Location

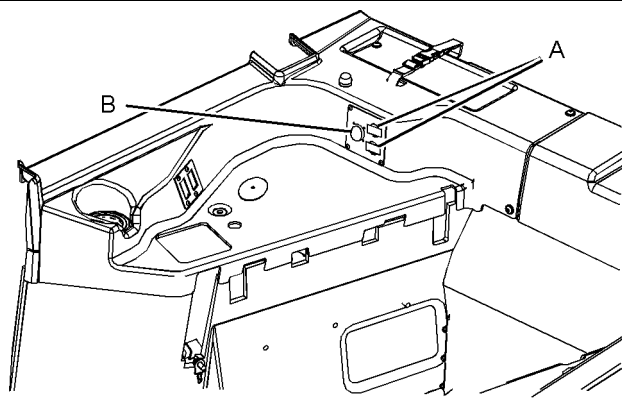


Illustration 121

Location of electrical connectors for the D6T Track-Type Tractor (tier iv) equipped with a cab

(A) Two connectors are 12 V power outlets.

These power outlets are located behind the operator seat on the right side of the compartment.

Data link connector (B) is located near the power outlets, as shown. This data link connector is for use with the Caterpillar Electronic Technician (ET). Also, this connector is used for the flash programming of software.

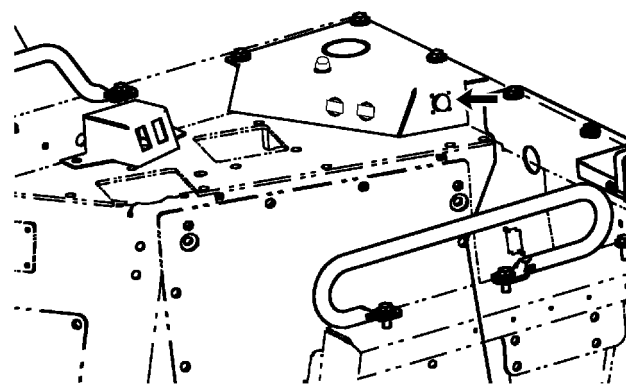


Illustration 122

Location of data link on OROPS machine, if equipped

Refer to Service Manual, SENR8367 "Electrical Component And Connector Locations" for additional information about these service tools.

Note: The engine start switch must be in the ON position in order for the electrical connectors to be activated.

Reporting a Problem

Report all of the information about problems to your Caterpillar dealer. Report all of the service code information and indicate if the codes are active or logged. Report an action indicator that lights but does not create a service code. Report if an action lamp is flashing or the action alarm is sounding.

Your Caterpillar dealer can remove the service codes.

Consult your Caterpillar dealer for more information.

Refer to Special Instruction, REHS0126 "Caterpillar Electronic Controls".

Listing of Abbreviations and Terms

The Monitoring System Display uses abbreviations when the display area shows the information inputs. The following tables describe the abbreviation with the full term.

Table 15

| Abbreviation and Term For Monitoring System Display | |
|---|---------------------------|
| Abbreviation | Term |
| act | active |
| autocal | automatic calibration |
| aux | auxiliary |
| bi-dir | bidirectional |
| bld | blade |
| cal | calibration |
| ctrl | control |
| cur | current |
| cyl | cylinder |
| DC | direct current |
| degrs | degrees |
| dist | distance |
| ecm | electronic control module |
| eng | engine |
| exten | extension |
| f | forward |
| fil | filter |
| filt | filter |
| forwrd | forward |
| freq | frequency |
| ft | feet |
| ftlb | foot pound |
| Gal | US Gallon |
| Gal/Hr | "US Gallons / Hour" |
| hi | high |
| hrs | hours |
| hyd | hydraulic |
| IGal | Imperial Gallon |
| IGal/Hr | "Imperial Gallons / Hour" |
| impl | implement |
| in | inch |
| in/sec | "inches / second" |
| init | initialization |
| km | kilometer |
| kPa | kilopascal |
| KPH | "Kilometers / Hour" |

| Abbreviation and Term For Monitoring System Display | |
|---|--------------------------------|
| Abbreviation | Term |
| kpig | "kilometers / Imperial gallon" |
| kpl | "kilometers / liter" |
| L | Liter |
| L/Hr | "Liters / Hour" |
| lt | left |
| m | Meter |
| max | maximum |
| Mi | Miles |
| min | minimum |
| mm | millimeter |
| mm/s | "millimeters / second" |
| mpg | "miles / US gallon" |
| MPH | "MILES / HOUR" |
| mpig | "miles / Imperial gallon" |
| n | neutral |
| Nm | Newton meter |
| occ | occurrence |
| p/n | part number |
| pos | position |
| prs | pressure |
| press | pressure |
| PSI | Pounds per square inch |
| ptrain | power train |
| pwr | power |
| r | reverse |
| rel | release |
| ren | renewal |
| req | required |
| ret | return |
| rev | reverse |
| rpm | revolutions per minute |
| rt | right |
| scrn | screen |

| Abbreviation and Term For Monitoring System Display | |
|---|-------------------------|
| Abbreviation | Term |
| sec | Second |
| secs | seconds |
| seg | segment |
| set | setting |
| shkin | shank in |
| shkout | shank out |
| snr | sensor |
| snsr | sensor |
| sol | solenoid |
| spd | speed |
| sts | status |
| std | standard |
| str | steering |
| sw | switch |
| tc | torque converter |
| tco | torque converter output |
| temp | temperature |
| term | terminal |
| trans | transmission |
| V | volt |

Table 16

| Abbreviation and Term for Monitoring System Display | |
|---|------------------------------|
| Additional Term | |
| Abbreviation | Term |
| Afttrmt | Aftertreatment |
| Alt | Alternator |
| ARD | Aftertreatment Regen Device |
| Auto/Man | Auto/Manual |
| Bal | Balance |
| Bar | Barometric |
| Batt | Battery |
| Brk | Brake |
| Chrg | Charge |
| Cnsmp | Consumption |
| Cntl | Control |
| Cnvtr | Converter |
| Crank | Crankcase |
| DC | Direct Current |
| Dec | Decrement |
| Decel | Decelerator |
| Dem | Demand |
| Diff | Differential |
| Dir | Direction |
| Div (Divrtr) | Diverter |
| DPF | Diesel Particulate Filter |
| ECU | Electronic Control Unit |
| EGR | Exhaust Gas Recirculation |
| Enbl | Enable |
| Exh | Exhaust |
| Fltr | Filter |
| Fwd | Forward |
| Grd | Grade |
| Hndl | Handle |
| ID MOD | Identification Number Module |
| Ignt | Ignition |
| Imp | Implement |
| In | Inlet |
| IN | Intake |
| Inc | Increment |

| Abbreviation and Term for Monitoring System Display | |
|---|------------------------|
| Additional Term | |
| Abbreviation | Term |
| Inhbt | Inhibit |
| Inj | Injector |
| Intk | Intake |
| Lf | Left |
| Lvl | Level |
| Lwr | Lower |
| Mn | Main |
| Man | Manifold |
| Mnifld | Manifold |
| Mod | Module |
| Mod | Modulation |
| Mtr | Motor |
| Mtrng | Metering |
| MVP | Multi Velocity Program |
| Offst | Offset |
| Oper | Operator |
| Out | Outlet |
| Out | Output |
| Param | Parameter |
| Pdl | Pedal |
| Perm | Permanent |
| Pmp | Pump |
| Prm | Primary |
| Prog | Program |
| PT | Power train |
| Recirc | Recirculation |
| Regen | Regeneration |
| Rip | Ripper |

| Abbreviation and Term for Monitoring System Display | |
|---|------------------------------|
| Additional Term | |
| Abbreviation | Term |
| Rkr | Rocker |
| Rng | Range |
| Rs | Raise |
| Scndry | Secondary |
| Sec | Secondary |
| Sel | Selector |
| Shnk | Shank |
| Shtdn | Shutdown |
| Shtdwn | Shutdown |
| Srv | Service |
| Tmg | Timing |
| Tmp | Temperature |
| Trb | Turbocharger |
| Trn | Transmission |
| Thmb | Thumb |
| Trig | Trigger |
| Torq Conv | Torque converter |
| Vlv | Valve |
| VPAT | Variable position angle tilt |
| WOFuelinj | Without fuel injection |

Product Link

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

The Product Link 121SR system utilizes satellite technology to communicate machine information. The Product Link 522/523 is a cellular based communication device that transmits machine information. This information is communicated to Caterpillar, Cat dealers and Caterpillar customers. Both Product Link systems contain Global Positioning System (GPS) satellite receivers.

The capability of two-way communication between the machine and a remote user is available with the Product Link 121SR and 522/523 system. The remote user can be a dealer or a customer. At any time, a user can request updated information from a machine such as hours of use or the location of the machine. Also, the system parameters for Product Link 121SR system and the Product Link 522/523 system can be changed.

Data Broadcasts

Data concerning this machine, the condition of the machine, and the operation of the machine is being transmitted by Product Link to Caterpillar and/or Cat dealers. The data is used to serve the customer better and to improve upon Caterpillar 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 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 Caterpillar 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 of 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

If the machine is required to work within 12 m (40 ft) of a blast site, then Product Link 121SR system or the Product Link 522/523 system should be disabled in compliance with applicable legal requirements. One of the following are suggested methods in order to disable the Product Link 121SR system or the Product Link 522/523 system: (a) Install a Product Link disconnect switch in the machine cab that will allow the Product Link 121SR system or the Product Link 522/523 system module

to be shut off. Refer to Special Instruction, REHS2365 "An Installation Guide for the Product Link PL121SR and for the PL300" and Special Instruction, REHS2368 "Installation Procedure For Product Link PL522/523 (Cellular)" for more details and installation instructions. Or, (b) Disconnect the Product Link 121SR system or the Product Link 522/523 module from the main power source by disconnecting the wiring harness at the Product Link module.

The following Product Link 121SR system and the Product Link 522/523 system specifications are provided in order to aid in conducting any related hazard assessment and to ensure compliance with all local regulations:

- The transmit power rating for the Product Link 121SR transmitter is 5 to 10 W.
- The operating frequency range for the Product Link 121SR system is 148 to 150 MHz
- The transmit power rating for the Product Link 522/523 transmitter is approximately 1 W.
- The operating frequency range for the Product Link 522/523 system is 824 to 849 MHz, 880 to 915 MHz, 1710 to 1785 MHz, and 1850 to 1910 MHz.

Consult your Cat dealer if there are any questions.

Information for the initial installation of the Product Link 121SR system is available in Special Instruction, REHS2365 "An Installation Guide for the Product Link PL121SR and for the PL300". Information for the initial installation of the Product Link 522/523 system is available in Special Instruction, REHS2368 "Installation Procedure For Product Link PL522/523 (Cellular)".

Operation, configuration and troubleshooting information for the Product Link 121SR system can be found in the Systems Operation, Troubleshooting, Testing and Adjusting, RENR7911, "Product Link 121/321".

Operation, configuration and troubleshooting information for the Product Link 522/523 system can be found in the Systems Operation, Troubleshooting, Testing and Adjusting, RENR8143, "Product Link - PL522/523".

Machine Security



Machine Lock Icon –

De-rate – Some machines can have the machine engine de-rated remotely by the owner of the machine. The action causes the machine to operate much slower than normal.

A warning is given before this action occurs on the display with the machine lock icon and “Security Pending”. When engine de-rate has happened, the machine display shows the machine lock icon and “Security Enabled”. The operator should move the machine to a safe location, apply the parking brake, power the machine down, notify the site supervisor, and contact your local Caterpillar dealer.

Disable – Some machines can be prevented from starting remotely by the owner of the machine. When disabling has happened, the machine display shows the machine lock icon and “Security Enabled”. The operator should notify the site supervisor.

Tampering – Tampering with the Product Link system to disable the Product Link can also result in engine de-rating or disabling of the machine. To avoid de-rating or disabling, prevent tampering with the Product Link. If, machine diagnostics occur due to Product Link, notify your site supervisor immediately to prevent derating or disabling. An example of this situation is an antenna becoming damaged.

Regulatory Compliance



Illustration 123

NOTICE

Transmission of information using Product Link is subject to legal requirements that may vary from location to location, including, but not limited to, radio frequency use authorization. The use of Product Link must be limited to those locations where all legal requirements for the use of the Product Link communication network have been satisfied.

In the event that a machine outfitted with Product Link is located in or relocated to a location where (i) legal requirements are not satisfied or (ii) transmitting or processing of such information across multiple locations would not be legal, Caterpillar disclaims any liability related to such failure to comply and Caterpillar may discontinue the transmission of information from that machine.

Consult your Cat dealer with any questions that concern the operation of the Product Link in a specific country.

EC DECLARATION OF CONFORMITY OF MACHINERY

Manufacturer: **CATERPILLAR INC.**, 100 **N.E.** ADAMS STREET, PEORIA, IL 61626, U.S.A.

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

Standards & Regulations Manager, Caterpillar France S.A.S 40, Avenue
Leon-Blum B.P.55 F38041, Grenoble Cedex 9

I, the undersigned, Michael R Verheyen, hereby certify that the construction equipment specified hereunder

| | | |
|--------------|-----------------------|-------------------------------|
| Description: | Generic Denomination: | Earth-moving Equipment |
| | Function: | Asset Management |
| | Model/Type: | PL121SR |
| | Commercial Name: | Product Link |

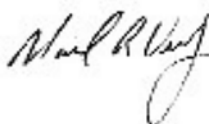
Fulfills all the relevant provisions of the following Directives

| Directives | Notified Body | Document No. |
|-------------|---------------|----------------|
| 2004/108/EC | N/A | PL121SR-PEO101 |
| 1999/5/EC | N/A | PL121SR-PEO101 |

Harmonised Standards Taken Into Consideration: **EN 13309**, **EN 301 389-1**, **EN 301 489-02**, **EN 55022**,
EN 60950-1, **EN 301 721**

Done at
CATERPILLAR INC.
100 **N.E.** Adams Street
AB 5410
Peoria, IL 61629 U.S.A.
Date
2010-06-10

Signature



Name / Position
Michael R Verheyen / Product
Manager

| 产品中有毒有害物质或元素的名称及含量 | | | | | | |
|---|-----------|-----------|-----------|---------------|---------------|-----------------|
| CAT S22  | | | | | | |
| 部件名称 (Part Name) | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr6+) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 内部接线 (Internal Cables) | ○ | ○ | ○ | ○ | ○ | ○ |
| 电路板 (Printed Circuit Assembly) | X | ○ | ○ | ○ | ○ | ○ |
| 金属封入物 (Metal Enclosure) | ○ | ○ | ○ | ○ | ○ | ○ |
| 所有硬件 (Hardware) | ○ | ○ | ○ | ○ | ○ | ○ |
| SIM卡 (SIM Card) | ○ | ○ | ○ | ○ | ○ | ○ |
| 螺母, 螺栓, 螺丝, 垫片, 紧固件 (Nuts, bolts, screws, washers, Fasteners) | ○ | ○ | ○ | ○ | ○ | ○ |
| 密封垫 (Gaskets) | ○ | ○ | ○ | ○ | ○ | ○ |
| 标签 (Labels) | ○ | ○ | ○ | ○ | ○ | ○ |
| <p>○: 该部品所有均质材料的有毒有害物质含量, 不可超过SJ/T11363-2006标准所规定的限量要求。</p> <p>X: 该部品中至少有一项均质材料的有毒有害物质含量, 超过SJ/T11363-2006标准所规定的限量要求。</p> | | | | | | |
| 制造业日期代码信息 (Manufacturing Date Code Information) | | | | | | |
| 产品序列号格式: XXXYZAAABB | | | | | | |
| X000= 产品制造儒略历的日期 | | | | | | |
| Y= 此年产品生产的年的最后一个数字 | | | | | | |
| 例如: 24219005RN | | | | | | |
| 242= 8月30日 | | | | | | |
| I=2001 年 | | | | | | |



Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94085

Industry Canada Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following products conform to Class B digital apparatus complies with Canadian ICES-003.

Product Name: Trimble MTS523, Caterpillar 523, Trimble MTS522, Caterpillar 522, Trimble MTS521

Product Description: Telematics with M2M cell and GPS Receiver

Antenna used in MTS500 family of telematics has overall antenna gain which complies with limits per Cinterion requirements for GSM antennas in Canada.

$$S = 850 / (150 * 10) 0.56667 \text{ mW/cm}^2$$

$$R = 20 \text{ cm}$$

$$P = 1771 \text{ mW}$$

$$\text{Maximum Gain} = 2.06 \text{ dBi}$$

Laird antenna: TRP GSM strongest measurements: Frequency 848.8 Mhz, Antenna Port Power 33 dBm, Maximum Gain 0.255211 dBi, Maximum Power / Peak EIRP 33.2552 dBm

Mobile Mark Antenna: CVS-900/1900 uses CVS RG-174 cable:

Antenna transmission gains up to 2.5dB, based on data based on Azimuth plot. However, cable loss of 0.34dB/ft and data sheet specify 8 foot cable, resulting in $2.5 - (8 * 0.34) = -0.22 \text{ db}$ maximum gain.

Both product antennas comply with FCC requirements.


This Class B digital apparatus complies with Canadian ICES-003.


Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:


Signature


Date

Name: Chuck Maniscalco

Title: Director of Engineering

Trimble Navigation Limited

935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Telephone: (408) 481-8000

FCC DoC Rev A



Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94085

FCC Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s) conforms to FCC Part 15 Subpart B Section 15.109:

Product Name: Trimble MTS523, Caterpillar 523, Trimble MTS522, Caterpillar 522,
Trimble MTS521

Product Description: Telematics with M2M cell and GPS Receiver


This device complies with Part 15 class B of the FCC Rules. Operation is subject to the following two conditions:

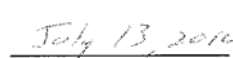
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:


Signature


Date

Name: Chuck Maniscalco
Title: Director of Engineering
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA
Telephone: (408) 481-8000

Trimble MTS500 FCC DoC Rev A



Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642

CE Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s):

Product Name: Trimble MTS523, Trimble MTS522, Trimble MTS521, Caterpillar 523,
Caterpillar 522

Product Description: Telematics

Complies with the essential requirements of the R&TTE Directive 1999/5/EC, as described in Article 10, using the following particular standards in full or in part:

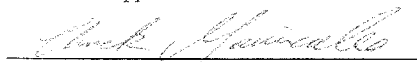
| | |
|------------------------|-------------------------------------|
| Article 3.1a - EMC: | EN 55022 : 2006 +A1:2007 |
| Article 3.1b - EMC: | EN 55024 : 1998 +A1 :2001 +A2 :2003 |
| | ISO 7637-2 : 2004 |
| | EN 301 489-1 v1.8.1 |
| | EN 301 489-3 v.1.4.1 |
| | EN 301 489-7 v1.3.1 |
| Article 3.2 - R&TTE: | TS 51.010-1 v8.3.0 [3GPP] |
| | EN 300 440-2 V1.2.1 [GPS] |
| | EN 301 511 V9.0.2 [GSM/GPRS] |
| Article 3.1a - Safety: | EN 60950-1 : 2006 |
| | EN 62311 : 2008 |

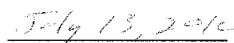
Mark First Applied: 2009

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:


Signature


Date

Name: Chuck Maniscalco
Title: Director of Engineering
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA
Telephone: (408) 481-8000

MTS500 series CE DoC Rev A

Backup Alarm

Backup Alarm – The alarm sounds when the transmission direction selector is in the REVERSE position. The alarm alerts the people behind the machine that the machine is backing up.

The backup alarm is on the rear of the machine on the right side of the machine.

Operation Information

To prevent injury, make sure that no maintenance work is being performed on the machine or near the machine. Keep the machine under control at all times in order to prevent injury.

Reduce the engine speed when you maneuver the machine in tight quarters or when you break over a rise.

Select the speed range that is necessary before you start the downgrade. Do not change speeds when you are going downhill.

When you drive down a grade, use the same speed that is used for driving up a grade.

Operating The Machine

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

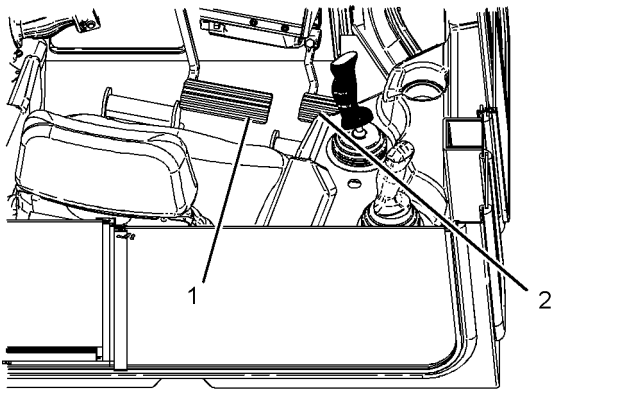


Illustration 129

3. Push down on service brake pedal (1) in order to prevent the machine from moving.
4. Start the engine.
5. Raise all attachments enough to clear any unexpected obstacles.

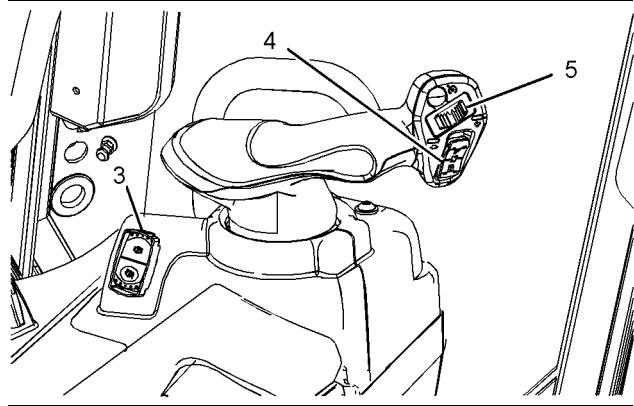


Illustration 130

Differential steering control and transmission direction selector

6. Release the parking brake by pushing down on parking brake switch (3). This action unlocks the parking brake, the transmission control, and the steering lever.

Note: When the parking brake is set, the transmission defaults to NEUTRAL. When the parking brake is released, the transmission will stay in NEUTRAL. To select the direction of machine travel, return direction selector (4) to neutral.

7. Then, move direction selector (4) to the desired direction. Use speed range selector (5) to select the desired speed.
8. Release service brake pedal (1) in order to allow the machine to move.

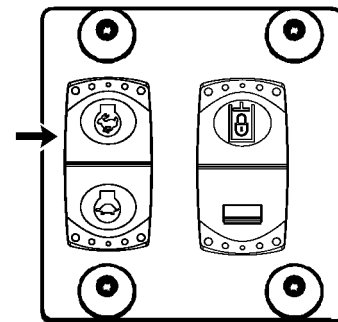


Illustration 131

The throttle control switch is located on the right side console.

9. To select high idle, push in on the top of the throttle control switch and release. The engine speed immediately moves to high idle.
10. To select low idle, push in on the bottom of the throttle control switch and release. The engine speed immediately moves to low idle.

11. Select an intermediate speed in the following manner:
 - a. Set the engine speed to high idle.
 - b. Select the desired engine speed with the decelerator (2).
 - c. Push in on the throttle control switch and hold for 3 seconds in order to lock in the engine speed. This speed is now the maximum operating speed.
12. Change an intermediate speed in the following manner:
 - a. Push in the top part of the throttle control switch and hold for 3 seconds. Then, release the switch. The rpm ramps up from the current setting.
 - b. Push in the bottom part of the throttle control switch and hold for 3 seconds. Then, release the switch. The rpm ramps down from the current setting.
13. Use the differential steering control in order to turn the machine.
14. Drive the machine forward for best visibility and for control.

Changing Direction and Speed

NOTICE

For operator comfort and maximum service life of power train components, deceleration and/or braking is recommended before any directional shifts are made.

Speed changes and directional changes at full engine speed are possible.

1. In order to decrease engine speed, push down on the decelerator pedal (2).
2. When the machine slows, shift the transmission to the desired direction with direction selector (4).
3. Increase the engine speed by releasing the decelerator pedal (2).
4. Select the desired speed with speed range selector (5).

Battery Disconnect Switch

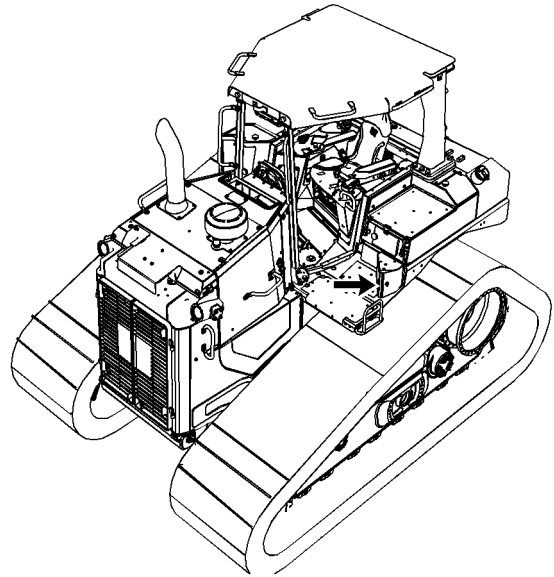


Illustration 132

The battery disconnect switch is on the left side of the machine behind the access door in front of the battery box.



On – Insert the key, and turn the key clockwise in order to activate the electrical system. The switch must be ON before you start the engine.



Off – Turn the key counterclockwise in order to shut off the entire electrical system.

Remove the key when you exit the machine overnight or when you exit the machine for an extended period. Also, remove the key when you service the electrical system.

NOTICE

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

Checking the Battery Disconnect System

NOTICE

To ensure no damage to the engine occurs, verify that the engine is fully operational before cranking the engine. Do not crank an engine that is not fully operational.

Perform the following procedure in order to check the battery disconnect system.

1. With the battery disconnect switch in the ON position, verify that electrical components in the operator compartment are functioning. Verify that the hour meter is displaying information. Verify that the engine will crank.
2. Turn the battery disconnect switch to the OFF position.
3. Verify that the following items are not functioning: electrical components in the operator compartment, hour meter and engine cranking. If any of the items continue to function with the battery disconnect switch in the OFF position, contact your Caterpillar dealer.

Engine Starting

Engine Starting

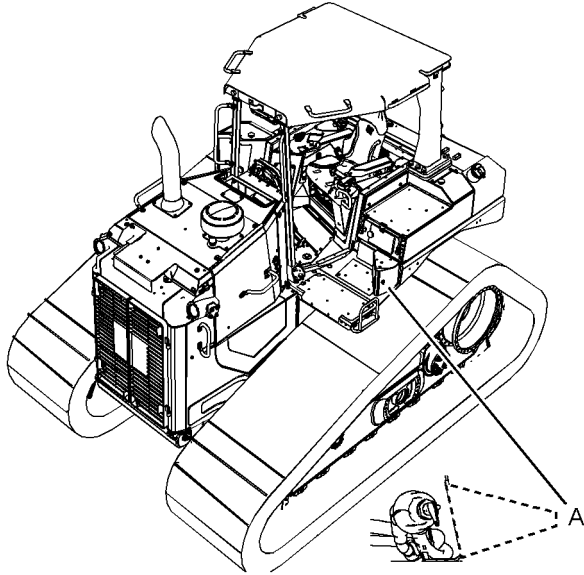


Illustration 133

Location of battery disconnect switch (A)

1. Turn the battery disconnect switch to the ON position. The battery disconnect switch is inside of the access door in front of the battery compartment on the left side of the machine.

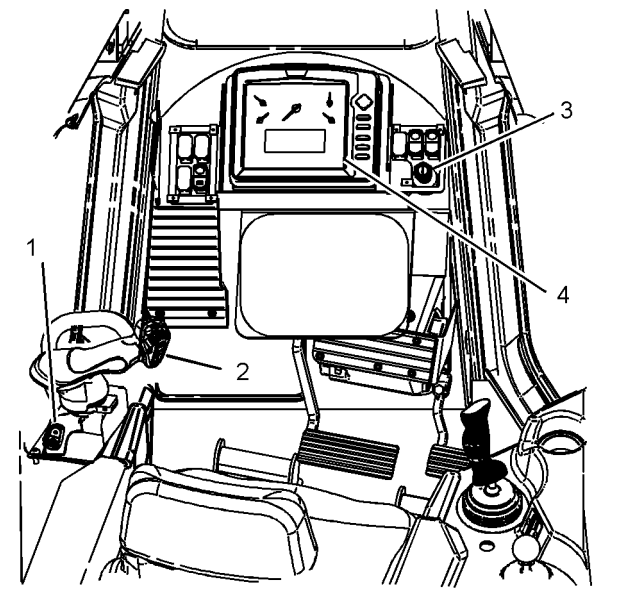


Illustration 134

2. Move direction selector (2) to the NEUTRAL position.
3. Engage parking brake (1).

4. Turn key start switch (3) to the ON position. The monitoring system performs an automatic self test. The action alarm sounds and all of the indicator lights come on briefly.

The indicator light for the parking brake will stay on until the parking brake is released. If the attachment controls are locked out, the indicator light for the hydraulic lockout control will stay on until the controls are unlocked. The indicator light for the auto kickdown will stay on until the function is unselected.

If the system detects a fault, check the electrical system. Make all of the necessary repairs before you start the engine.

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 forward horn before you start the engine.
6. Turn start switch key (3) to the START position. Crank the engine. Release the key when the engine starts.

NOTICE

Do not crank the engine for more than 30 seconds. Allow the starter to cool for two minutes before cranking again. Turbocharger damage can result if the engine rpm is not kept low until the oil gauge display verifies that the oil pressure is sufficient.

Ether Starting Aid (If Equipped)



Ether Starting Aid – The machine may be equipped with an ether starting aid. The ether starting aid is continuously available to the engine for cold weather starting. The engine ECM will determine automatically when the premeasured amount of ether injects the engine air intake. This action will occur during the engine starting procedure. The indicator light indicates that the relay for the ether aid is being activated.

For starting below the approximate temperature of -1°C (30°F), the use of the ether starting aid is automatic. Continue the procedure for Engine Starting.

For starting below -18°C (0°F), the use of the cold weather starting aids is recommended. Lighter viscosity fluids, a jacket water heater, a fuel heater, or the heavy-duty starter may be required.

At temperatures below -23°C (-10°F), consult your Caterpillar dealer. For information on starting the engine in cold weather, refer to the Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations for all Caterpillar Machines".

Subsequent Engine Starting Procedures

NOTICE

Keep engine speed low until the engine oil pressure registers on the gauge or the engine oil indicator light goes out.

If it does not register or the light does not go out within ten seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

1. Allow a cold engine to warm up at low idle for at least 5 minutes.
2. You can begin to operate the machine with a reduced load.
3. When the oil pressure reaches the normal operating range and the temperature gauge begins to move, you may operate the machine at full load.
4. Monitor lights and gauges (4) frequently during operation.
5. Check oil levels in the power train, the engine, and the hydraulic systems when the oil is at operating temperature. Maintain the oil levels to the FULL marks.

Engine and Machine Warm-Up

NOTICE

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

NOTICE

Always run the engine at low idle for at least ten minutes before performing any other operations in cold conditions to protect your engine and to protect your transmission.

The engine may automatically change speeds when the machine is stationary and idling in cold ambient temperature for an extended time. This action 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 1000 rpm and 1600 rpm. Operation at 1600 rpm is minimal and will only last for up to 20 minutes. The high exhaust system temperature indicator may also illuminate during extended idling conditions to signal that a low speed regeneration is in progress. A regeneration done in cold ambient extended idling conditions may activate below 30% soot level. A regeneration done in cold ambient extended idling conditions will typically last for 5-10 minutes.

After the engine has been started, allow the monitoring system to complete the self test.

1. Allow a cold engine to warm up at LOW IDLE for at least 5 minutes. To help the hydraulic components to warm up faster, engage the attachment controls and disengage the attachment controls.
2. You can begin to operate the machine with a reduced load.
3. When the engine coolant temperature reaches the normal operating range and no faults are present, you may operate the machine at full load.
4. Look at the indicators and the gauges frequently during operation. Refer to Operation and Maintenance Manual, "Monitoring System".
5. Check oil levels in the power train, the engine, and the hydraulic systems when the oil is at operating temperature. Maintain the oil levels to the FULL marks.

The hydraulic oil will warm up faster, if the dozer blade control is held in the CLOSED position. Hold the dozer in the CLOSED position for short periods of 10 seconds or less. This action will allow the hydraulic oil to reach relief pressure, which causes the hydraulic oil to warm up more rapidly.

Cycle all controls in order to allow warm hydraulic oil to circulate through all hydraulic cylinders and through all hydraulic lines.

Idling

When you idle the engine in order to warm up the engine, observe the following recommendations:

- Allow the engine to warm up for approximately 15 minutes when the temperature is higher than 0°C (32°F).
- Allow the engine to warm up for approximately 30 minutes or more when the temperature is below 0°C (32°F).
- More time may be required if the temperature is less than –18°C (0°F). More time may also be required if the hydraulic functions are sluggish.

Additional Low Idling Speed

Note: If the engine is running at low idle with the parking brake ON and the engine coolant temperature below 70 °C (158.0°F) for 10 minutes, the engine speed will automatically increase to 1000 RPM. This action increases the coolant temperature faster.

Adjustments

Tracks

NOTICE

If tracks are too tight or loose, wear of components is accelerated.

If they appear too tight or too loose, adjust the track.

Follow the procedures in the Maintenance Section for adjustment.

Parking

Stopping the Machine

NOTICE

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

Do not engage the parking brake while the machine is moving unless an emergency exists.

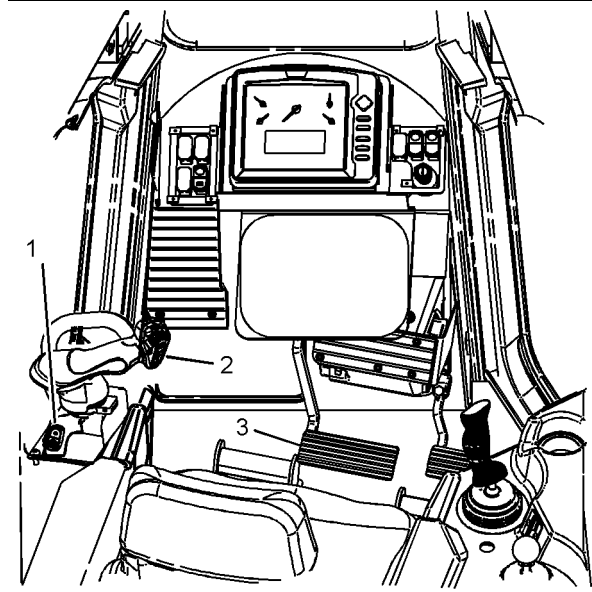


Illustration 135

1. Apply service brake pedal (3) in order to stop the machine.
2. Move transmission control (2) to NEUTRAL.
3. Engage parking brake (1).
4. Lower the bulldozer blade and lower all of the attachments to the ground. Apply slight downward pressure.

Stopping the Engine

NOTICE

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

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

1. While the machine is stopped, run the engine for 5 minutes at low idle.

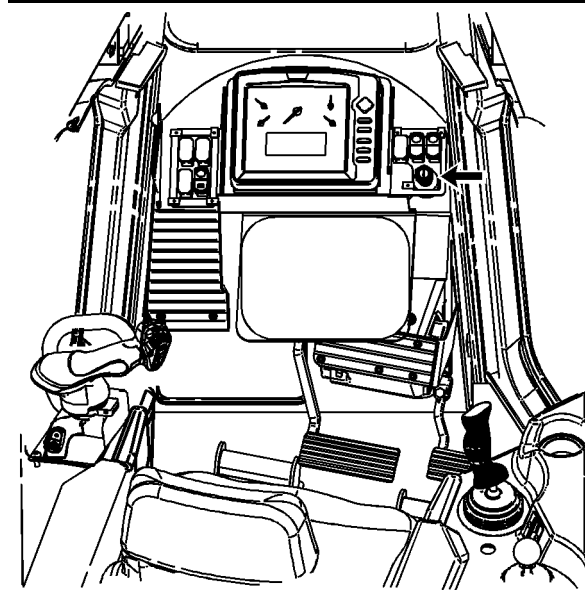


Illustration 136

2. Turn the start switch key to the OFF position. Remove the start switch key.

Delayed Engine Shut Down



Illustration 137

This message display alerts the operator that an engine cooldown is active. The engine key start switch is in the OFF position. After the delayed engine shutdown has been completed, the engine will shut down.

See "Diesel Particulate Filter Regeneration" in this manual for additional information on delayed engine shutdown.

Idling the Engine for Extended Periods

If the machine is parked and left running for extended periods, set the engine speed at a slightly higher RPM than low idle. Idling the engine at a higher RPM ensures good engine lubrication.

Stopping the Engine if an Electrical Malfunction Occurs

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

1. Turn the key to the Emergency Shutdown Override position in the event of a Delayed Engine Shutdown (DES) or Key Off Regeneration (KOR) is active.
2. Apply the parking brake.
3. Lower the implement, if necessary.
4. Dismount the machine.



Illustration 138

5. Open the access door on the left side of the cab. At the Ground Level Service Center, toggle the Engine Shutdown Switch upward in order to stop the engine.

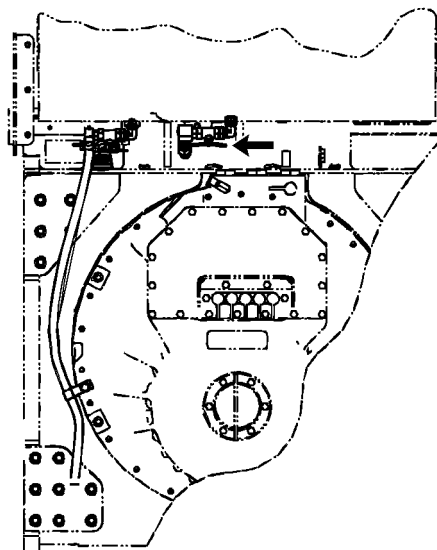


Illustration 139

Rear view

6. If the engine remains operating, locate the fuel shutoff valve. The fuel shutoff valve is under the fuel tank at the center rear of the machine.
7. Close the red handle of the fuel shutoff valve in order to shut off the fuel supply to the engine.

Note: Do not operate the machine until the malfunction has been corrected.

Leaving the Machine

1. Park on a level surface. If you must park on a grade, block the machine.
2. Apply the service brake in order to stop the machine. Move the speed range selector to the NEUTRAL position. Use the throttle switch to reduce the engine speed to low idle. Engage the parking brake.
3. Lower all implements to the ground.
4. Stop the engine by turning the engine start switch key to the OFF position. Remove the key.
5. Turn the key for the battery disconnect switch to the OFF position. Remove the key when you exit the machine for an extended period.
6. When you dismount, use the steps and the handholds. Use both hands and face the machine.

- 7.** Inspect the engine compartment for debris.
Clean out any debris and paper in order to avoid a fire.

- 8.** Install all the vandalism protection covers and install the locks where equipped.

Padlocks are factory installed for the following areas:

- Master Switch Locking Cover
- Fuel Drain

- 9.** Lock the cab doors and the windows, if equipped.

Transportation Information

Shipping the Machine

Investigate the travel route for overpass clearances. Make sure that there is adequate clearance for the machine that is being transported. This proceeding is especially true for machines that are equipped with a ROPS/FOPS structure, a cab, or a canopy.

Remove ice, snow, or other slippery material from the loading dock and from the truck bed before loading. Removing ice, snow, or other slippery material will prevent the machine from slipping as you load the machine. Removing ice, snow, or other slippery material will prevent the machine from slipping in transit.

NOTICE

Obey all state and local laws governing the mass, width and length of a load.

Observe all regulations governing wide loads.

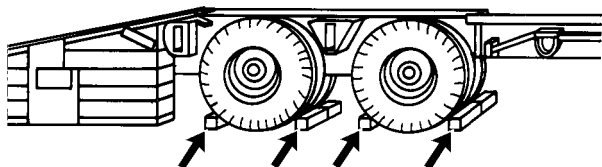


Illustration 140

1. Place blocks under the trailer wheels or under the rail car wheels before loading, as shown.
2. Lower all attachments to the floor of the transport machine. Move the transmission control lever to the NEUTRAL position.
3. Engage the parking brake switch.
4. Stop the engine by turning the engine start switch key to the OFF position. Remove the key.
5. Engage the parking brake switch in order to lock the parking brake.
6. Turn the battery disconnect switch to the OFF position. Remove the key.
7. Lock the door and lock the access covers. Attach any vandalism protection.

8. Install the tie-downs at several locations and block the tracks in the front and in the rear.
9. Cover the opening for the engine exhaust. Rotation of the turbocharger without engine operation can result in damage to the turbocharger.

Consult your Cat dealer for shipping instructions for your machine.

Lifting and Tying Down the Machine

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.

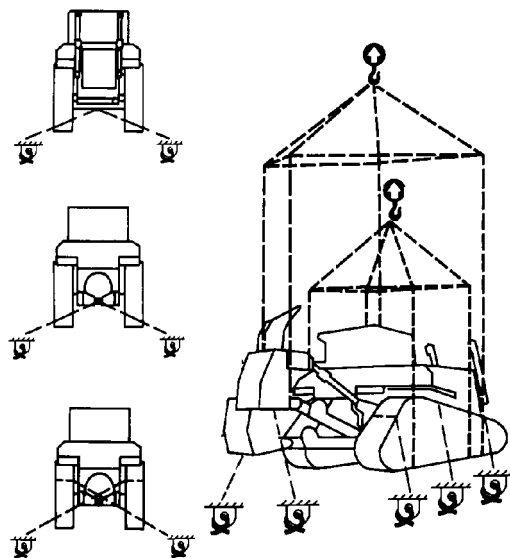


Illustration 141

An image of a Track-Type Tractor with an attached ripper is shown for example only.

NOTICE

Improper lifting or tiedowns can allow load to shift and can cause injury and damage.

Note: Do not use handles or steps in order to lift or tie down the machine.

Consult your Cat dealer for shipping instructions for your machine.

1. The approximate machine shipping weights are found in the Operation and Maintenance Manual, "Specifications". The instructions that are listed below describe the units that are manufactured by Caterpillar Inc.

Note: Significant deviations can affect shipping the machine, or significant deviations can affect lifting the machine. Some examples of these deviations are listed below:

- Different implements
 - Additional fuel
 - Wider track shoes
 - Tracks with accumulated mud
2. The parking brake must be engaged before you sling the machine. Engage the parking brake before you secure the machine with tie-downs.
 3. Use properly rated cables and use properly rated slings for lifting. For a machine without a ripper, position the slings beneath the front of the track and beneath the rear of the track. For a machine with a ripper, position the slings beneath the front of the track and under the ripper at the rear of the machine.
 4. On sharp corners, use corner protectors. The crane should be positioned so that the machine may be lifted in a level plane. The spreader bars should be wide enough to prevent contact with the machine.

5. Locations for Tie-downs

- Use the eye of the front tie-down.
- Use the inside edge of the track shoe for the side tie-downs.
- Use the drawbar, the ripper, or the outer edge of the track shoe for the rear tie-downs.

Check the state laws and the local laws that govern the following load characteristics.

- Weight
- Width
- Length
- Height

Towing Information

Towing the Machine

WARNING

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

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

WARNING

Personal injury or death can result from worn wire rope cable.

Worn or frayed cable could break causing injury.

Check the wire rope cable. If cable is worn or is frayed install a new cable.

WARNING

When the final drive sun gears are removed, the machine has NO parking brakes. The machine can roll and cause personal injury or death.

Block the tracks securely so that the machine cannot move.

The towing connection must be rigid, or towing must be done by two machines of the same size or larger than the towed machine. Connect a machine on each end of towed machine.

Be sure all necessary repairs and adjustments have been made before a machine that has been towed to a service area, is put back into operation.

Note: Consult your Caterpillar dealer for towing a disabled machine.

This machine is equipped with spring applied brakes. These brakes are also oil pressure released brakes. If the power train oil system for pressure oil is inoperable, the brakes are applied and the machine cannot be moved.

Do not allow an operator to be on the machine that is being towed unless the operator can control the steering and/or the braking. Do not attempt to tow a machine without reading and understanding the following procedures.

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. These instructions are only for emergencies.

Always haul the machine if long distance moving is required. When any towed machine is loaded, the machine must be equipped with a brake system that is operable from the operator's compartment.

Normally, the towing machine should be as large as the disabled machine, or larger than 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.

Do not use a chain for pulling a disabled machine. A chain link can break. This may cause possible personal injury. Use a wire cable with ends that have loops or rings. Put an observer in a safe position in order to watch the pulling procedure. A safe position would be at a distance away from either machine that is greater than two times the length of the towing cable. The observer can stop the procedure, if necessary. The procedure should be stopped if the cable starts to break. Also, stop the procedure if the cable starts to unravel. Stop pulling whenever the towing machine moves without moving the towed machine.

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

Before towing, make sure that the tow line or the bar is in good condition. Make sure that the tow line or the bar has enough strength for the towing procedure that is involved. The strength of the towing line or of the bar should be at least 150 percent of the gross weight of the towing machine. This is true for a disabled machine that is stuck in the mud and for towing on a grade.

For towing, only attach the tow line to the tow eyes on the frame, if equipped.

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

All situation requirements cannot be listed. Minimal towing machine capacity is required on smooth, level surfaces. Maximum towing machine capacity is required on inclines or on surfaces that are in poor condition.

Consult your Caterpillar dealer for the equipment that is necessary for towing a disabled machine.

Running Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The power train and the steering system must be operable. **Tow the machine for a short distance only.** For example, pull the machine out of mud or pull the machine to the side of the road.

The operator on the towed machine must steer the machine in the direction of the tow line.

Carefully follow all instructions that are outlined in the Towing Information. Ensure that the instructions are followed exactly.

Stopped Engine or Drive Line Defect

You can move the machine when the engine is not operable. You must use a brake release pump or you must remove the axle shafts.

You can use a brake release pump or you can remove the axle shafts in order to tow the machine, if the engine is stopped and if the driveline is not damaged.

If an internal transmission or a driveline failure is suspected, remove the axle shafts.

For the first method, remove the axle shafts. You may remove the axle shafts from the final drives in order to tow the machine. This will make the machine brakes inoperable and the machine can move freely. The towed machine will be totally dependent on the towing machine for control and for braking.

If you are towing a machine without axle shafts, you may not be able to use the implements to stop the machine. The implement hydraulic system is pilot controlled. With an inoperable engine or an inoperable hydraulic pump, the accumulator pressure will bleed off rapidly. The implement controls will not operate when there is no pressure in the accumulator. The implements can not be lowered with the implement control lever in order to stop a towed machine when there is no pressure in the accumulator.

One or more towing machines must provide sufficient control and sufficient braking when you are moving a disabled machine downhill. This may require a larger towing machine and additional machines that are connected to the rear. This will prevent the machine from rolling away out of control.

Consult your Caterpillar dealer or refer to the machine's Service Manual for axle shaft removal and installation procedures.

For the second method, use a brake release pump. If a brake release pump is used to tow the machine, the brakes can not be applied with the service brake pedal or with the parking brake control. If the brake release pump is used and you need to apply the brakes, the brakes must be applied with the brake release pump that is being used.

Note: The axles must not be removed when you use a brake release pump.

Connection of Brake Release Pump

Note: This machine is free to move. This machine is free to roll away. This machine has no braking ability with the parking brake or with the service brake when both brakes have been released.

The pressure hoses from the pump connect to the brake valve. The pump takes oil from the sump of the brake release pump. Then, the pump pressurizes the brake piston cavity in order to release the brake.

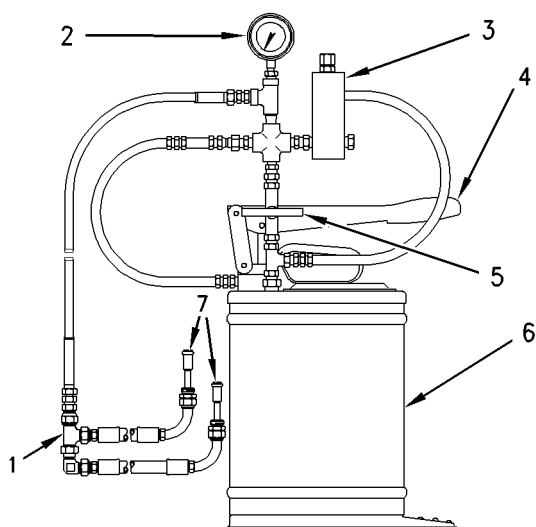


Illustration 142

- (1) FT1973 Adapter Gp
- (2) 8T-0855 Pressure Gauge
- (3) 8T-0477 Relief Valve
- (4) Handle
- (5) 6V-5016 Ball Valve
- (6) FT1845 Brake Release Pump
- (7) 123-0525 Brake Release Adapter
- (Not shown) 5P-2909 Plug

The machine brakes can be released for towing.
Use FT1973 Adapter Gp (1), two 123-0525 Adapters (7), and FT1845 Brake Release Pump (6).

Relief Valve Setting

NOTICE

Possible brake piston seal damage could result without checking relief valve. Opening pressure must be checked and adjusted before connection is made.

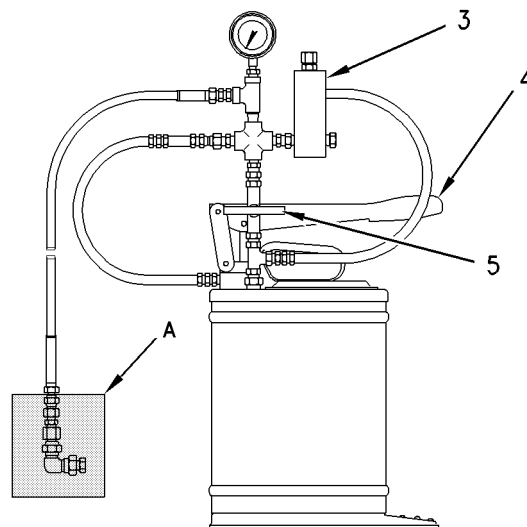


Illustration 143

1. The main pressure hose connects to 9J-6190 Adapter Union, 04-6683 Nipple, 5P-8018 Adapter Union, 8M-0547 Elbow, and 5P-2909 Plug. Plug the pressure hose at the connection with a 5P-2909 Plug. The components are indicated by shaded area (A).
2. Turn the handle of bypass valve (5) to the closed position.
3. While you are pumping handle (4), observe the opening pressure of relief valve (3).
4. Adjust the opening pressure of the relief valve. Set the pressure to 3030 ± 70 kPa (440 ± 10 psi).
5. Turn the handle on bypass valve (5) to the open position in order to relieve the pressure in the pump and in the hose.

Connection for the Pump

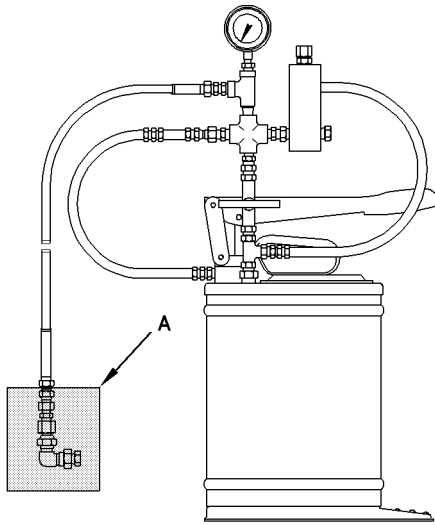


Illustration 144

1. Remove the components that were used to plug the pressure hose. The components are 9J-6190 Adapter Union, 04-6683 Nipple, 5P-8018 Adapter Union, 8M-0547 Elbow, and 5P-2909 Plug. The components are indicated by shaded area (A).

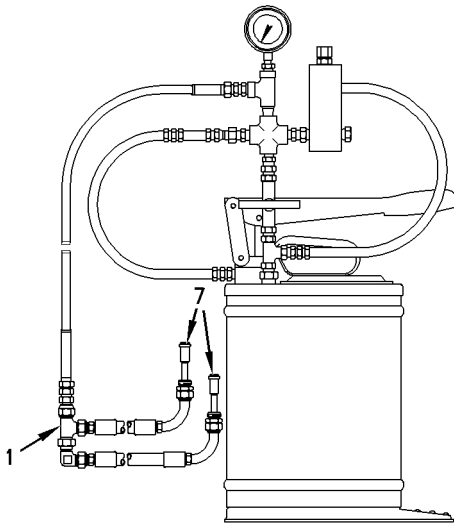


Illustration 145

- (1) Pump adapter
- (7) Brake release adapter

2. Connect FT1973 Adapter (1) to the pump pressure hose. The adapter will be downstream from the relief valve.

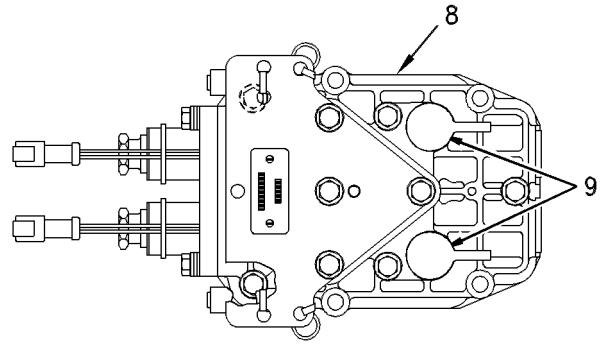


Illustration 146

- (8) Brake control valve
- (9) Brake valve ports

3. Remove the seat and the floorplate from the operator's station.
4. Remove the pressure test fittings from the top of brake valve ports (9).
5. Install one 123-0525 Adapter (7) into each of the brake valve ports.
6. Connect the FT1973 Adapter to the 123-0525 Adapters.
7. Route the pressure hose through the rear, around the side, and through the door of the cab. Connect the pressure hose to the pump. Install the pump temporarily on the platform.
8. Replace the floorplate and the seat.
9. Place the brake release pump in front of the operator.
10. Fasten the seat belt. Continue to the next topic.

Brake Release

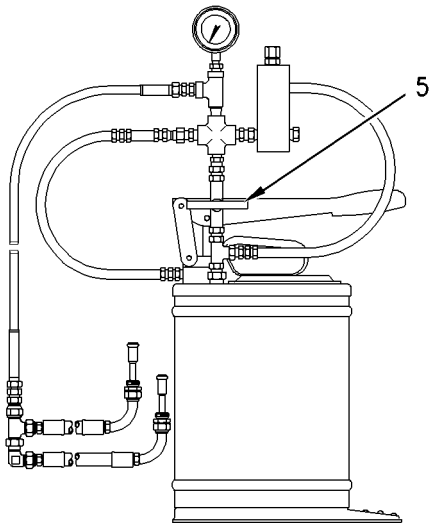


Illustration 147
(5) Bypass valve

1. Turn bypass valve handle (5) to the closed position.
2. Initially, rapidly move the pump handle. This will produce a large volume of oil flow.
3. The brake piston seal must be fully seated. The seating of the seal is evident by a sudden rise in the oil pressure.

When the seal is properly seated, the pressure rises to the relief valve setting. The setting is 3030 ± 70 kPa (440 ± 10 psi).

4. Now, the machine can be towed.

NOTICE

Do not allow pressure to drop below 2756 kPa (400 psi) while towing.

Partial brake engagement could occur and can result in brake damage.

Brakes must be fully released when towed machine is moving.

Brake Engagement

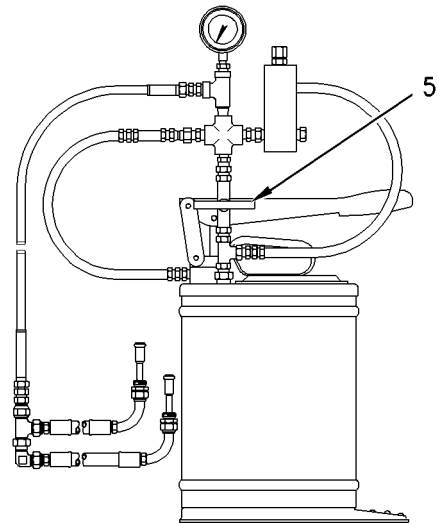


Illustration 148
(5) Bypass valve

Open bypass valve (5) in order to apply the brakes. This will completely dump the oil.

The brake system can only be applied by turning the bypass valve. The service brake pedal and the steering levers do not function.

After towing, remove the brake release pump. Repair the machine. Install the floorplate and the seat.

Engine Starting (Alternate Methods)

Engine Starting with Jump Start Cables

WARNING

Batteries give off flammable fumes which can explode.

To avoid injury or death, do not strike a match, cause a spark, or smoke in the vicinity of a battery.

WARNING

Failure to properly service the batteries may cause personal injury.

Prevent sparks near the batteries. They could cause vapors to explode. Do not allow the jump start cable ends to contact each other or the machine.

Do not smoke when checking battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear eye protection when starting a machine with jump start cables.

Improper jump start procedures can cause an explosion resulting in personal injury.

Always connect the battery positive (+) to battery positive (+) and the battery negative (–) to battery negative (–).

Jump start only with an energy source with the same voltage as the stalled machine.

Turn off all lights and accessories on the stalled machine. Otherwise, they will operate when the energy source is connected.

NOTICE

When starting from another machine, make sure that the machines do not touch. This could prevent damage to engine bearings and electrical circuits.

Turn on (close) the battery disconnect switch prior to the boost connection to prevent damage to electrical components on the stalled machine.

Severely discharged maintenance free batteries do not fully recharge from the alternator after jump starting. The batteries must be charged to proper voltage with a battery charger. Many batteries thought to be unusable are still rechargeable.

This machine has a 24 volt starting system. Use only the same voltage for jump starting. Use of a welder or higher voltage damages the electrical system.

Refer to Special Instruction, Battery Test Procedure, SEHS7633, available from your Caterpillar dealer, for complete testing and charging information.

Use of Jump Start Cables

When the auxiliary start receptacles are not available, use the following procedure.

1. Determine the failure of the engine to start.

Reference: Refer to Special Instruction, SEHS7768 on the use of 6V-2150 Starting/Charging Analyzer. Use this procedure if the machine does not have a diagnostic connector.

Reference: Also, refer to Systems Operation, SENR2947 "Starting and Charging Systems for Machines Equipped with Diagnostic Connector".

2. Place the transmission control on the stalled machine in the NEUTRAL position. Engage the parking brake switch. Lower all attachments to the ground. Move all controls to the HOLD position.
3. On a stalled machine, turn the start switch key to the OFF position. Turn off the accessories.
4. On a stalled machine, turn on the battery disconnect switch.
5. Move the machines together in order for the cables to reach. **DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.**
6. Stop the engine on the machine that is the electrical source. When you use an auxiliary power source, turn off the charging system.

7. Check the battery caps for correct placement and for correct tightness. Make these checks on both machines. Make sure that the batteries in the stalled machine are not frozen. Check the batteries for low electrolyte.

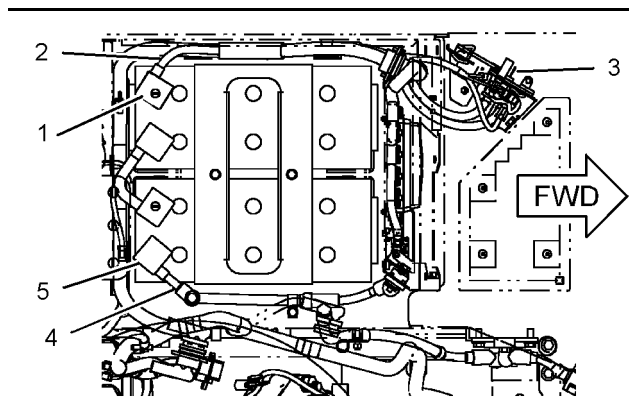


Illustration 149

Top view

- (1) Negative cable terminal
- (2) Negative cable
- (3) Battery disconnect switch
- (4) Positive cable
- (5) Positive cable terminal

NOTICE

Do not allow positive cable clamps to contact any metal except for battery terminals.

Note: Some positive cables and some covers for positive terminals are red for correct identification.

8. Connect the positive jump-start cable to the positive cable terminal of the discharged battery.
9. Batteries in series may be in separate compartments. Use the terminal that is connected to the starter solenoid. Trace this cable in order to make sure that the cable is connected to the starter.
10. Connect the positive jump-start cable to the positive terminal of the electrical source. Use the procedure from Step 149 in order to determine the correct terminal.
11. Connect one end of the negative jump-start cable to the negative terminal of the electrical source.
12. Make the final connection. Connect the negative cable to the frame of the stalled machine. Make this connection away from the battery, the fuel, the hydraulic lines, or moving parts.

13. Start the engine on the machine that is the electrical source. Also, you can energize the charging system on the auxiliary power source.

14. Allow the electrical source to charge the batteries for 2 minutes.

15. Attempt to start the stalled engine. Refer to Operation and Maintenance Manual, "Engine Starting". See the beginning of this topic. Allow the electrical source to charge the batteries for 2 minutes.

16. Immediately after the stalled engine starts, disconnect the jump-start cables in reverse order.

17. Conclude with a failure analysis on the starting charging system. Check the stalled machine, as required. Check the machine when the engine is running and the charging system is in operation.

Maintenance Section (D6T LGP (OEM))

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities (Fluids Recommendations)

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 for all Caterpillar Machines". This publication is available from your Cat dealer.

For cold-weather applications where transmission oil SAE 0W-20 is recommended, Cat Cold Weather TDTO is recommended.

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

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

Selecting the Viscosity

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

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

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

NOTICE

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

Engine Oil

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

Cat DEO-ULS or oils that meet the Cat ECF-3 specification and the API CJ-4 are required for use in the applications listed below. Cat DEO-ULS and oils meeting Cat ECF-3 specification and the API CJ-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 and the API CJ-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 or API CJ-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) will plug sooner and require more frequent DPF ash service intervals.

Typical aftertreatment systems include the following:

- Diesel Particulate Filters (DPF)
- Diesel Oxidation Catalysts (DOC)
- Selective Catalytic Reduction (SCR)
- Lean NOx Traps (LNT)

Other systems may apply.

Table 17

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

Hydraulic Systems

- Cat DEO-ULS Cold Weather

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

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

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

Cat HYDO Advanced fluids have a 50% increase in the standard oil drain interval for machine hydraulic systems (3000 hours versus 2000 hours) over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual, for your particular machine. 6000 hour oil drain intervals are possible when using S·O·S Services oil analysis. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

Second choice oils are listed below.

- Cat MTO
- Cat DEO
- Cat DEO-ULS
- Cat TDTO
- Cat TDTO Cold Weather
- Cat TDTO-TMS
- Cat DEO-ULS SYN
- Cat DEO SYN

Table 18

| Lubricant Viscosities for Ambient Temperatures | | | | | | |
|--|---------------------------------------|----------------------|-----|-----|-----|-----|
| Compartment or System | Oil Type and Performance Requirements | Oil Viscosities | °C | | °F | |
| | | | Min | Max | Min | Max |
| Hydraulic System | Cat HYDO Advanced 10 Cat TDTO | SAE 10W | –20 | 40 | –4 | 104 |
| | Cat HYDO Advanced 30 Cat TDTO | SAE 30 | 0 | 50 | 32 | 122 |
| | Cat BIO HYDO Advanced | “ISO 46” Multi-Grade | –30 | 45 | –22 | 113 |
| | Cat MTO Cat DEO-ULS Cat DEO | SAE10W-30 | –20 | 40 | –4 | 104 |
| | Cat DEO-ULS Cat DEO | SAE15W-40 | –15 | 50 | 5 | 122 |
| | Cat TDTO-TMS | Multi-Grade | –15 | 50 | 5 | 122 |
| | Cat DEO-ULS SYN Cat DEO 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 |

Transmission and Axles

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

When you are operating the machine in temperatures below –20°C (–4°F), refer to Special Publication, SEBU5898, “Cold Weather Recommendations for all Caterpillar Machines”. This publication is available from your Cat dealer.

Table 19

| Lubricant Viscosities for Ambient Temperatures | | | | | | |
|--|---------------------------------------|-----------------|-----|-----|-----|-----|
| Compartment or System | Oil Type and Performance Requirements | Oil Viscosities | °C | | °F | |
| | | | Min | Max | Min | Max |
| Power Shift Transmission | Cat TDTO Cold Weather | SAE 0W-20 | –40 | 10 | –40 | 50 |
| | Cat TDTO | SAE 10W | –20 | 10 | –4 | 50 |
| | | SAE 30 | 0 | 35 | 32 | 95 |
| | | SAE 50 | 10 | 50 | 50 | 122 |
| | Cat TDTO-TMS | Multi-Grade | –20 | 43 | 4 | 110 |

Where recommended for use, Cat FDAO SYN Cat FDAO or commercial oil that meets Cat FD-1 are the preferred oil types to maximize gear and bearing life. Do not use Cat FDAO, Cat FDAO SYN, or Cat FD-1 in compartments containing clutches and/or brakes. Cat TDTO, Cat TDTO-TMS, or commercial oil that meets Cat TO-4 oil types must be used in any compartment containing friction material unless specified otherwise by Caterpillar.

For the Final Drives in severe usage or in continuous operations, WARM-UP is required. Exercise the final drives for several minutes with the engine at a partial throttle in order to warm up the oil prior to production operation

Table 20

| Lubricant Viscosities for Ambient Temperatures | | | | | | | |
|--|--|--|-----------------|-----|-----|-----|-----|
| Compartment or System | Application | Oil Type and Classification | Oil Viscosities | °C | | °F | |
| | | | | Min | Max | Min | Max |
| Final Drive | Moderate Usage or Intermittent Operation | Cat FDAO commercial FD-1 Cat TDTO COLD WEATHER Cat TDTO Cat TDTO-TMS commercial TO-4 | SAE 60 | -7 | 50 | 19 | 122 |
| | | | SAE 50 | -15 | 32 | 5 | 90 |
| | | | SAE 30 | -25 | 15 | -13 | 59 |
| | | | Cat TDTO-TMS | -35 | 15 | -31 | 59 |
| | Severe Usage or Continuous Operation (Multiple Shifts/Day) | Cat FDAO commercial FD-1 Cat TDTO COLD WEATHER Cat TDTO Cat TDTO-TMS commercial TO-4 | SAE 60 | -25 | 50 | -13 | 122 |
| | | | SAE 50 | -33 | 14 | -27 | 58 |
| | | | SAE 30 | -40 | 0 | -40 | 32 |
| | | | Cat TDTO-TMS | -40 | 0 | -40 | 32 |

Special Applications

Cat Synthetic GO is an SAE 75W-140 viscosity grade oil.

Table 21

| Lubricant Viscosities for Ambient Temperatures | | | | | | | |
|--|-------------|--|-----------------|-----|-----|-----|-----|
| Compartment or System | Application | Oil Type and Classification | Oil Viscosities | °C | | °F | |
| | | | | Min | Max | Min | Max |
| End Pin Joints for the Equalizer Bar, Bogie Cartridge Pins, and Track Pins | Normal | Cat GO Cat Synthetic GO commercial API GL-5 gear oil | SAE 75W-90 | -30 | 40 | -22 | 104 |
| | | | SAE 75W-140 | -30 | 45 | -22 | 113 |
| | | | SAE 80W-90 | -20 | 40 | -4 | 104 |
| | | | SAE 85W-140 | -10 | 50 | 14 | 122 |
| | | | SAE 90 | 0 | 40 | 32 | 104 |
| Winches (hydraulic drive) | Normal | Cat TDTO Cat TDTO-TMS commercial TO-4 | SAE 0W20 | -40 | 10 | -40 | 50 |
| | | | SAE 0W30 | -40 | 20 | -40 | 68 |
| | | | SAE 5W30 | -30 | 20 | -22 | 68 |
| | | | SAE 10W | -20 | 10 | -4 | 50 |
| | | | SAE 30 | 0 | 43 | 32 | 110 |
| | | | Cat TDTO-TMS | -10 | 35 | 14 | 95 |
| Track Roller Frame Recoil Spring Pivot Shaft Bearings | Normal | Cat TDTO Cat TDTO-TMS Cat Arctic TDTO commercial TO-4 | SAE 0W-20 | -40 | 0 | -40 | 32 |
| | | | SAE 0W-30 | -40 | 10 | -40 | 50 |
| | | | SAE 5W-20 | -35 | 0 | -31 | 32 |
| | | | SAE 10W | -30 | 0 | -22 | 32 |
| | | | SAE 30 | -20 | 25 | -4 | 77 |
| | | | SAE 40 | -10 | 40 | 14 | 104 |
| | | | SAE 50 | 0 | 50 | 32 | 122 |
| | | | Cat TDTO-TMS | -25 | 25 | -13 | 77 |
| Track Roller Frame Recoil Spring Pivot Shaft Bearings | Normal | Cat TDTO Cat TDTO-TMS Cat Arctic TDTO commercial TO-4 | SAE 0W-20 | -40 | 0 | -40 | 32 |
| | | | SAE 0W-30 | -40 | 10 | -40 | 50 |
| | | | SAE 5W-20 | -35 | 0 | -31 | 32 |
| | | | SAE 10W | -30 | 0 | -22 | 32 |
| | | | SAE 30 | -20 | 25 | -4 | 77 |
| | | | SAE 40 | -10 | 40 | 14 | 104 |
| | | | SAE 50 | 0 | 50 | 32 | 122 |
| | | | Cat TDTO-TMS | -25 | 25 | -13 | 77 |
| Track Idlers and Track Rollers | Normal | Cat DEO Cat DEO SYN Cat ECF-1 API CG-4 API CF | SAE 30 | -20 | 25 | -4 | 77 |
| | | | SAE 40 | -10 | 40 | 14 | 104 |
| | | | SAE 5W-40 | -35 | 40 | -31 | 104 |

Special Lubricants

Grease

In order to use a non-Cat grease, the supplier must certify that the lubricant is compatible with Cat grease.

Each pin joint should be flushed with the new grease. Ensure that all old grease is removed. Failure to meet this requirement may lead to failure of a pin joint.

Table 22

| Recommended Grease | | | | | | |
|-----------------------------|---------------------|--------------|-----|-----|-----|-----|
| Compartment or System | GreaseType | NLGI Grade | °C | | °F | |
| | | | Min | Max | Min | Max |
| External Lubrication Points | Cat Advanced 3Moly | NLGI Grade 2 | -20 | 40 | -4 | 104 |
| | Cat Ultra 5Moly | NLGI Grade 2 | -30 | 50 | -22 | 122 |
| | | NLGI Grade 1 | -35 | 40 | -31 | 104 |
| | | NLGI Grade 0 | -40 | 35 | -40 | 95 |
| | Cat Arctic Platinum | NLGI Grade 0 | -50 | 20 | -58 | 68 |
| | Cat Desert Gold | NLGI Grade 2 | -20 | 60 | -4 | 140 |

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for additional information about grease. This manual may be found on the Web at Safety.Cat.com.

Diesel Fuel Recommendations

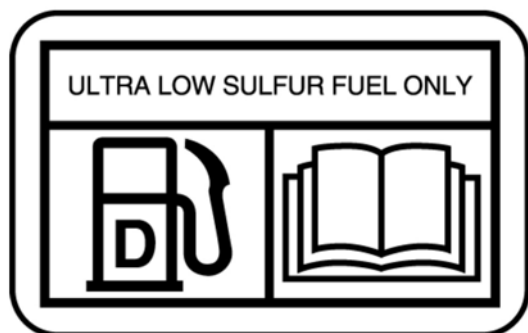


Illustration 150

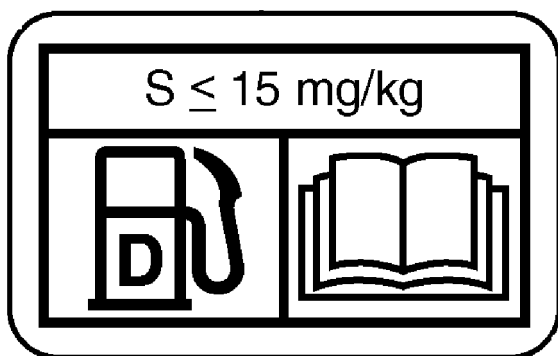


Illustration 151

Diesel fuel must meet "Cat Specification for Distillate Fuel" and the latest versions of "ASTM D975" or "EN 590" in order to ensure optimum engine performance. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for the latest fuel information and for Cat fuel specification. This manual may be found on the Web at Safety.Cat.com.

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 (≤ 10 ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European nonroad Stage IIIB and newer standards and are equipped with exhaust aftertreatment systems.

Misfueling with fuels of higher sulfur level will invalidate the warranty and 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 from the use of improper fuels are not Cat factory defects. Therefore the cost of repairs would not be covered by a Cat warranty.

Caterpillar does not require the use of ULSD in off road and machine applications that are not Tier 4/ Stage IIIB certified engines. ULSD is not required in engines that are not equipped with after treatment devices. For Tier 4/Stage IIIB/Stage IV certified engines always follow operating instructions. Fuel tank inlet labels are installed in order 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 requirements. This manual may be found on the Web at Safety.Cat.com.

Fuel Additives

Cat Diesel Fuel Conditioner and Cat Fuel System Cleaner are available for use when needed. These products are applicable to diesel and biodiesel fuels. Consult your Cat dealer for availability.

Biodiesel

Biodiesel is a fuel that can be made from various renewable resources that include vegetable oils, animal fat, and waste cooking oil. Soybean oil and rapeseed oil are the primary vegetable oil sources. In order to use any of these oils or fats as fuel, the oils or fats are chemically processed (esterified). The water and contaminants are removed.

U.S. distillate diesel fuel specification "ASTM D975-09a" includes up to B5 (5 percent) biodiesel. Currently, any diesel fuel in the U.S. may contain up to B5 biodiesel fuel.

European distillate diesel fuel specification "EN 590" includes up to B5 (5 percent) and in some regions up to B7 (7 percent) biodiesel. Any diesel fuel in Europe may contain up to B5 or in some regions up to B7 biodiesel fuel.

Note: 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.

Note: Up to B20 biodiesel blend level is acceptable for use in the engine.

When biodiesel fuel is used, certain guidelines must be followed. Biodiesel fuel can influence the engine oil, aftertreatment devices, non-metallic, fuel system components, and others. Biodiesel fuel has limited storage life and has limited oxidation stability. Follow the guidelines and requirements for engines that are seasonally operated and for standby power generation engines.

In order to reduce the risks associated with the use of biodiesel, the final biodiesel blend and the biodiesel fuel used must meet specific blending requirements.

All the guidelines and requirements are provided in the latest revision of Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations". This manual may be found on the Web at Safety.Cat.com.

Coolant Information

The information provided in this "Coolant Recommendation" section should be used with the "Lubricants Information" provided in the latest revision of Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations". This manual may be found on the Web at Safety.Cat.com.

The following two types of coolants may be used in Cat diesel engines:

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/Coolant)

NOTICE

Never use water alone without Supplemental Coolant Additives (SCA) or without inhibited coolant. Water alone is corrosive at engine operating temperatures. In addition, water alone does not provide adequate protection against boiling or freezing.

Capacities (Refill)

Table 23

| APPROXIMATE REFILL CAPACITIES | | | |
|-------------------------------|--------|--------|-----------------|
| Compartment or System | Liters | US gal | Imperial gallon |
| Cooling System | 51 | 13.5 | 11.2 |
| Fuel Tank | 425 | 112.3 | 93.5 |
| Engine Crankcase and Filter | 24.5 | 6.5 | 5.4 |
| Power Train Oil System | 148 | 39.1 | 32.6 |
| Hydraulic Tank Oil | 96 | 25.4 | 21.1 |
| Each Final Drive | 13.5 | 3.6 | 3 |
| Each Recoil Spring Housing | 25 | 6.6 | 5.5 |
| Pivot Shaft per Side | 5 | 1.3 | 1.1 |

Note: When you are operating on severe slopes, the quantity of oil in the power train can be increased up to 10 percent. When you are operating with the increased oil quantity, prolonged operation in some machines can cause high-power train oil temperatures. After the work on the severe slopes has been completed, drain the excessive oil quantity from the bevel gear case.

Ecology Drains

Table 24

| Ecology Drain Components | |
|--------------------------|---|
| Drain Location | Component Needed |
| Transmission | 12.7 mm (0.5 inch) pipe with 1/2-14 NPTH thread |
| Torque Converter | 12.7 mm (0.5 inch) pipe with 1/2-14 NPTH thread |
| Engine Oil | 19 mm (0.75 inch) pipe with 3/4-14 NPTH thread |
| Hydraulic Tank | 126-7914 Oil Drain Coupling or 25.4 mm (1 inch) pipe with 1-11 1/2 NPTH thread |
| Bevel Gear Case | 33 mm (1.31 inch) pipe with 1 5/16-12 NPTH thread |

S-O-S Information

S-O-S Services is a highly recommended process for Cat customers to use in order to minimize owning and operating cost. Customers provide oil samples, coolant samples, and other machine information. The dealer uses the data in order to provide the customer with recommendations for management of the equipment. In addition, S-O-S Services can help determine the cause of an existing product problem.

Refer to Special Publication, SEBU6250 "Caterpillar Machine Fluid Recommendations" for detailed information concerning S-O-S Services.

Refer to the Operation and Maintenance Manual, "Maintenance Interval Schedule" for a specific sampling location and a service hour maintenance interval.

Consult your Cat dealer for complete information and assistance in establishing an S-O-S program for your equipment.

Maintenance Support

Welding on Machines and Engines with Electronic Controls

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Caterpillar dealer.

Proper welding procedures are necessary in order to avoid damage to the electronic controls and to the bearings. When possible, remove the component that must be welded from the machine or the engine and then weld the component. If you must weld near an electronic control on the machine or the engine, temporarily remove the electronic control in order to prevent heat related damage. The following steps should be followed in order to weld on a machine or an engine with electronic controls.

1. Turn off the engine. Place the engine start switch in the OFF position.
2. If equipped, turn the battery disconnect switch to the OFF position. If there is no battery disconnect switch, remove the negative battery cable at the battery.

NOTICE

Do NOT use electrical components (ECM or sensors) or electronic component grounding points for grounding the welder.

3. Clamp the ground cable from the welder to the component that will be welded. Place the clamp as close as possible to the weld. Make sure that the electrical path from the ground cable to the component does not go through any bearing. Use this procedure in order to reduce the possibility of damage to the following components:
 - Bearings of the drive train
 - Hydraulic components
 - Electrical components
 - Other components of the machine
4. Protect any wiring harnesses and components from the debris and the spatter which is created from welding.
5. Use standard welding procedures in order to weld the materials together.

Severe Service Application

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 5 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")

Maintenance Interval Schedule

Ensure that all safety information, warnings and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, WHICH EVER OCCURS FIRST, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance.

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

Note: If Cat HYDO Advanced 10 hydraulic oil is used, the hydraulic oil change interval will change. The normal interval of 2000 hours is extended to 3000 hours. S-O-S services may extend the oil change even longer. Consult your Cat dealer for details.

When Required

| | |
|---|-----|
| Engine Air Filter Primary and/or Secondary Element - Clean/Replace..... | 136 |
| Engine Air Precleaner - Clean | 138 |
| Ether Starting Aid Cylinder - Replace | 143 |
| Front Idler Position - Check | 145 |
| Fuel System - Prime | 147 |
| Fuses and Circuit Breakers - Replace/Reset..... | 152 |
| Oil Filter - Inspect..... | 161 |
| Radiator Core - Clean | 162 |
| Radiator Pressure Cap - Clean/Replace | 162 |
| Window Washer Reservoir - Fill | 174 |
| Windows - Clean..... | 175 |

Every 10 Service Hours or Daily

| | |
|--|-----|
| Backup Alarm - Test | 125 |
| Brakes, Indicators and Gauges - Test..... | 127 |
| Cab Filter (Fresh Air) - Clean/Inspect/Replace.... | 128 |
| Cooling System Coolant Level - Check | 132 |
| Engine Oil Level - Check | 138 |
| Fuel System Primary Filter/Water Separator - Drain | 148 |
| Hydraulic System Oil Level - Check | 160 |
| Seat Belt - Inspect | 165 |
| Transmission Oil Level - Check | 173 |

Every 50 Service Hours or Weekly

| | |
|--|-----|
| Cab Filter (Recirculation) - Clean/Inspect/Replace | 129 |
| Equalizer Bar Center Pin - Lubricate | 142 |
| Lift Cylinder Yoke Bearings - Lubricate | 161 |
| Track Pins - Inspect..... | 168 |

Every 250 Service Hours or Monthly

| | |
|---|-----|
| Belt - Inspect/Replace | 126 |
| Engine Oil Sample - Obtain | 139 |
| Equalizer Bar End Pins Oil Level - Check..... | 143 |
| Final Drive Oil Level - Check | 144 |
| Fuel Tank Water and Sediment - Drain..... | 151 |
| Track - Check/Adjust | 167 |

Every 250 Service Hours or 3 Months

| | |
|-------------------------------------|-----|
| Pivot Shaft Oil Level - Check | 162 |
|-------------------------------------|-----|

Every 500 Service Hours

| | |
|---|-----|
| Final Drive Oil Sample - Obtain | 145 |
| Hydraulic System Oil Sample - Obtain | 160 |
| Transmission System Oil Sample - Obtain | 174 |

Every 500 Service Hours or 3 Months

| | |
|---|-----|
| Cooling System Coolant Sample (Level 1) - Obtain | 133 |
| Engine Oil and Filter - Change | 139 |
| Fuel System Secondary Filters - Replace..... | 148 |
| Fuel System Water Separator Element - Replace | 149 |
| Fuel Tank Cap Filter and Strainer - Replace/Clean | 150 |
| Hydraulic System Oil Filters - Replace | 158 |
| Recoil Spring Compartment Oil Level - Check.... | 163 |
| Window Wipers - Inspect/Replace | 175 |

Every 1000 Service Hours or 6 Months

| | |
|--|-----|
| Battery - Inspect | 126 |
| Rollover Protective Structure (ROPS) - Inspect ... | 165 |
| Torque Converter Scavenge Screen - Clean..... | 166 |
| Transmission Breather - Clean/Replace | 170 |
| Transmission Magnetic Screen - Clean..... | 170 |
| Transmission Oil - Change | 171 |
| Transmission Oil Filter - Replace | 172 |
| Transmission Scavenge Screen - Clean..... | 173 |

Every 2000 Service Hours

Fumes Disposal Filter Element - Replace..... 152

Every 2000 Service Hours or 1 Year

Cooling System Coolant Sample (Level 2) - Obtain
..... 134
Final Drive Oil - Change..... 144
Hydraulic System Oil - Change 155
Hydraulic System Oil Filter (Pilot) - Replace..... 157
Track Roller Frame Guides - Inspect..... 168

Every 2000 Service Hours or 2 YearsCooling System Water Temperature Regulator - Re-
place 135**Every 2500 Service Hours**

Engine Valve Lash - Check/Adjust 142

Every Year

Refrigerant Dryer - Replace..... 164

**Every 3 Years After Date of
Installation or Every 5 Years After
Date of Manufacture**

Seat Belt - Replace 165

Every 4500 Service Hours

ARD Spark Plug - Replace 125

Every 5000 Service Hours

Diesel Particulate Filter - Clean/Replace 136
Fuel Priming Pump - Replace 147

Every 6000 Service Hours or 3 Years

Cooling System Coolant Extender (ELC) - Add... 131

Every 12 000 Service Hours or 6 Years

Cooling System Coolant (ELC) - Change 129

ARD Spark Plug - Replace

Removing the Spark Plug

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.

The maximum air pressure for cleaning purposes must be reduced to 205 kPa (30 psi) when the air nozzle is deadheaded.

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.

1. Open the right engine access door.

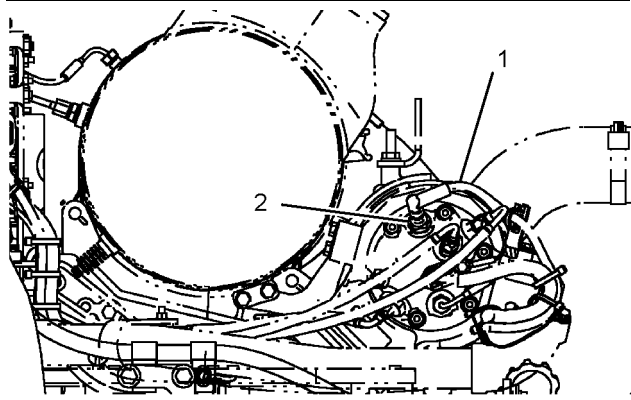


Illustration 152

- (1) Wiring harness
(2) ARD spark plug (aftertreatment regeneration device)

2. Remove wire harness (1) from spark plug (2).
3. Debris may have collected in the spark plug well. Thoroughly remove any debris. Use compressed air. The maximum air pressure for cleaning purposes must be below 205 kPa (30 psi). Ensure that the area around the spark plug is clean and free of dirt and debris.

4. 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. After the spark plug has been removed, inspect the used spark plug and the gasket.

If the spark plug could not be removed by hand, clean the threads with a 305-2389 Brush. This tool scrapes debris from the seat and from the threads.

NOTICE

Do not use a thread tap. A thread tap will remove metal unnecessarily. The threads could be stripped and the combustion group could be damaged.

Installing the Spark Plug

Note: Do not use anti-seize compound on the spark plug. Most of the heat is transferred through the threads and the seat area of the spark plug. Contact of the metal surfaces must be maintained in order to provide the heat transfer that is required.

1. Ensure that the spark plug is clean and free of dirt and oil.

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.

2. Install the spark plug by hand until the spark plug contacts the ARD. Torque the spark plug to the proper specification. Refer to Specifications, "Spark Plug" for the proper torque specification.
3. Connect the wiring harness.
4. Close the right engine access door.

Backup Alarm - Test

The backup alarm is on the rear of the machine.

In order to test the alarm for proper functioning, turn the engine start switch to the ON position.

Apply the service brake. Release the parking brake. Move the speed range selector to the REVERSE position.

The backup alarm should start to sound immediately. The backup alarm will continue to sound until the speed range selector is moved to the NEUTRAL position or to the FORWARD position.

Battery - Inspect

1. Open the battery access covers. The battery access covers are located on the left side of the machine outside the operator compartment.
2. Tighten the battery retainers. Clean the top of the batteries with a clean cloth. Keep the terminals clean and coated with petroleum jelly. Install the terminal covers after you coat the terminals.
3. Close the battery access covers.

Belt - Inspect/Replace

Your engine is equipped with a serpentine belt (1) that drives the alternator (5), the water pump (3), and the a/c compressor (4), if equipped.

Inspect the Belt

1. Park the machine on level ground. Lower the dozer blade to the ground. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Open the right engine access door.

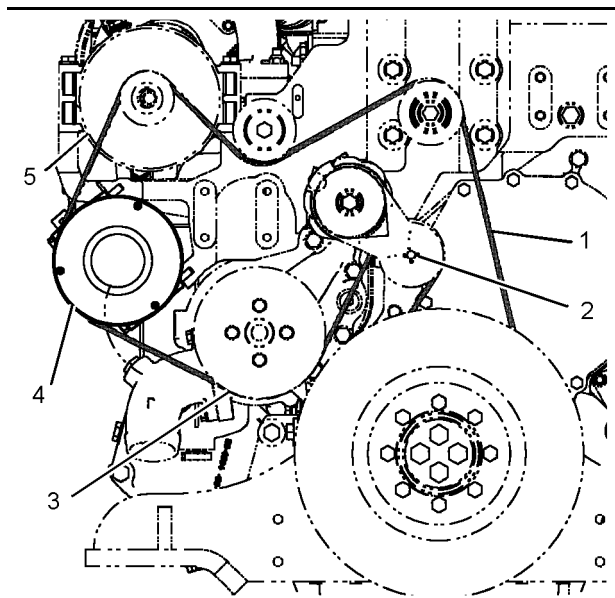


Illustration 153

3. Inspect the condition of serpentine belt (1) visually.

Note: This machine is equipped with one belt tensioner (2). The belt tensioner automatically adjusts the belt to the correct position.

4. Close the right engine access door.

Replace the Belt

Note: Replace a belt that is in poor condition, when a new belt is required.

Replace the belt if any of the following conditions exist:

- excessive cracking
- excessive wear
- excessive damage

1. Park the machine on level ground. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Open the right engine access door.
3. Turn the battery disconnect switch to the OFF position.
4. Release the tension on serpentine belt (1). Insert a 12.7 mm (0.50 inch) ratchet into the square hole in the belt tightener (2) and pry the belt tightener in a clockwise direction.
5. Remove the belt from the pulleys.

6. Install the new belt around the pulleys.
7. When you release the tension off the belt tensioner, the belt tensioner will automatically adjust the belt to the correct position. Recheck the belt tension.
8. Turn the battery disconnect switch to the ON position.
9. Close the right engine access door.

Note: If a new belt is installed, recheck the belt adjustment after 30 minutes of operation.

Brakes, Indicators and Gauges - Test

Inspect the dash panel for broken lenses, indicator lights, and switches.

Functional Test of the Monitoring System Display

To ensure proper operation of Monitoring System Display (1), check the system on a daily basis.

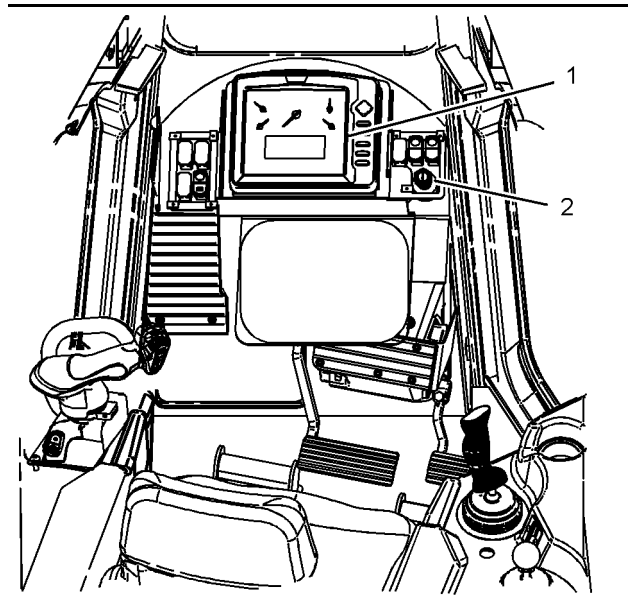


Illustration 154

The battery disconnect switch must be ON in order to supply electrical power to the machine so that the electrical systems will function.



ON – The engine start switch key (2) must be turned to the ON position. This action will supply electrical power to the operator compartment so that the CMS will function.

Turn the engine start key to the ON position. The system should act in the following manner:

- The indicator lights on the monitoring system display come on briefly.
- The action light comes on briefly.
- The action alarm sounds briefly.
- The pointers on the gauges point upward. Then, the pointers point to the left. Then, the pointers point to the right. Then, the pointers point to the final position.

If the system functions properly, start the engine. If any of the following events occur, do not start the engine:

- The indicator lights on the monitoring system display do not come on.
- The action light does not come on.
- The action alarm does not sound.

Complete any necessary repairs before you start the engine.

Braking System (Test)

WARNING

If the machine moves during the test, reduce the engine speed immediately, and engage the parking brake.

If the machine moved while testing the brakes, consult your Caterpillar dealer for brake inspection and repair. Damaged brakes must be repaired before returning the machine to operation.

Note: Driving through the brakes in the first speed range is possible for this machine.

Make sure that the area around the machine is clear of personnel and clear of obstacles.

Test the brakes on a dry, level surface.

Fasten the seat belt before you test the brakes.

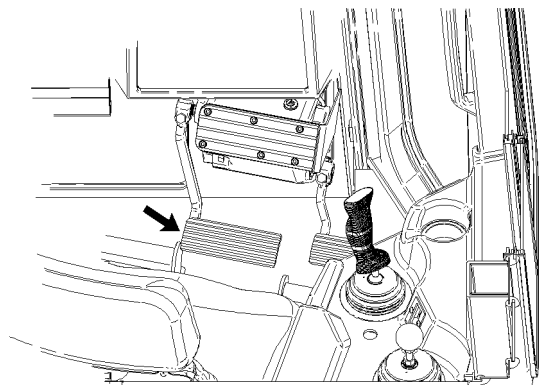


Illustration 155

1. Start the engine.
2. Raise all attachments.
3. Depress the service brake pedal.
4. Release the parking brake.
5. While the brake pedal is depressed, move the directional control to the SECOND SPEED FORWARD position.
6. Gradually increase the engine speed to full load speed. The machine should not move.
7. Move the directional control to the NEUTRAL position.
8. Reduce the engine speed to LOW IDLE. Engage the parking brake. Lower all attachments to the ground. Apply a slight down pressure. Stop the engine.
9. Make any necessary repairs before you operate the machine.

NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the service brake before returning the machine to operation.

Cab Filter (Fresh Air) - Clean/Inspect/Replace (If Equipped)

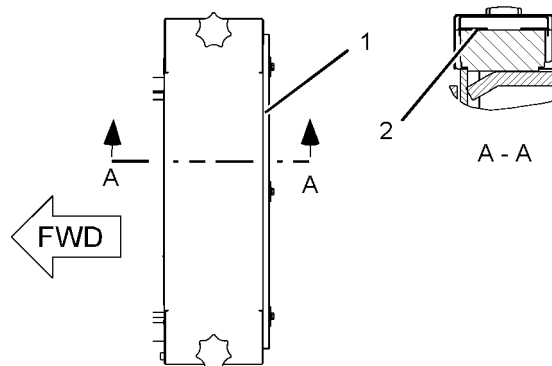


Illustration 156

Top view

1. Remove filter cover (1) and filter element (2). The filter cover is in front of the front window of the cab.
2. The filter element can be cleaned by using pressure air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
3. Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
4. Install the filter element.

Note: Clean the filters more often in dusty conditions.

Cab Filter (Recirculation) - Clean/Inspect/Replace (If Equipped)

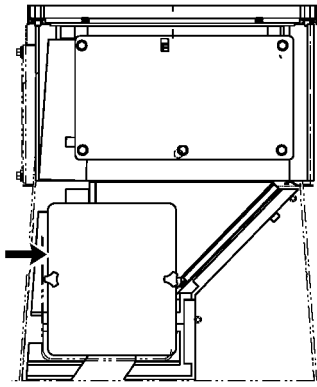


Illustration 157

1. Remove the filter element that is positioned in the operator's compartment below the left side of the dash.
2. The filter element can be cleaned by using pressure air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
3. Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
4. Install the filter element.

Note: Clean the filters more often in dusty conditions.

Cooling System Coolant (ELC) - Change

WARNING

Accidental machine starting can cause injury or death to personnel working on the machine.

To avoid accidental machine starting, turn the battery disconnect switch to the OFF position and remove the key. If the machine is not equipped with a battery disconnect switch, disconnect the battery cables from the battery and tape the battery clamps.

Place a do not operate tag at the battery disconnect switch location to inform personnel that the machine is being worked on.

NOTICE

Make sure you read and understand the information in the topics Safety and Cooling System Specifications for all information pertaining to water, antifreeze and supplemental coolant additive requirements before you proceed with maintenance of the cooling system.

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.

Drain the coolant whenever the coolant is dirty or whenever foaming is observed.

The filler cap is located inside the access door in the top, right side of the radiator guard.

1. Slowly loosen the filler cap in order to relieve system pressure. Remove the filler cap.

Table 25

| Required Tools | | | |
|----------------|-------------|-------------------------------------|-----|
| Tool | Part Number | Part Description | Qty |
| A | 1U-7505 | Mobile Transmission Jack (Low Lift) | 1 |

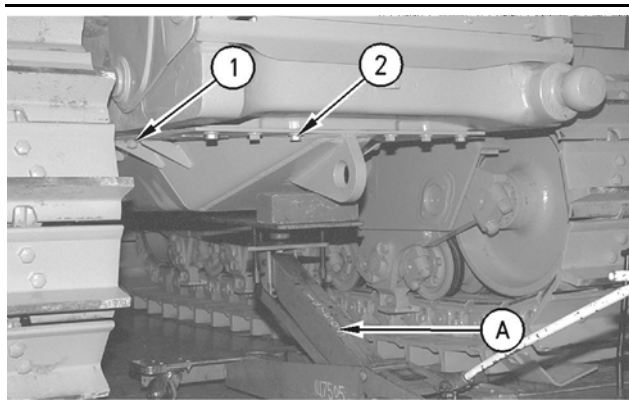


Illustration 158

2. Use Tooling (A) and a suitable block to support the front bottom guard.

Note: The front bottom guard weighs 75 kg (165 lb).

3. Remove nuts (1) and the washers.
4. Remove bolts (2) and the washers. Lower Tooling (A) and remove the front bottom guard from the machine.
5. Direct the hose on the drain valve (pipe) into a suitable container.
6. Open the drain valve. Allow the coolant to drain into a suitable container.
7. Close the drain valve. Fill the system with a solution which consists of clean water and of cooling system cleaner. The concentration of the cooling system cleaner should be 6 to 10 percent.
8. Start the engine. Run the engine for 90 minutes. Stop the engine. Drain the cleaning solution into a suitable container.
9. While the engine is stopped, flush the system with water. Flush the system until the draining water is clear.
10. Close the drain valve.

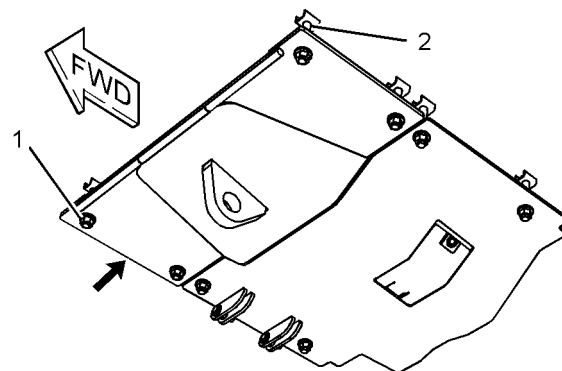


Illustration 159

11. Use Tooling (A) and a suitable block to install the front bottom guard.
12. Install the front bottom guard on the machine with the four bolts (2), the washers, and nuts. Tighten nuts (1) to 370 ± 50 N·m (273 ± 37 lb ft).
13. Add the coolant solution. See the following topic in this publication:
 - Capacities (Refill)

Note: Caterpillar antifreeze contains additive. If you are using Caterpillar antifreeze, do not add the supplemental coolant additive at this time. Also, do not change the supplemental coolant additive element at this time.

14. Start the engine. Run the engine without the filler cap until the thermostat opens and the coolant level stabilizes.

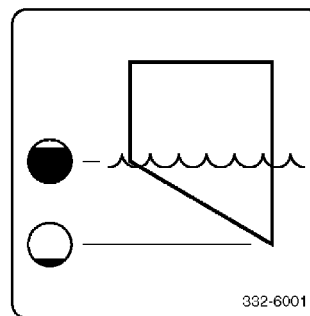


Illustration 160

15. Open the left engine access door. Check the coolant level. Make necessary adjustments to the coolant level. Fill the coolant level to the top of the sight glass, as shown.
16. If the gasket is damaged, replace the filler cap. Install the filler cap.

17. Stop the engine.

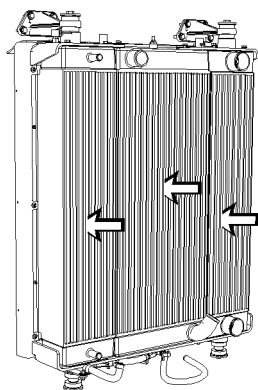


Illustration 161

18. Clean the radiator cores with compressed air. You may need to use water in order to remove debris.

19. Close the left engine access door.

Cooling System Coolant Extender (ELC) - Add

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.

Table 26

| "Cat ELC Extender" and the Cooling System Capacity | |
|---|--|
| Cooling System Capacity D6T Track-Type Tractor | Recommended Amount of "Cat ELC Extender" |
| 64.4 L (17.0 US gal) | 1.2 L (41 oz) |
| 64.4 L (14.2 Imp gal) | 1.2 L (41 oz) |

When a Caterpillar Extended Life Coolant (ELC) is used, an extender must be added to the cooling system. See the Operation and Maintenance Manual, "Maintenance Interval Schedule" for the proper service interval. The amount of extender is determined by the cooling system capacity.

For additional information about adding an extender, see Special Publication, SEBU6250 "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

Extended Life Coolant (ELC) Extender

Use a 8T-5296 Coolant Conditioner Test Kit to check the concentration of the coolant.

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.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.

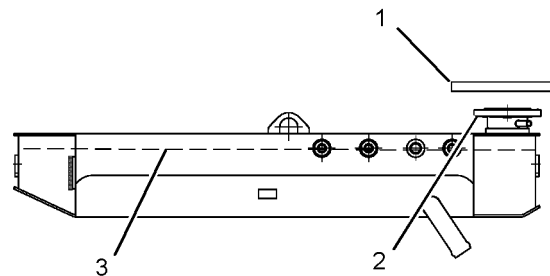


Illustration 162

Rear view

1. Open radiator access door (1) on the top right side of the radiator guard.
2. Filler cap (2) is located inside the radiator access door on the top, right side of the radiator guard. Loosen the radiator cap slowly in order to relieve pressure. Remove the radiator cap.
3. Drain some coolant from the radiator so that Extender can be added to the cooling system, if necessary.

Note: Always discard drained fluids according to local regulations.

4. Add 1.20 L (41 oz) of Extender to the cooling system.
5. Start the engine. Run the engine without the filler cap until the thermostat opens and the coolant level stabilizes. Check for leaks.
6. Maintain the coolant level above the sight gage in the coolant tank to area (3). Adding coolant above this area will cause the coolant to overflow the cooling system. If you need to add coolant daily, check the cooling system for leaks.
7. Inspect filler cap (2) and the filler cap seal for debris, for foreign material, or for damage. Clean filler cap (2) with a clean cloth. Replace the radiator cap if the cap gasket is damaged.
8. Install the filler cap.
9. Close radiator access door (1).

Cooling System Coolant Level - Check



WARNING

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 fill cap is cool enough to touch with your bare hand.

Remove the fill cap slowly to relieve pressure.

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

This machine radiator has a surge tank. There is no top tank in this cooling system. The surge tank has one sight glass. Removing the filler cap is not necessary to check the coolant level. The sight glass for checking the daily coolant level is inside the left engine compartment. The filler cap is at the top of the coolant tank that is beneath the radiator access door on the top right side of the radiator guard.

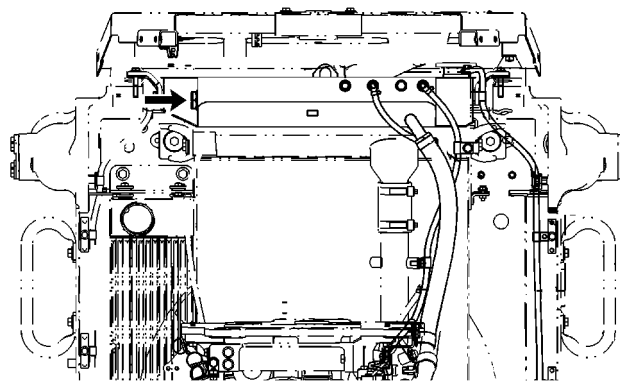


Illustration 163

Rear view

1. Observe the sight glass in order to verify the level of the coolant. If the coolant completely covers the sight glass, the coolant level is okay. If the coolant level is visible in the sight glass, the coolant is low. Add coolant in order to fill the system.

Note: The factory fill is Extended Life Coolant (ELC). Refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" for additional information. Maintaining the system as ELC is preferred. See the sections "Coolant Recommendations" and "ELC Cooling System Maintenance".

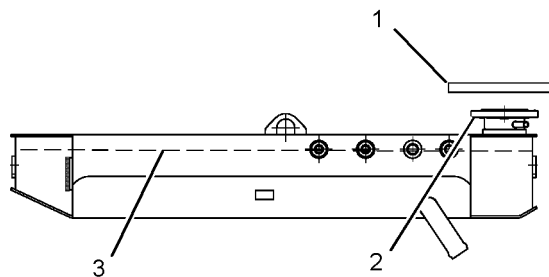


Illustration 164

Rear view

2. If additional coolant is necessary, open radiator access door (1). Remove filler cap (2) slowly in order to relieve the pressure.
3. Maintain the coolant level above the sight gage in the coolant tank to area (3). Adding coolant above this area will cause the coolant to overflow the cooling system. If you need to add coolant daily, check the cooling system for leaks.

4. Inspect filler cap (2) and the filler cap seal for debris, for foreign material, or for damage. Clean filler cap (2) with a clean cloth. Replace the radiator cap if the filler cap is damaged.
5. Install the filler cap.
6. Inspect the radiator core for debris. Clean the radiator core, if necessary.

Use compressed air, high-pressure water, or steam to remove dust and debris from the radiator core. However, the use of compressed air is preferred.

Cooling System Coolant Sample (Level 1) - Obtain

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.

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 Cat dealer.

Level 1 Analysis

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: Obtaining a Coolant Sample (Level 1) is not necessary 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 interval 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 sampling 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

Testing the coolant can be done at your Caterpillar dealer. Caterpillar S·O·S Coolant Analysis is the best way to monitor the condition of your coolant and your cooling system. S·O·S Coolant Analysis is a program that is based on periodic samples.

Perform a Coolant Analysis (Level 1) at 250 hours for systems that do not contain extended life coolant (ELC).

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.

- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the shipping sleeve 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.

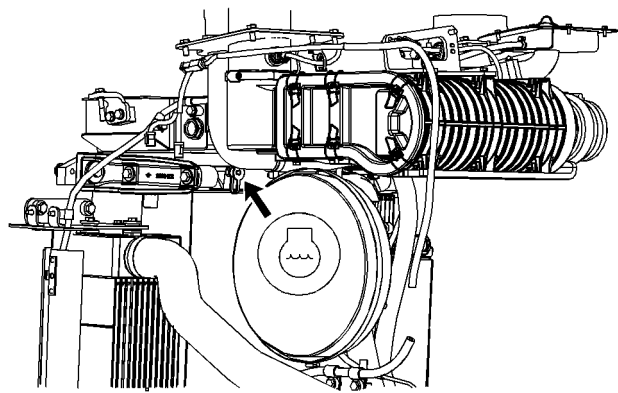


Illustration 165

Location of coolant sampling port

1. Park the machine on a hard, level surface. Set the engine at low idle speed.
2. Open the left engine compartment. Remove the protective cap from the sampling valve.
3. Obtain a sample. For additional information about coolant analysis, see Special Publication, SEBU6250 "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.
4. Replace the protective cap. Close the left side engine compartment.

Submit the sample for Level 1 analysis.

Note: Level 1 results may indicate a need for Level 2 Analysis.

Level 2 is a comprehensive analysis which should be performed annually. See Operation and Maintenance Manual, "Cooling System Coolant Sample (Level 2) - Obtain" for more information.

Cooling System Coolant Sample (Level 2) - Obtain

Level 2 Analysis

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.

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.

Testing the coolant can be done at your Caterpillar dealer. Caterpillar S·O·S Coolant Analysis is the best way to monitor the condition of your coolant and your cooling system. S·O·S Coolant Analysis is a program that is based on periodic samples. See Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluid Recommendations" "S.O.S Coolant Analysis" for more information.

Perform a Coolant Analysis (Level 2) at initial 500 hours for systems that contain extended life coolant (ELC). Perform the analysis yearly after the initial 500 hours.

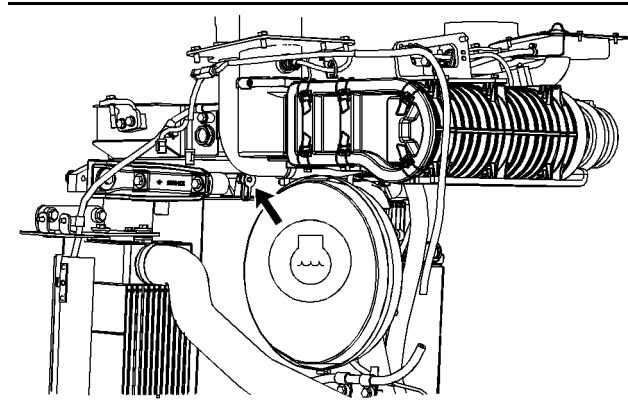


Illustration 166

Location of coolant sampling port

1. Park the machine on a hard, level surface. Set the engine at low idle speed.
2. Open the left side engine compartment. Remove the protective cap from the sampling valve.
3. Obtain a sample. For additional information about coolant analysis, see Special Publication, SEBU6250 "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.
4. Replace the protective cap. Close the left side engine compartment.

Submit the sample for Level 2 analysis.

Cooling System Water Temperature Regulator - Replace

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Replace the thermostat on a regular basis per the maintenance interval schedule. This action reduces the chance of unscheduled downtime and of problems with the cooling system.

A new thermostat should be installed after the cooling system has been cleaned. Install the thermostat while the cooling system is drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

NOTICE

Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

Note: If you are only installing a new thermostat, drain the cooling system coolant to a level that is below the thermostat housing.

1. Open the right engine compartment.

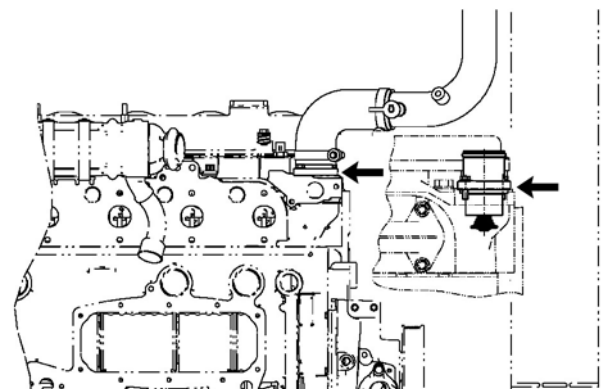


Illustration 167

2. Loosen the hose clamp and remove the hose from the elbow. Disconnect the hose assembly from the thermostat housing assembly.
3. Remove the bolts from the elbow. Remove the elbow and the thermostat housing assembly.
4. Remove the gaskets, the thermostat, and the seal from the thermostat housing.

NOTICE

Since Caterpillar engines incorporate a shunt design cooling system, it is mandatory to always operate the engine with a thermostat.

Depending on load, failure to operate with a thermostat could result in either an overheating or an overcooling condition.

NOTICE

If the thermostat is installed incorrectly, it will cause the engine to overheat.

5. Install a new seal in the thermostat housing. Install the new thermostat and the new gasket. Install the thermostat housing on the engine cylinder head.
6. Install the elbow and the hose. Tighten the hose clamp.
7. Close the right engine compartment.
8. Replace the coolant that was drained from the system. Refer to Operation and Maintenance Manual, "Capacities (Refill)".

Diesel Particulate Filter - Clean/Replace

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: In order 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.

Engine Air Filter Primary and/or Secondary Element - Clean/Replace

Primary Filter

NOTICE

Service the primary filter element only when the alert indicator for the intake air filter is flashing. Do not open the filter compartment unless it is time for service. Opening the filter compartment can cause dirt to get into the clean side of the filter housing.

NOTICE

Extremely short air filter life can result if the precleaner system malfunctions. If air filter life is drastically reduced from typical for the operating conditions, consult your Caterpillar Dealer. The exhaust system dust ejector for the strata tube precleaner must pull a minimum vacuum of 508 mm (20 inch) of water.

NOTICE

Service the engine air filters with the engine stopped. Engine damage could result.

NOTICE

Do not use the filter for longer than one year.

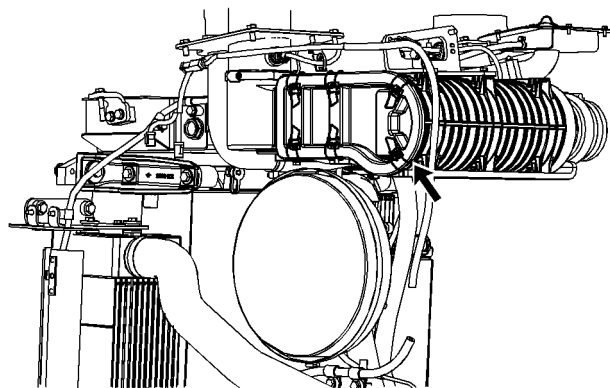


Illustration 168

1. Open the engine access door on the left side of the machine.

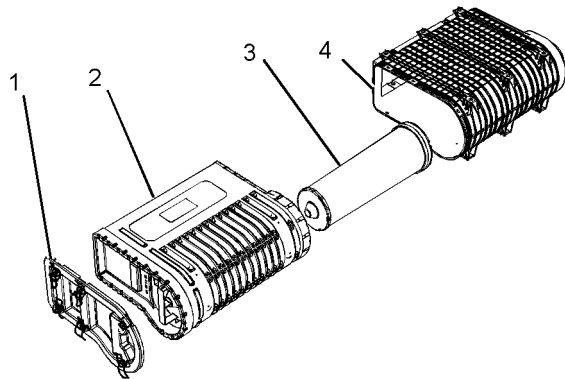


Illustration 169

2. Remove air cleaner housing cover (1). Pull out in order to remove the element.
3. Remove primary filter element (2) from air cleaner housing (4).
4. Mark secondary filter element (3) in order to show that the primary filter element has been serviced. The secondary filter element should be replaced when the primary filter element is serviced for the third time. Refer to the section "Secondary Filter".
5. Clean the inside of air cleaner housing (4). Keep the secondary filter element in place while you clean the housing.
6. Install a new primary air filter.

NOTICE

Do not clean the filter elements by bumping or tapping them. Do not use filter elements with damaged pleats, gaskets, or seals. Do not wash the filter elements.

7. Push the filter element firmly in order to properly seat the element. Write the date on the element, if the primary element is replaced.
8. Install air cleaner housing cover (1).
9. Close the engine access door.

Secondary Filter

NOTICE

Always replace the secondary filter element. Never attempt to reuse the filter by cleaning.

The secondary filter element should be replaced at the time the primary element is serviced for the third time.

NOTICE

The filter should be kept in service for no longer than 1 year.

NOTICE

Always leave the secondary filter element in place while you clean the air cleaner housing.

1. Open the left engine access door.

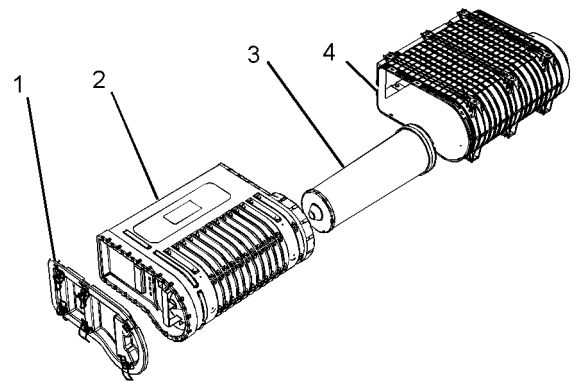


Illustration 170

2. Remove air cleaner housing cover (1).
3. Remove primary filter element (2). Refer to the section "Primary Filter".
4. Clean the inside of air cleaner housing (4).
5. Remove secondary filter element (3). Pull out in order to remove the element.
6. Install a new secondary filter element. Push the element firmly in order to properly seat the element. Write the date on the element, if the element is replaced.
7. Install primary filter element (2) and air cleaner housing cover (1).
8. Close the engine access door.

Engine Air Precleaner - Clean

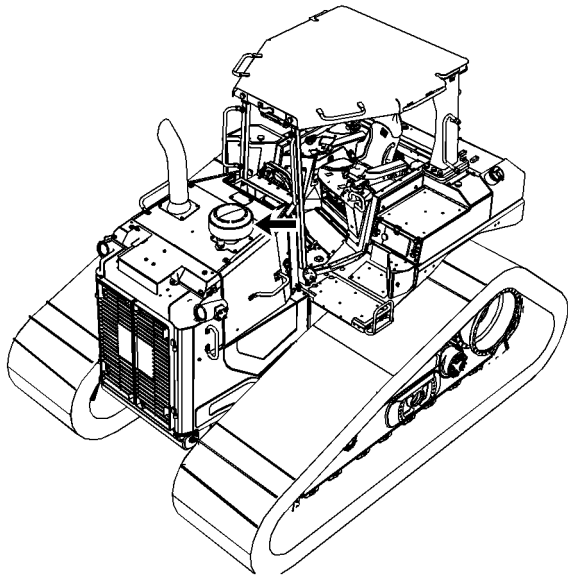


Illustration 171

1. Inspect the air inlet screen for dirt and for trash.
2. Remove the screen. Clean the screen if the screen is dirty.
3. Inspect the precleaner tubes for dirt and for dust.
4. Use pressure air to clean the tubes. Put the tubes on a flat surface. Direct the pressurized air into the tubes from the top. This proceeding loosens up the dirt. Install the screens.

NOTICE

Service the air cleaner only with the engine stopped. Engine damage could result.

Engine Oil Level - Check



WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

1. The engine oil level gauge relies on gravity. The machine must be on a level surface for an accurate check.

2. Open the engine access cover that is on the left side of the machine.

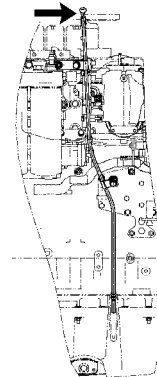


Illustration 172

3. Check the engine oil level gauge while the engine is stopped and the oil is at cold. The engine oil level may also be checked while the engine is running at low idle and the oil is at operating temperature. Maintain the oil level in the operating area on the engine oil level gauge. The operating area is between the "ADD" mark and the "FULL" mark.

Note: When you operate the machine on severe slopes, the oil level in the engine crankcase must be at the "FULL" mark on the engine oil level gauge.

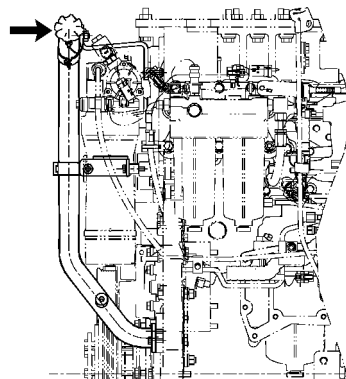


Illustration 173

4. Remove the oil filler cap. If necessary, add oil.
5. Clean the oil filler cap and install the oil filler cap.
6. Close the access cover.

Engine Oil Sample - Obtain

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Obtain the sample of the engine oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 250 service hours. In order to receive the full effect of S·O·S oil analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

1. Open the engine access door on the right side of the machine.

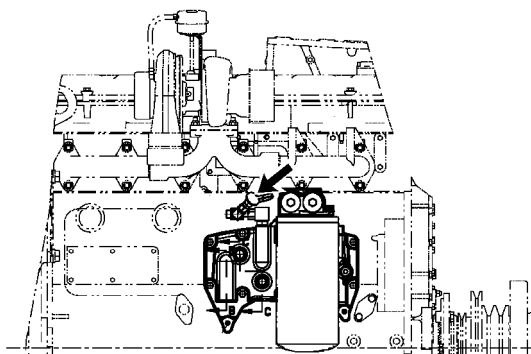


Illustration 174

2. Remove the protective cap.
3. Use 169-8373 Fluid Sampling Bottle in order to obtain a sample of the engine oil.

4. Replace the protective cap.
5. Close the engine access door.

Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for the correct fluid for your machine.

Engine Oil and Filter - Change

Selection of the Oil Change Interval

NOTICE

A 500 hour engine oil change interval is available, provided that the operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S·O·S Services oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

Cat oil filters are recommended.

Refer to this Operation and Maintenance Manual, "Lubricant Viscosities" for further information about oils that may be used in Cat engines.

Refer to this Operation and Maintenance Manual, "Severe Service Application" to determine if oil change interval should be reduced from the normal change interval. If operating in any of the conditions or environments outlined in the Severe Service Application, use S·O·S Services oil analysis to determine the best oil change interval. If S·O·S Services oil analysis is not being used, oil change interval should be reduced to 250 hrs.

Table 27

| Oil Change Interval ⁽¹⁾ | | |
|--|----------------------|----------------------------|
| Multigrade Oil Type | Operating Conditions | |
| | Normal | Severe Service Application |
| Cat DEO-ULS | 500 hr | 250 hr |
| Oil meeting the requirements of the Cat ECF-3 Specification or the API CJ-4 classification 8 minimum TBN Preferred | 500 hr | 250 hr |
| Oil meeting the requirements of the ACEA C9/E6 Specification TBN below 10.4 | 500 hr | 250 hr |

(1) The standard oil change interval in this engine is 500 hours, if the operating conditions and recommended oil types that are listed in this table are met. If the type of oil, the quality of the oil and the operating conditions fail to meet certain standards, the oil change intervals must be decreased to 250 hours. Refer to Special Publication, PEHJ0192, "Optimizing Oil Change Intervals" in order to determine whether the oil change interval should be reduced to 250 hours.

Procedure for Changing the Engine Oil and Filter

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

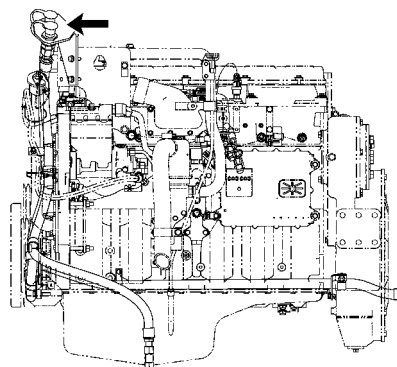


Illustration 175

Left view

If the machine is equipped with a high speed oil change, use a 126-7539 Nozzle.

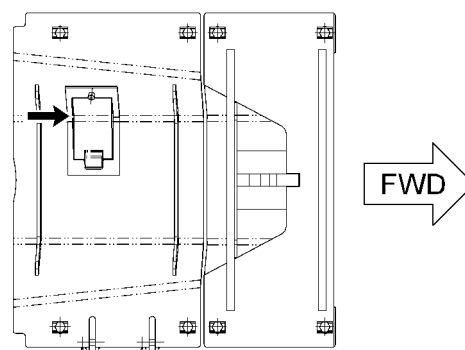


Illustration 176

Top view

1. Remove the bolt in order to remove the crankcase drain access cover, which is in the crankcase guard.

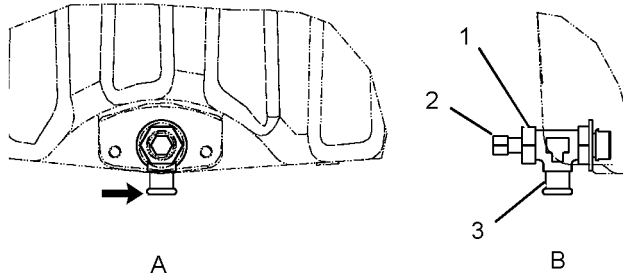


Illustration 177

- (1) drain valve
- (2) shutoff valve
- (3) drain valve elbow
- (A) Left view
- (B) Rear view

2. Install a drain hose (not shown) onto drain valve elbow (3).
3. Open shutoff valve (2). Allow the oil to drain into a suitable container.
4. When the oil has completed draining from the crankcase, close shutoff valve (2). Remove the hose. Install the crankcase drain access cover in the crankcase guard.

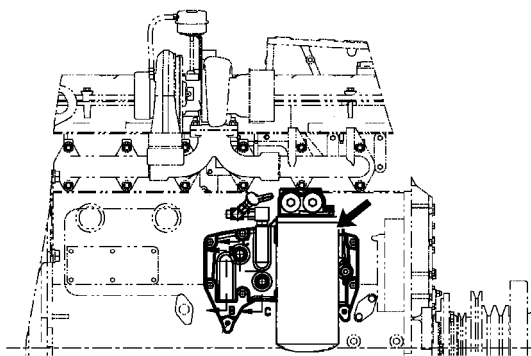


Illustration 178

5. Open the engine access door on the right side of the machine.
6. Clean the area around engine oil filter (2) before you remove the engine oil filter. Remove the engine oil filter with a strap type wrench. Refer to Operation and Maintenance Manual, "Oil Filter - Inspect".

7. Clean the base of the engine oil filter housing. Make sure that all of the old filter gasket is removed.
8. Apply a thin coat of oil to the seal on the new filter.
9. Install the new engine oil filter by hand until the seal of the engine oil filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the engine oil filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the engine oil filter, use the rotation index marks as a guide.

10. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Cat filters, use the instructions that are provided with the filter.

Note: You may need to use a Cat strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

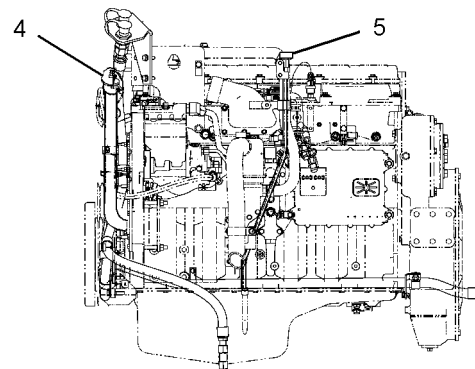


Illustration 179

11. Open the left engine access door.
12. Clean the area around oil filler cap (4) before you remove the oil filler cap. Clean the area around oil level gauge (5) before you remove the oil level gauge. Remove the oil filler cap. Fill the crankcase with new oil. See the topic Operation and Maintenance Manual, "Refill Capacities" and "Lubricant Viscosities" in this manual.
13. Clean oil filler cap (4) and install oil filler cap (4).
14. Start the engine and allow the oil to warm. Check the engine for leaks.

15. Check the oil level. If necessary, add oil. To ensure that the correct amount of oil was added, always measure the oil level with the engine oil dipstick (5). Refer to Operation and Maintenance Manual, "Engine Oil Level - Check" for more information.

16. Stop the engine. Close the engine access doors.

Engine Valve Lash - Check/Adjust

WARNING

To prevent possible injury, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

WARNING

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

NOTICE

Operation of Caterpillar engines with improper valve adjustments will reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

NOTICE

Measure the valve clearance with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the valves to cool to engine cylinder head and engine block temperature.

Check the valve bridge before setting the valve lash. Ensure that the valve bridge is seated equally on both valve stems.

NOTICE

Only qualified service personnel should perform this maintenance. Refer to the Systems Operation/Testing and Adjusting Manual, "Valve Lash and Valve Bridge Adjustment" article or consult your Caterpillar dealer for the complete valve lash adjustment procedure.

Equalizer Bar Center Pin - Lubricate

NOTICE

Apply lubricant to the fittings with a hand operated grease gun only. Use of pressure operated lubricating equipment damages the seals.

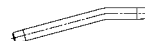
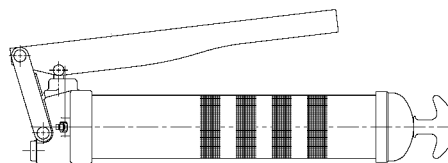
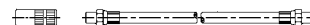


Illustration 180

8F-9866 Grease Gun

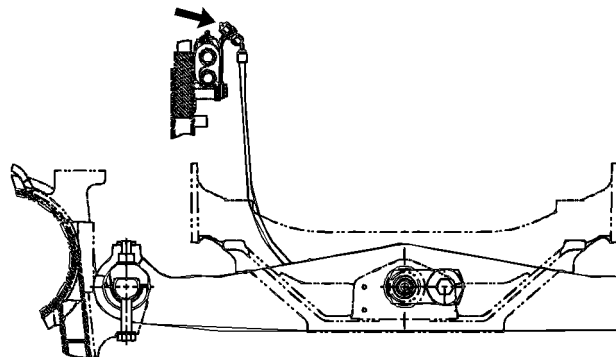


Illustration 181

Remote Fitting

Lubricate the equalizer bar center pin through the remote fitting. The remote fitting is located on the frame on the left side of the machine. The fitting is located below the dipstick.

The proper lubricant for the center pin is the "Desert Gold". NLGI 2 grease

Refer to Operation and Maintenance Manual, SEBU6250 "Lubricating Greases" for more information.

Equalizer Bar End Pins Oil Level - Check

NOTICE

Apply gear oil through the fittings with a hand operated lubrication pump or a suitable grease gun. Use of pressure operated lubricating equipment damages the seals.

NOTICE

Before and after the equalizer bar end pin is filled with gear oil, seal (1) must be flush with the equalizer bar. If the seals are not flush, damage to the seals can result by overfilling.



Illustration 182

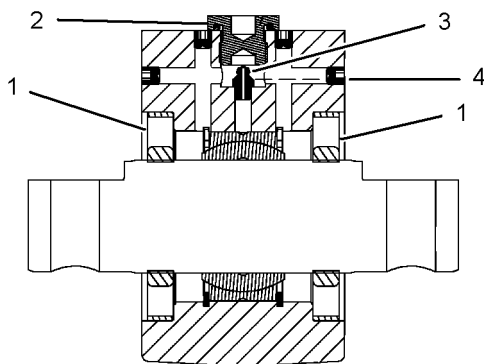


Illustration 183

1. Clean the areas that are around the end pin with a high-pressure wash. Inspect the condition of the seal (1).
2. Check the area for oil leakage. Be sure that the seal is in a neutral position.
3. Remove plug (2).
4. Check the oil level. Oil level (4) should be at the top of the hex head on the fitting.

5. If the oil level is low, apply the gear oil through fitting (3) until the gear oil reaches oil level (4) at the top of the hex head on the fitting. Remove any excess oil. This exercise will maintain a volume of air. The gear oil must be applied with a 7H-1680 Lubrication Hand Pump. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for the correct oil. The gear oil has excellent load carrying capacity.
6. Be sure that seals (1) are not pushed out. Push back the seals if the seals are pushed out.
7. Install plug (2).

Note: MPGM GREASE IS ALLOWED ONLY FOR A FAILED SEAL. THE SEAL SHOULD BE REPLACED AS SOON AS POSSIBLE. THE COMBINATION OF GEAR OIL AND MPGM IS NOT HARMFUL TO THE MACHINE.

When you operate the machine in arctic conditions, lubricate the equalizer bar with EMGARD EP 75W90 gear lubricant. EMGARD EP 75W90 gear lubricant is a synthetic lubricant. This lubricant is available from Hudson Corporation.

Ether Starting Aid Cylinder - Replace

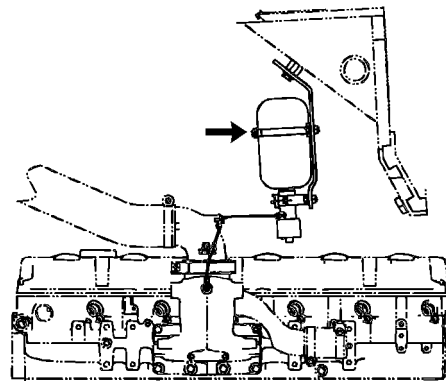


Illustration 184

1. Open the left engine access door.
1. The ether cylinder is mounted on the bracket assembly which is seated toward the front of the cab. Loosen the retaining clamp. Remove the old ether cylinder by turning the cylinder counterclockwise.
2. Install the new ether cylinder. Turn the cylinder clockwise. Hand tighten the ether cylinder in order to seal the gasket to the cylinder. Tighten the clamp around the cylinder.

Note: The ether starting aid cylinder must be installed with the appropriate gasket. The gasket must be clean in order to make a proper seal.

3. Close the left engine access door.

Final Drive Oil - Change

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "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.

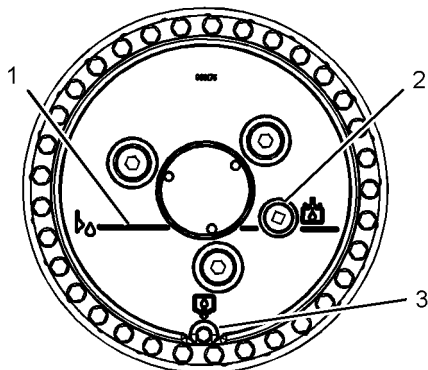


Illustration 185

1. Position one final drive so that oil level mark (1) is horizontal. The drain plug (3) will point downward.
2. Remove oil filler plug (2).
3. Remove drain plug (3). Allow the oil to drain into a suitable container.
4. Inspect the drain plug seal. Replace the drain plug seal if the drain plug seal is damaged.

5. Clean the drain plug and install the drain plug.
6. Fill the final drive with oil to the bottom of the filler plug opening. See Operation and Maintenance Manual, "Capacities Refill".
7. Inspect the condition of the seal of the filler plug. Replace the plug seal if the plug seal is damaged. Wipe the magnet in order to clean the plug. Install the plug.
8. Repeat Step 185 to Step 7 in order to change the oil in the other final drive.

For additional information about final drive oil, see Special Publication, SEBU6250 "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

Final Drive Oil Level - Check

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

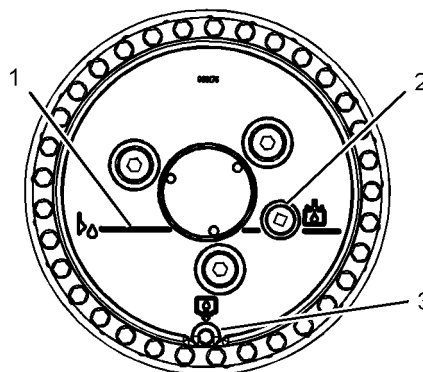


Illustration 186

1. Position one final drive so that oil level mark (1) is horizontal and drain plug (3) is at the bottom.
2. Remove oil filler plug (2).
3. The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.

See the Table in the article "Lubricant Viscosities" for the type of oil.
4. Install oil filler plug (2).
5. Repeat Step 186 to Step 4 in order to check the oil level in the other final drive.

Final Drive Oil Sample - Obtain

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "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.

Obtain the sample of the differential and final drive oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S-O-S oil analysis, establish a consistent trend of data.

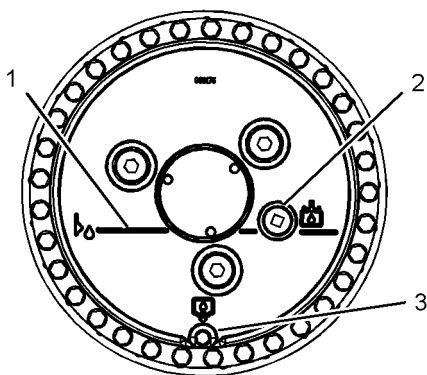


Illustration 187

1. Position one final drive so that oil level mark (1) is horizontal. Drain plug (3) should face downward.
2. Remove oil filler plug (2) and obtain the oil sample with a 1U-5718 Vacuum Pump.

Note: Do not use the drain stream method to obtain a sample of the final drive oil. A stream of dirty oil from the bottom of the compartment will contaminate the sample. Likewise, never dip an oil sample from an oil container or pour a sample from a used filter.

3. Install oil filler plug (2).
4. Repeat Step 1 to Step 3 in order to sample the oil in the other final drive.

Reference: Refer to, "Lubricant Viscosities" in the Maintenance Section of this manual for the correct fluid for your machine.

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "S-O-S Oil Analysis" for information that pertains to obtaining a sample of the final drive oil. Refer to Special Publication, PEHP6001 "How To Take A Good Oil Sample" for more information about obtaining a sample of the final drive oil.

Front Idler Position - Check

SystemOne Undercarriage

The following check is for Caterpillar SystemOne Undercarriages that have the center tread idler.

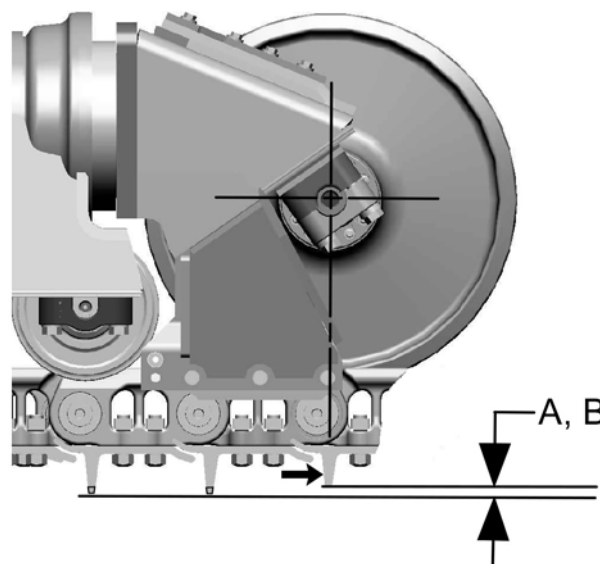


Illustration 188

Elevated undercarriage system

1. Park the machine on a hard, flat surface. Make sure that the bottom track is tight and that the measured grouser lies directly below the track idler shaft.
2. Measure the height (A, B) from the flat ground surface to the grouser tip that is centered below the track idler shaft.
3. Maintain the grouser height (rise) to the following dimensions.

a. (A) Front Idlers

Minimum – 0 mm (0 inch)

Maximum – 20 mm (0.8 inch)

b. (B) Rear Idlers

Minimum – 10 mm (0.4 inch)

Maximum – 40 mm (1.6 inch)

4. Repeat Steps 1 through 3 in order to determine the proper height dimension under each idler.

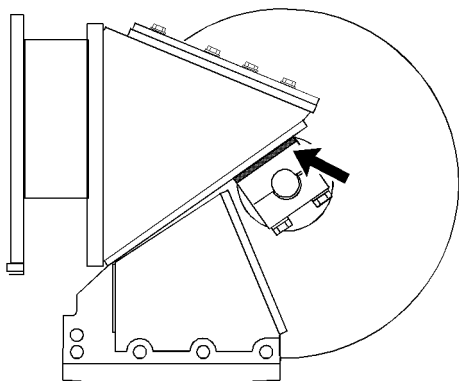


Illustration 189

Adjustment shim (center tread idler)

5. For machines with the SystemOne Undercarriage, remove one shim under each track idler block when the wear on the link and roller system is at 50%.

Consult your Caterpillar dealer for detailed information about adjustments to the center tread idler.

See Operation and Maintenance Manual, “Track - Check/Adjust” for information on needed track adjustments.

Reference: See Operation and Maintenance Manual, “Reference Material” for publications and Special Instructions, on removal and installation of SystemOne Track, as needed.

Conventional Design

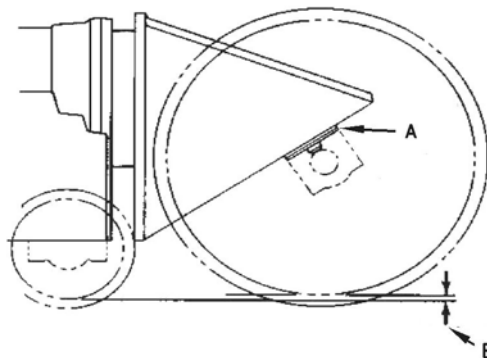


Illustration 190

- (A) Adjusting shims
(B) Dimension between the height of the front idler tread and the height of the roller tread

The following check is for undercarriage systems that have the conventional idler.

The height of the front idler tread should always be higher than the height of the roller tread. The dimension (B) is set approximately to 9.0 mm (.35 inch) at the factory. Dimension (B) decreases as the undercarriage wears. If a rebuilt idler or a new idler is installed with track rollers that are worn, dimension (B) decreases.

Adjustment of the front idler to the correct height can improve the ride of the tractor and the performance of the dozer. Use the following procedures to determine the best operating position.

If the machine is operated on FIRM UNDERFOOT conditions and excess vibration occurs, shims can be removed in order to raise the front idler.

If the machine is operated on SOFT UNDERFOOT conditions and dozing performance is poor, shims can be installed in order to lower the front idler. Lowering the front idler can improve dozing performance. If ground rippling by the dozer or excess vibration occur in soft material, shims can be removed in order to raise the front idler.

Consult your Caterpillar dealer for detailed information about checking the idler and about adjustments to the idler.

Fuel Priming Pump - Replace

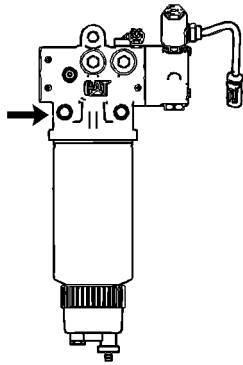


Illustration 191

A replacement kit is available for the electronic fuel priming pump. Contact your Cat dealer for the correct part number and details for your application.

Fuel System - Prime

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

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not loosen the fuel lines at the fuel manifold. The fittings may be damaged and/or a loss of priming pressure may occur when the fuel lines are loosened.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over disconnected fuel system component.

Prime the fuel system in order to fill the fuel filter, and prime the fuel system in order to purge trapped air. The fuel system should be primed under the following conditions:

- The injector has been changed.
 - The fuel filter has been changed.
 - The fuel system is dry.
1. Turn the engine start switch to the ON position. Leave the engine start switch in the ON position for 2 minutes.

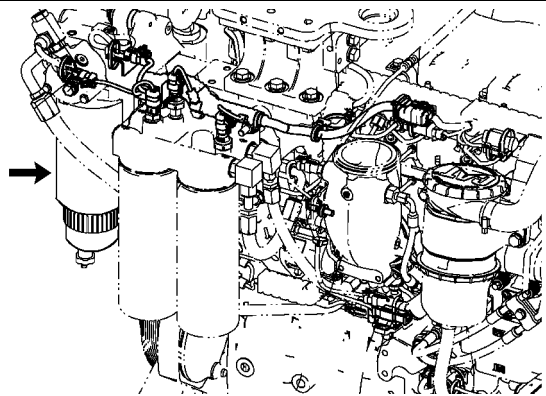


Illustration 192

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. This operation will cycle the fuel priming pump again.
4. When the water separator is full of fuel, attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate at low idle until the engine is running smoothly. If the engine cannot be started, or if the engine continues to misfire or smoke, repeat Step 1.

Fuel System Primary Filter/ Water Separator - Drain

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 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over disconnected fuel system component.

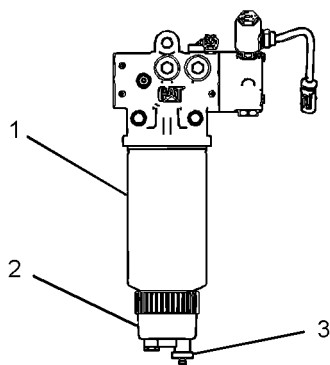


Illustration 193

- (1) Element
- (2) Bowl
- (3) Drain

Bowl (2) should be monitored daily for signs of water. If water is present, drain the water from the bowl.

1. Open drain (3). The drain is a self-ventilated drain. Catch the draining water in a suitable container. Dispose of the water properly.

2. Close drain (3).

NOTICE

The water separator is under suction during normal engine operation. Ensure that the drain valve is tightened securely to help prevent air from entering the fuel system.

Fuel System Secondary Filters - Replace

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

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

Before you replace the secondary fuel filter elements, replace the primary fuel filter element.

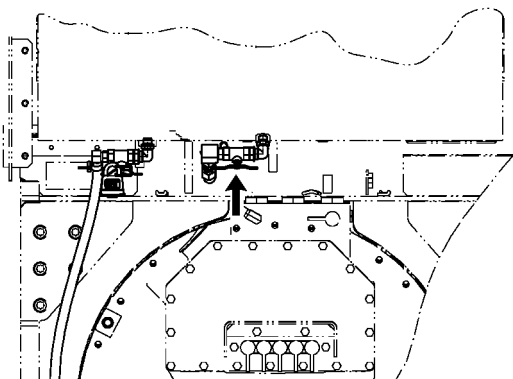


Illustration 194

Rear view

1. Turn the handle of the fuel shutoff valve clockwise in order to shut off the fuel supply. The fuel shutoff valve is located at the rear of the machine under the fuel tank.
2. Open the engine access door on the left side of the machine. The secondary fuel filters are mounted on the left side of the engine next to the primary fuel filter.

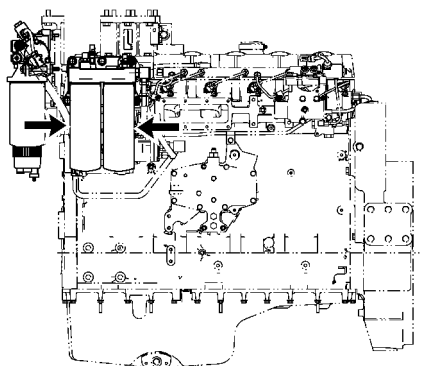


Illustration 195

Left view

3. Remove the secondary fuel filter. Drain the fuel into a suitable container.
- Note:** Discard any drained fluids according to local regulations. Discard the fuel filter properly.
4. Clean the filter base. Make sure that all of the old seal is removed.
 5. Coat the seal of the new high efficiency fuel filters with clean diesel fuel.
 6. Install the new fuel filters by hand.

Instructions for the installation of the filters 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. Open the fuel shutoff valve. Refer to illustration 194.
8. Prime the fuel system. See the Topic "Fuel System - Prime" in this manual.
9. Close the engine access door.

Fuel System Water Separator Element - Replace

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 fuel filter with fuel before installing the fuel filter. Contaminated fuel causes accelerated wear to fuel system parts.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

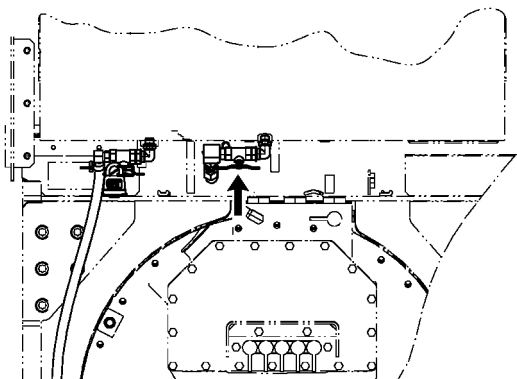


Illustration 196

1. The fuel shutoff valve is located at the rear of the machine under the fuel tank. Turn the red handle of the fuel shutoff valve in order to shut off the fuel supply.
2. Open the left engine access door.

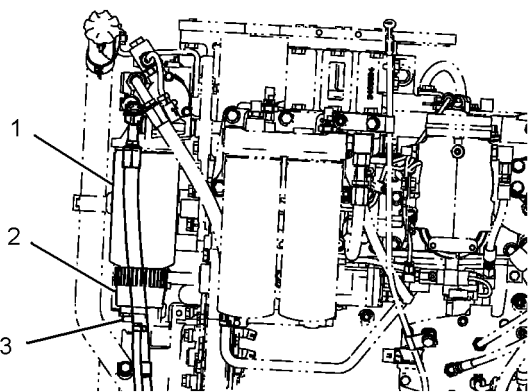


Illustration 197

3. In order to drain primary filter (1), open drain valve (3) on water separator bowl (2). The water separator bowl is under primary filter (1). Catch the fuel in a suitable container.

Note: Discard any drained fluids according to local regulations.

4. Remove primary filter (1) and water separator bowl (2).
5. Remove water separator bowl (2) from the primary filter element (1).
6. Wash water separator bowl (2) in a clean nonflammable solvent. Use pressure air to dry water separator bowl (2).
7. Install the clean water separator bowl onto a new primary filter element.

8. Wash the filter mounting base in clean, nonflammable solvent. Make sure that all of the old seal is removed.
9. Coat the seal of the new filter element with clean diesel fuel.
10. Install the new filter element by hand.

Instructions for the installation of the filters 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.

11. Open the fuel shutoff valve.
12. Prime the fuel system, if the machine is equipped with a priming pump.

Refer to the Operation and Maintenance Manual, "Fuel System - Prime" for the proper procedure.

13. Close the left engine access door.

Fuel Tank Cap Filter and Strainer - Replace/Clean

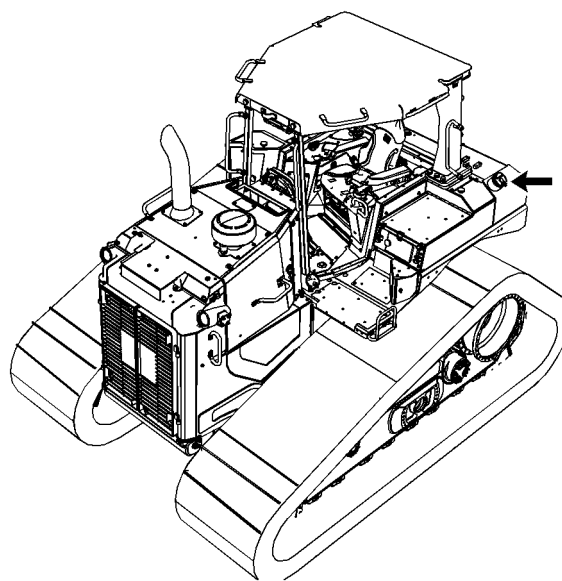


Illustration 198

The fuel tank is located on the rear of the machine. The filler cap is on the left side of the machine next to the ROPS.

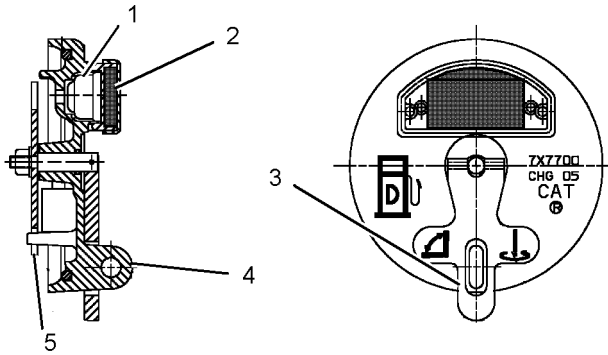


Illustration 199

1. Lift lever (3) in order to remove the fuel tank filler cap. Turn the lever counterclockwise until the lever stops. Lift the cap straight up in order to remove the cap.
2. Remove the fuel strainer from the filler neck.
3. In order to replace the filter assembly, remove two screws that secure filter assembly (2) to the fuel cap. Remove filter assembly (2), valve (1), and the gaskets.
4. Wash the cap and the strainer in a clean, nonflammable solvent.
5. Inspect the tank cap seal. If the seal is damaged, replace the seal.
6. Replace the filter assembly, the valve, the gaskets, and the screws. Use a 9X-2205 Cap Filter Kit.
7. Install the strainer.
8. Install the fuel cap. Rotate the fuel cap clockwise until three tabs (5) drop into the slots in the adapter. Rotate lever (3) clockwise until the lever stops. Lower lever (3) over locking tab (4).

Fuel Tank Water and Sediment - Drain

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

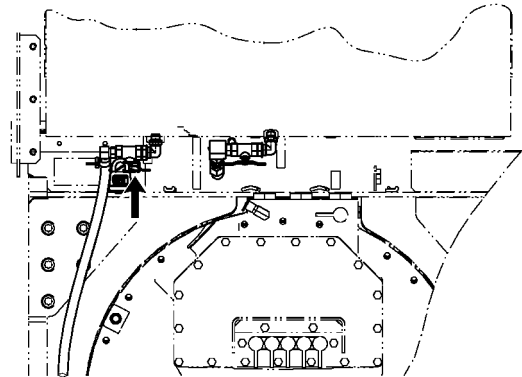


Illustration 200

The drain valve is under the fuel tank at the rear of the machine.

1. Open the drain valve. Allow the water and the sediment to drain into a suitable container.
2. Close the drain valve.

Fumes Disposal Filter Element - Replace (Open Crankcase Ventilation (OCV) Filter)

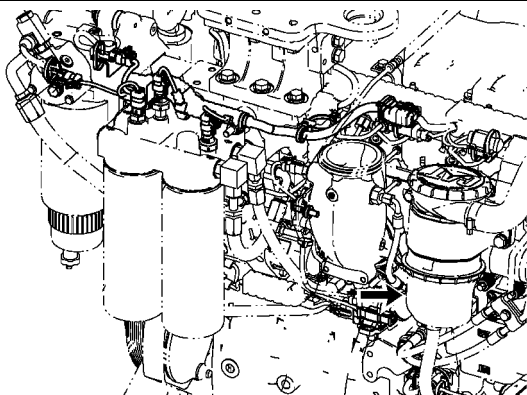


Illustration 201

The filter for the open crankcase ventilation system is located toward the rear of the left side of the engine. A filter that has been used may contain a small amount of engine oil.

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.

Refer to Special Publication, NENG2500 "Caterpillar Tools and Shop Products Guide", for tools and supplies suitable to collect and contain fluids in Caterpillar machines.

Dispose of all fluids according to local regulations and mandates.

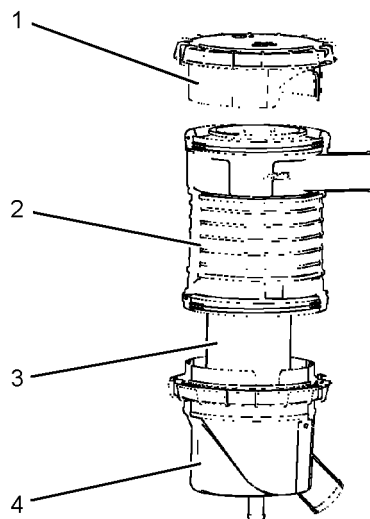


Illustration 202

- (1) Cap
- (2) Housing for the filter element
- (3) Filter element
- (4) Cup

Remove either the cap or the cup from the housing for the OCV filter. Remove the OCV filter. The filter may not be used again. Dispose of the filter. Place a new OCV filter inside the filter housing. If the cap was removed, replace the cap. If the cup was removed, replace the cup. Tighten hand tight.

Note: Caterpillar will not be held liable for an engine that does not comply with EPA emissions standards due to modification of the OCV filter or due to the use of a filter that is not approved by Caterpillar.

Fuses and Circuit Breakers - Replace/Reset



Fuses – Fuses protect the electrical system from damage that is caused by overloaded electrical circuits. Replace a fuse if the element separates. If the fuse of a particular electrical system requires frequent replacement, check the electrical circuit. Repair the electrical circuit, if necessary.

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.

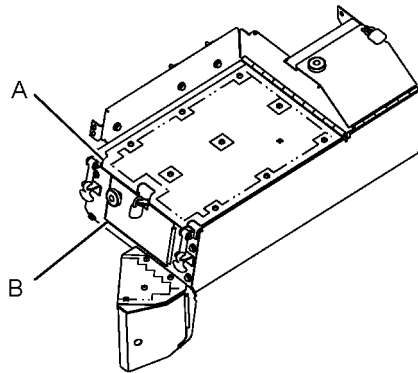


Illustration 203

On the left side of the machine, open access door (B) to the circuit breakers and the fuses.

Fuses

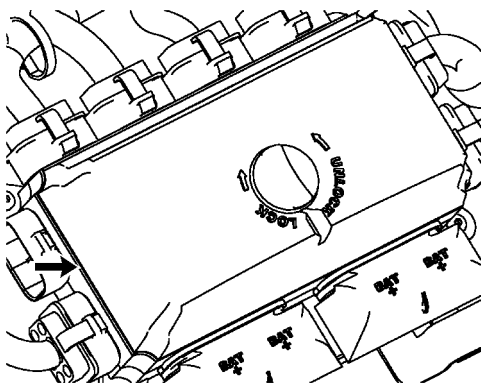


Illustration 204

Fuses are located behind the fuse block cover.

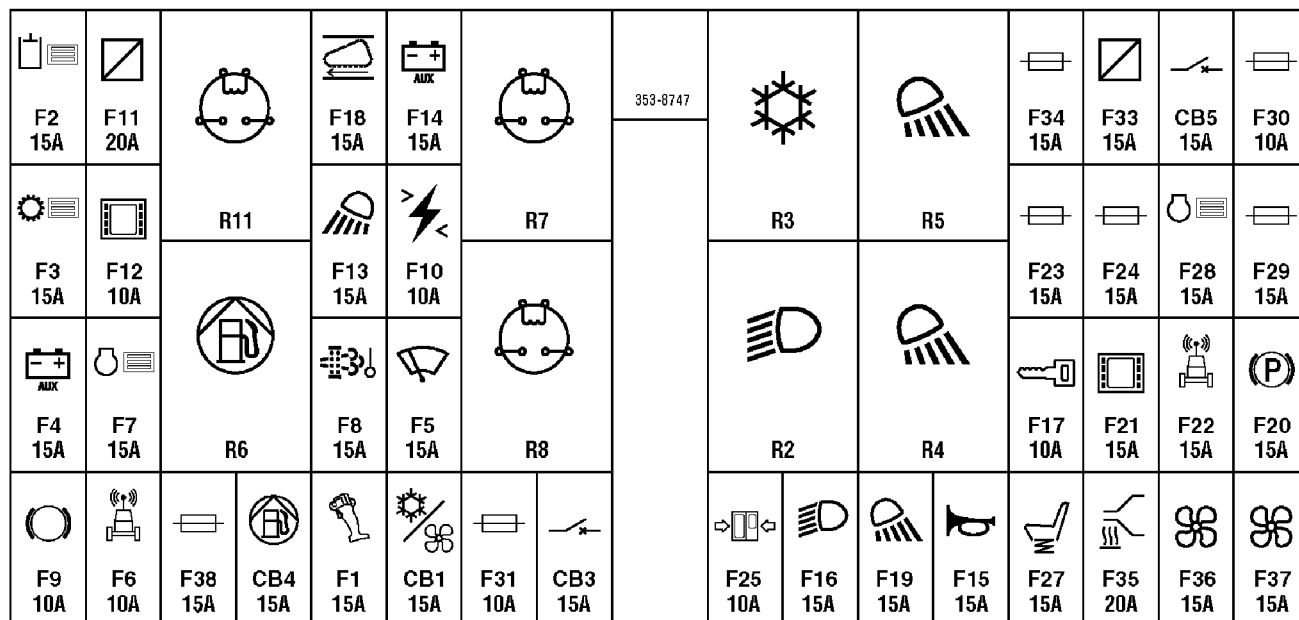


Illustration 205

Relays

- (R2) Front flood lights
- (R3) Cab pressurizer
- (R4) Forward Flood lights
- (R5) Access / Egress Light
- (R6) Fuel priming relay
- (R7) Spare
- (R8) Spare
- (R11) Spare

Implement lever (F1) – 15 Amp

Implement control ECM (F2) – 15 Amp

Power train control ECM (F3) – 15 Amp

Unswitched auxiliary / Service connector power (F4)
– 15 Amp

Wipers (F5) – 15 Amp

Product link (F6) – 10 Amp

Engine control ECM (F7) – 15 Amp

Soot sensor (F8) – 15 Amp

Service brake (F9) – 10 Amp

High, low voltage (F10) – 10 Amp

12 V Converter (F11) – 20 Amp

CAES (Navigator)(F12) – 10 Amp

Rear ROPS floodlights (F13) – 15 Amp

Auxiliary / Converter switched power (F14) – 15
Amp

Horns (F15) – 15 Amp

Front floodlights (F16) – 15 Amp

Ignition key (F17) – 10 Amp

AccuGrade (F18) – 15 Amp

Forward floodlights (cab post) (F19) – 15 Amp

Parking brake solenoid (F20) – 15 Amp

Monitoring system display (F21) – 15 Amp

Accugrade (electric mast) (F22) – 15 Amp

Spare (F23) – 15 Amp

Spare (F24) – 15 Amp

Cab pressurizer (F25) – 10 Amp

Seat (F27) – 15 Amp

Engine ECM (28) – 15 Amp

Spare (F29) – 15 Amp

Spare (F30) – 10 Amp

Spare (F31) – 10 Amp

Standard 12 V Converter (F33) – 15 Amp

Spare (F34) – 15 Amp

Caterpillar Regeneration System CRS Heater (nozzle) (F35) – 20 Amp

Condenser (F36) – 15 Amp

Condenser (F37) – 15 Amp

Spare (F38) – 15 Amp

Circuit Breakers



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.

depressed.

Note: If the button does not remain depressed, check the appropriate electrical circuit. Repair the electrical circuit, if necessary.

Blower fan motor (CB1) – 15 Amp

Spare (CB3) – 15 Amp

Fuel priming (CB4) – 15 Amp

Spare (CB5) – 15 Amp

Hydraulic System Oil - Change

Note: The normal hydraulic oil change interval is at every 2000 Service Hours or 1 Year. By performing S-O-S oil analysis, the hydraulic oil change interval may be extended to 6000 Service Hours or 1 Year. S-O-S oil analysis must be performed at every 500 Service Hours or 3 Months in order to extend the hydraulic oil change interval. The results from the S-O-S oil analysis will determine if the hydraulic oil change interval may be extended. If S-O-S oil analysis is not available, the hydraulic oil change interval must remain at every 2000 Service Hours or 1 Year. Refer to the Operation and Maintenance Manual, “Hydraulic System Oil Sample - Obtain”.

Machines that are used in severe conditions are not included in the 6000 hour maintenance interval. Machines that are used in severe conditions must use the interval in the Maintenance Interval Schedule.

Lubricants

Approved hydraulic oil must be used to obtain the 4000 hour hydraulic oil change. Refer to the list that follows for approved oils.

Caterpillar Hydraulic Oils

- Cat HYDO Advanced
- Cat TDTO
- Cat TDTO (TMS)
- Cat DEO
- Cat BIO HYDO Advanced (HEES)
- Cat MTO

Commercial Oils

If Caterpillar oils cannot be used, oils that meet the following oil specifications can be used in most Caterpillar hydraulic systems and in most Caterpillar hydrostatic transmission systems.

- Engine oils that meet the performance requirements of one of the following oil specifications: Cat ECF-1-a, Cat ECF-2 and Cat ECF-3 The oils must have a minimum level of zinc additive of 0.09 percent (900 ppm).
- Biodegradable oils that meet the performance requirements of Cat BF-2 oil specification

- Oils that meet the Cat TO-4 performance requirements that have a minimum zinc additive level of 0.09 percent (900 ppm)

Note: Industrial hydraulic oils are not recommended for the hydraulic systems of Caterpillar machines. Industrial hydraulic oils are more likely to allow corrosion and industrial hydraulic oils are more likely to allow excessive wear.

Change the Hydraulic Oil



WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

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

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

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.

Operate the machine in order to warm the oil.

Park the machine on level ground. Lower the bulldozer blade to the ground and apply slight downward pressure. If equipped, lower the ripper to the ground. Engage the parking brake and stop the engine.

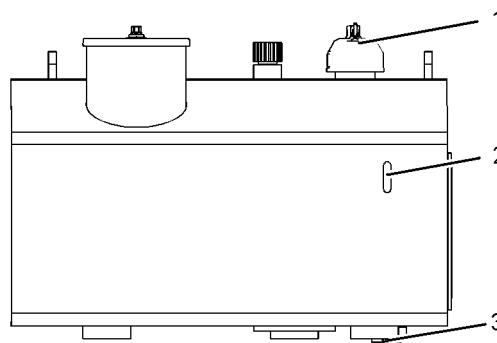


Illustration 206

Right side of cab

1. Remove hydraulic tank filler cap (1) slowly in order to relieve any pressure.
2. Wash the filler strainer and the filler cap in a clean nonflammable solvent.
3. Use a 126-7914 Oil Drain Coupling and attach a 1 inch hose. Make sure that enough of the swivel hose bypasses the track assembly and fills into a suitable container.
4. Remove oil drain plug (3) which is located under the right fender of the machine.
5. Install the swivel hose into the drain plug opening.
6. Rotate the swivel hose clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.
7. Remove the swivel hose. The internal drain valve for the hydraulic tank will close.
8. Clean the drain plug and install the drain plug. Tighten the drain plug to a torque of 68 ± 7 N·m (50 ± 5 lb ft).
9. Change the hydraulic system filter.
10. Install the filler strainer.
11. Fill the hydraulic oil tank.

Reference: See Operation and Maintenance Manual, "Hydraulic System Oil Filter - Replace".

Reference: See Operation and Maintenance Manual, "Lubricant Viscosities and Capacities (Refill)" for additional information.

12. Inspect the filler cap gasket. Replace the gasket if damage or wear is evident.

13. Install the filler cap.

14. Start the engine. Operate the engine for a few minutes.

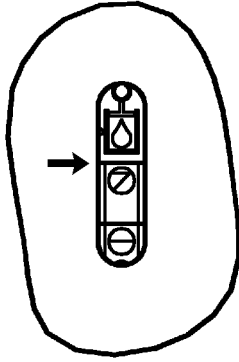


Illustration 207

15. Maintain the oil level to the "FULL" mark in sight gauge (2). Add oil, if necessary.

16. Stop the engine.

Hydraulic System Oil Filter (Pilot) - Replace

WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

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

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

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.

1. Lower the bulldozer and the ripper to the ground.

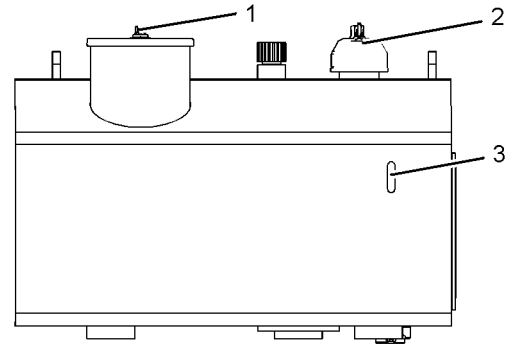


Illustration 208

Right side of cab

2. Slowly remove hydraulic tank filler cap (2) in order to relieve the system pressure.

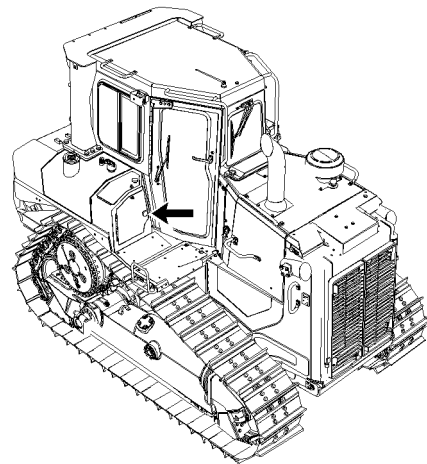


Illustration 209

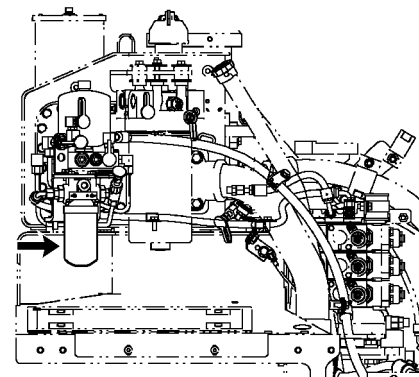


Illustration 210

Note: The pilot filter is located in the compartment in front of the hydraulic tank on the right side of the machine.

3. Remove the filter element with a strap type wrench.
4. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.
5. Install the new pilot filter element by hand.

Note: 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.

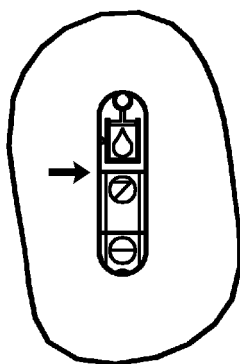


Illustration 211

(3) Hydraulic tank sight glass

6. Maintain the hydraulic oil to the "FULL" mark in the sight glass.
7. Install hydraulic tank filler cap (2).
8. Close access door to the pilot filter.

Hydraulic System Oil Filters - Replace

WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

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

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

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.

1. Lower the bulldozer and the ripper to the ground.

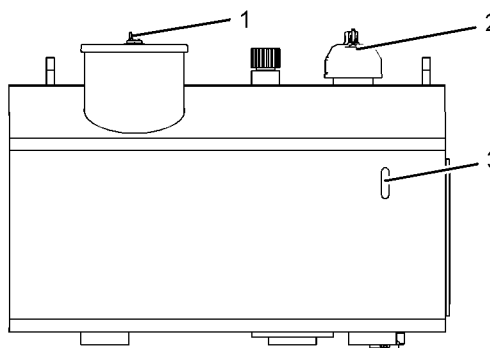


Illustration 212

Right side of cab

2. Slowly remove hydraulic tank filler cap (2) in order to relieve the system pressure.
3. Remove retaining nut (1).

Hydraulic Tank

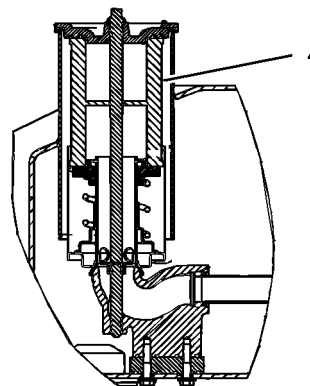


Illustration 213

1. Remove the cover and remove oil filter (4) from the filter housing. Perform the following steps.
2. Properly dispose of the filter element.

Apply a thin coat of oil to the seal on the new filter element.
3. Install the filter element into the filter housing.
4. Replace the cover and install retaining nut (1).

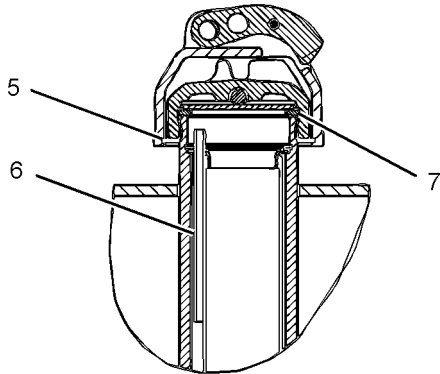
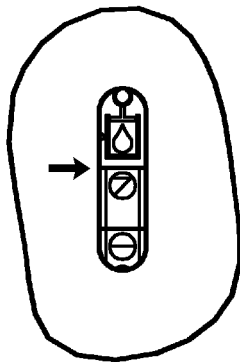


Illustration 214

5. Remove retainer ring (5) from the oil filler tube.
6. Remove strainer (6) from the oil filler tube.
7. Wash the screen in a clean nonflammable solvent.
8. Inspect seal (7) on the filler cap. Replace the seal if the seal is worn or if the seal is damaged.
9. Install the strainer, the retainer ring, and filler cap (2).

Illustration 215
(3) Hydraulic tank sight glass

10. Maintain the hydraulic oil to the "FULL" mark in the sight glass.

Steering Charge Filter

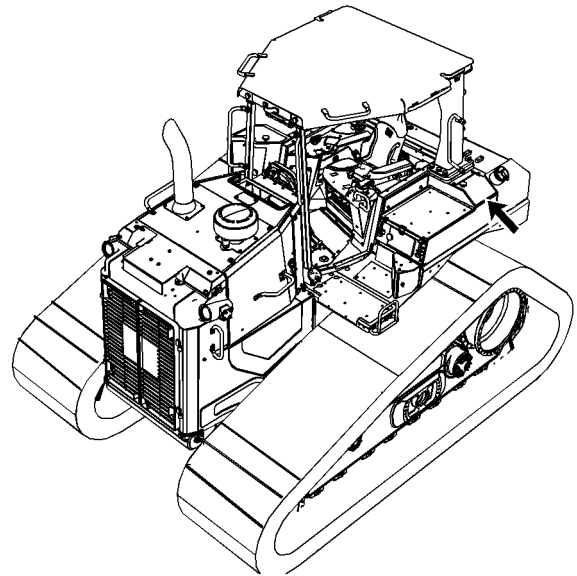


Illustration 216

1. Open the access door on the left side of the machine that is forward of the fuel tank.

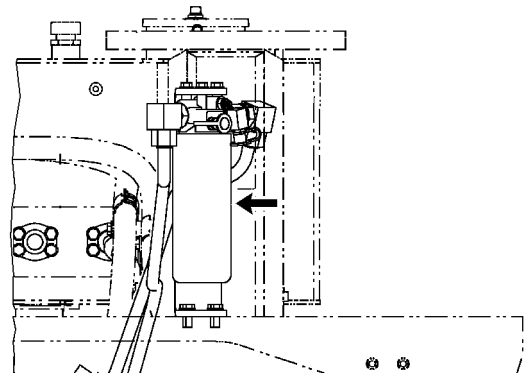


Illustration 217

Steering charge filter

2. Remove the filter element that is next to the window washer reservoir with a strap type wrench.
3. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.
4. Install the new steering charge filter element by hand.

Note: 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.

5. Close the access door.

Hydraulic System Oil Level - Check

WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

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

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

Lower the bulldozer and the ripper to the ground. Place the ripper shanks in the vertical position.

The hydraulic tank is on the right fender of the machine.

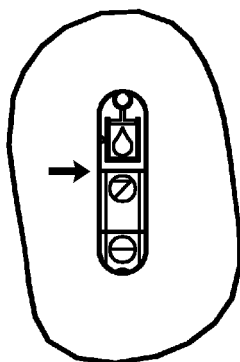


Illustration 218

1. Maintain the oil level to the "FULL" mark in the sight gauge. Check the oil level when the oil is cold. Verify that the oil level is below the "FULL" mark before you remove the filler cap.

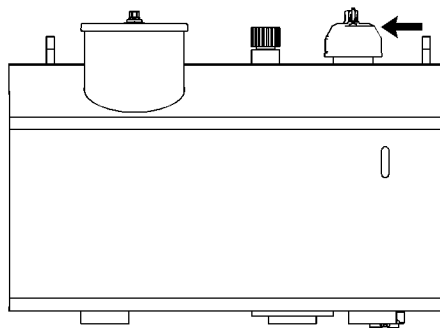


Illustration 219

Right side of cab

2. If the hydraulic system requires additional hydraulic oil, remove the filler cap slowly in order to relieve any pressure. Add oil through the filler tube.
3. Clean the filler cap and install the filler cap.

Hydraulic System Oil Sample - Obtain

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "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.

Obtain the hydraulic oil sample as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S·O·S oil analysis, establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

If the machine is operated under a high load and/or under high temperature conditions, sample all fluids at the 250 hour interval.

1. Open the access cover on the right side of the cab that is in front of the hydraulic tank.

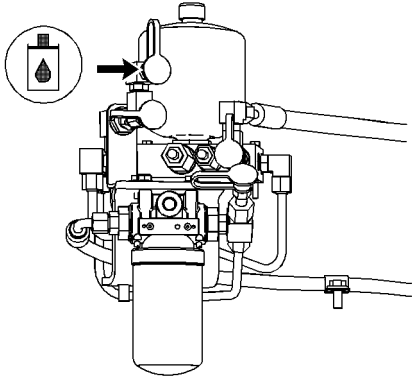


Illustration 220

The hydraulic oil sampling valve is shown.

2. Remove the protective cap.
3. Use 8T-9190 Fluid Sampling Bottle (1) to obtain the sample.
4. After you take a sample, remove the cap with the probe from the bottle. Discard the cap with the probe. Install the sealing cap that is provided with 8T-9190 Fluid Sampling Bottle (1).
5. Replace the protective cap.
6. Close the access cover.

Reference: Refer to , “Lubricant Viscosities” in the Maintenance Section of this manual for the correct fluid for your machine.

Lift Cylinder Yoke Bearings - Lubricate (If Equipped)

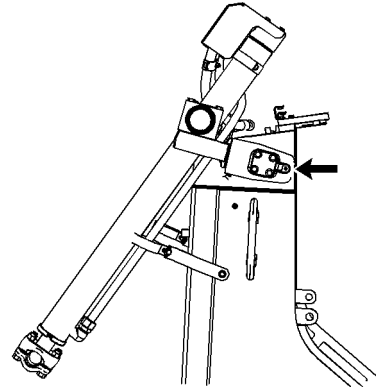


Illustration 221

The grease fittings are on the left side of the radiator guard and on the right side of the radiator guard. Lubricate the bearings by applying grease to the fittings. Use MPGM grease.

Oil Filter - Inspect

Inspect a Used Filter for Debris

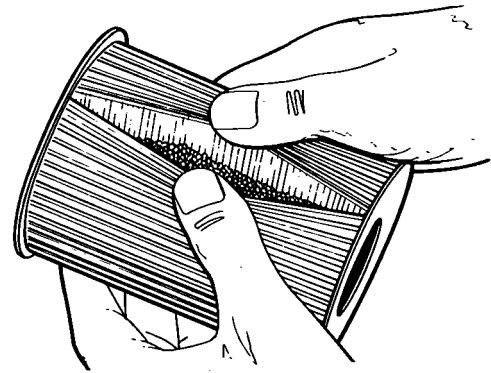


Illustration 222

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.

Pivot Shaft Oil Level - Check

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

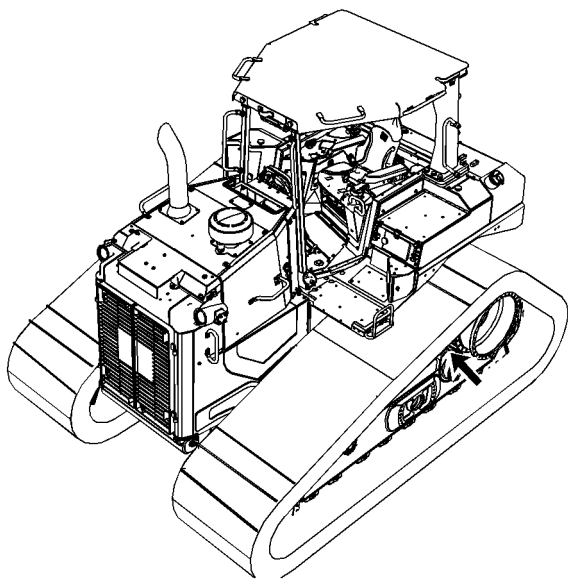


Illustration 223

The oil plugs are located on both sides of the machine on top of the track roller frame.

1. Remove the oil plugs on one side of the machine. Check the oil level. The oil level should be at the bottom of the threaded hole.
2. If necessary, add oil in order to bring the oil level up to the bottom of the threaded hole.

Reference: See Operation and Maintenance Manual, "Lubricant Viscosities" in this manual for the correct viscosity grade.

3. Install the oil plugs.
4. Repeat Steps 1 through 3 on the other side of the machine.

Radiator Core - Clean

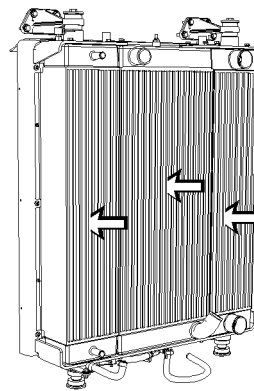


Illustration 224

You can use compressed air, high-pressure water, or steam to remove dust and other debris from the radiator core and the aftercooler core. However, the use of compressed air is preferred.

See Special Publication, SEBD0518, "Know Your Cooling System" for the complete procedure for cleaning the radiator core.

Radiator Pressure Cap - Clean/Replace

WARNING

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 fill cap is cool enough to touch with your bare hand.

Remove the fill cap slowly to relieve pressure.

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

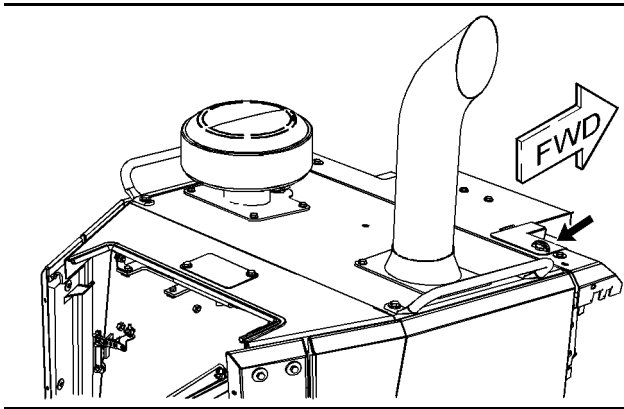


Illustration 225

1. Open the radiator cap access cover. Slowly remove the radiator cap in order to relieve system pressure.
2. Inspect the radiator cap for damage, for deposits, or for foreign material. Clean the radiator cap with a clean cloth. Replace the radiator cap if the radiator cap is damaged.
3. Install the radiator cap.

Recoil Spring Compartment Oil Level - Check

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

1. Remove all of the debris around the cover plate on the top of the track roller frame.
2. Remove the cover plate for the oil filler. Observe the level of the oil.

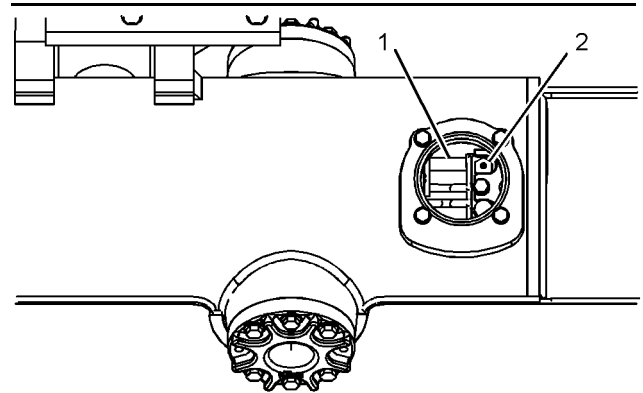


Illustration 227

3. Maintain the oil level above the top of the track adjusting cylinder (1). Do not fill the oil above the track adjustment valve (2).
4. Install the cover plate.
5. Repeat the procedure for the other recoil spring housing.

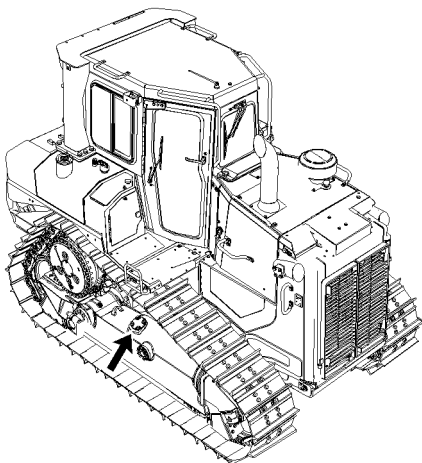


Illustration 226

Refrigerant Dryer - Replace (If Equipped)

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.

Note: The refrigerant dryer contains the orifice tube and the desiccant that dries the liquid refrigerant.

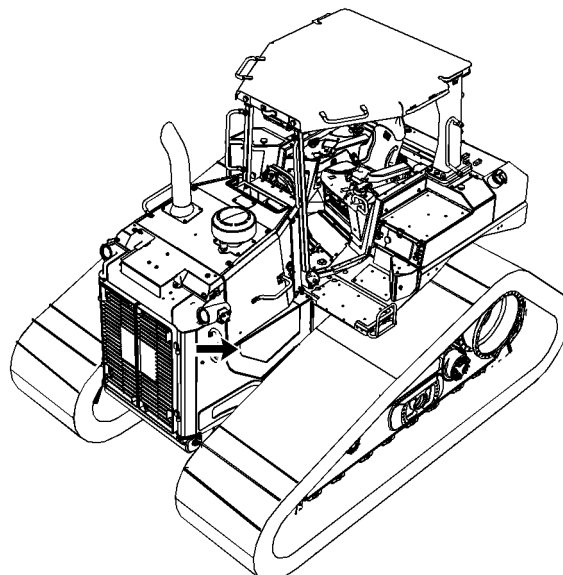


Illustration 228

Location of the refrigerant dryer is behind the lower access door on the left side of the machine.

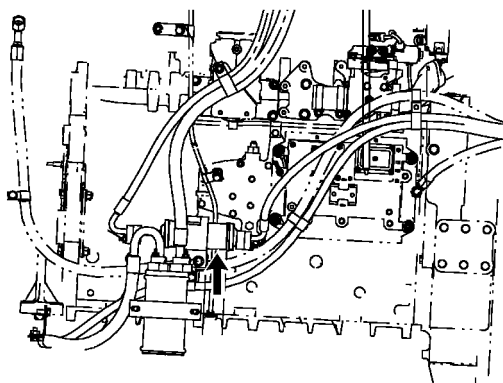


Illustration 229

This refrigerant dryer does not have quick couplers.

Reference: For the correct replacement procedure, refer to Service Manual, SENR5664, "Air Conditioning and Heating R-134a All Caterpillar Machines" "In-Line Refrigerant Dryer - Remove and Install" or the Disassembly and Assembly Manual, for your machine.

Rollover Protective Structure (ROPS) - Inspect

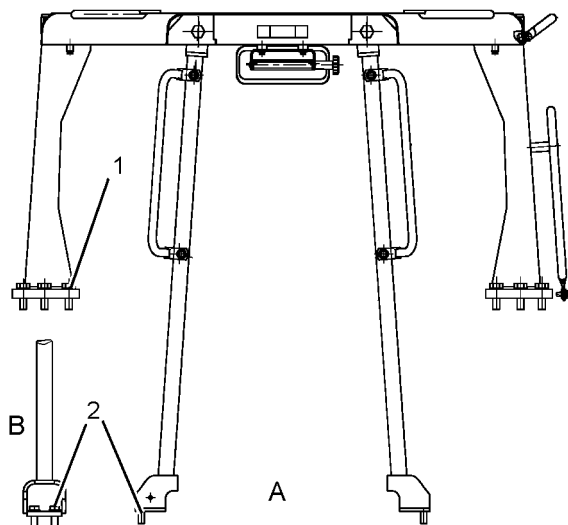


Illustration 230

(A) Front view
(B) Side view

Inspect the Rollover Protective Structure (ROPS) for bolts that are loose or damaged. Replace any damaged bolts and any missing bolts with original replacement parts only. Tighten the 12 top bolts (1) to a torque of 800 ± 100 N·m (590 ± 74 lb ft). Tighten the four bottom bolts (2) to a torque of 460 ± 60 N·m (340 ± 45 lb ft).

Note: Apply oil to all bolt threads for the ROPS before you install the bolts. Improper bolt torque can result if you do not apply oil to the threads.

Do not weld reinforcement plates to the ROPS in order to straighten the ROPS. Do not weld reinforcement plates to the ROPS in order to repair the ROPS.

If the ROPS has any cracks in the welds, in the castings, or in any metal section, consult your Cat dealer for repairs.

Seat Belt - Inspect

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.

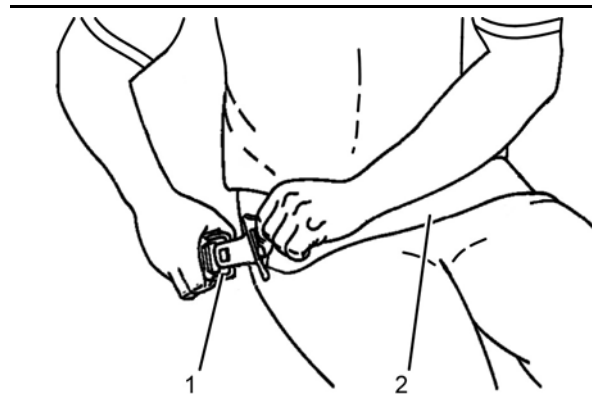


Illustration 231

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).

Seat Belt - Replace

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).

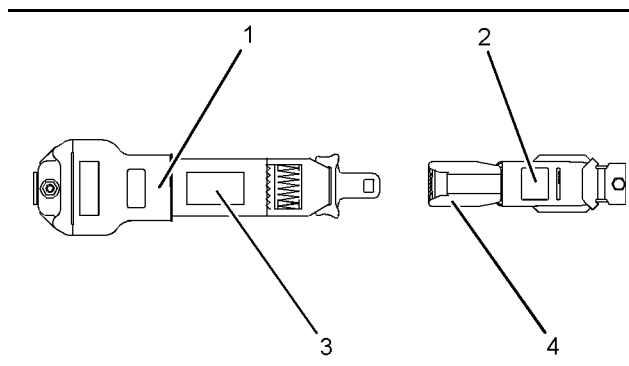


Illustration 232

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.

Torque Converter Scavenge Screen - Clean

When you change the transmission oil, clean the torque converter scavenge screen.

1. Remove the bottom guard in order to gain access to the torque converter.

Note: Drain all fluids into a suitable container.

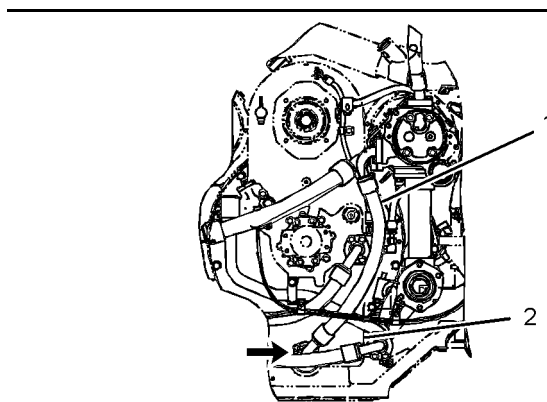


Illustration 233

Rear view

2. Disconnect hose (1) from torque converter housing (2).

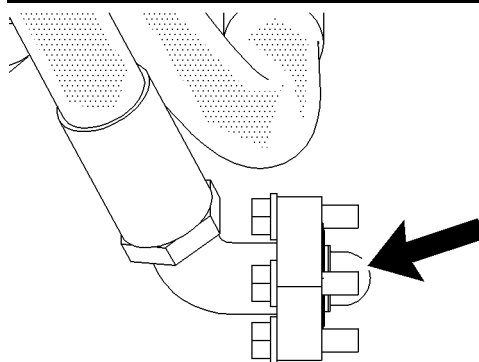


Illustration 234

3. Remove the torque converter scavenge screen from the torque converter housing.
4. Wash the screen in a clean, nonflammable solvent.
5. Install the screen in the torque converter housing.
6. Connect hose (1) to torque converter housing (2).
7. Install the bottom guard.

Track - Check/Adjust

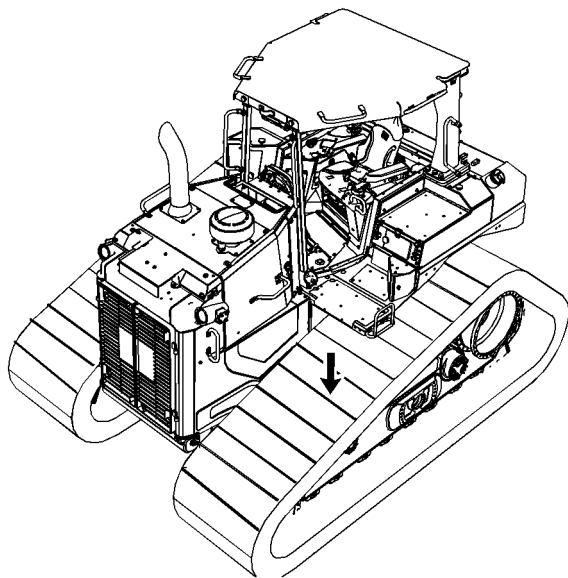


Illustration 235

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

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.

1. Move the machine forward. Allow the machine to coast to a stop without the use of the service brakes. Adjust the tracks while you are in the machine typical operating conditions. If packing conditions prevail on the workplace, the tracks should be adjusted without removing the packed material.
2. To measure the sag in the track, stretch a string over the grousers that are between the sprocket and the front idler. Take the measurement from the string to the top of the grouser at the maximum measurement. Dimension (A) is the maximum distance between the string and the grouser.

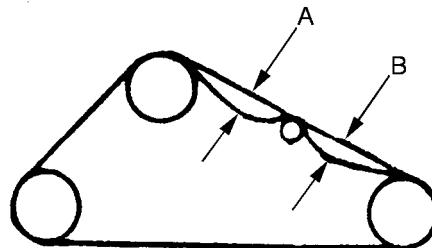


Illustration 236

The machine is equipped with a carrier roller. Calculate the average of dimension (A) and dimension (B). The correct average value is 55 ± 10 mm (2.2 ± 0.4 inch).

Loose Track Adjustment

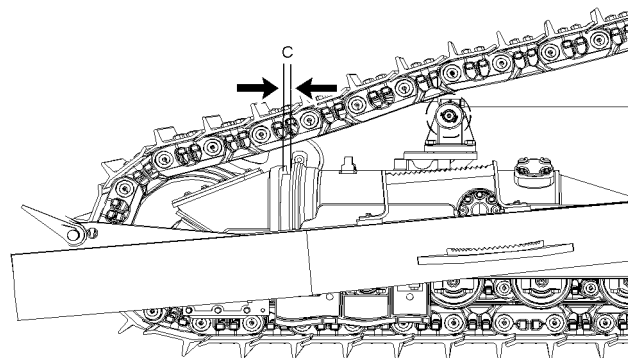


Illustration 237

NOTICE

Do not attempt to tighten track when dimension (C) is 150 mm (5.9 inch) or more.

Contact your Caterpillar dealer for track service or instructions.

1. Remove the access cover.

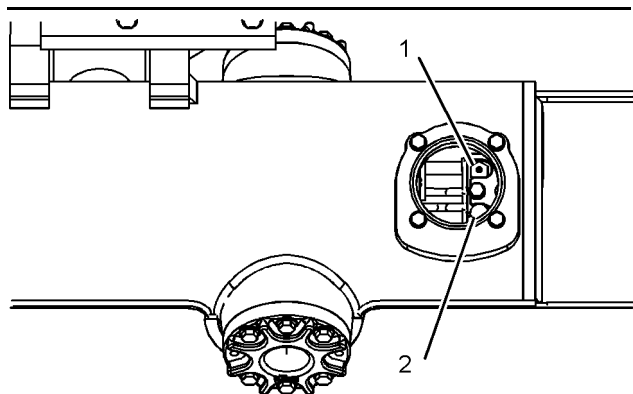


Illustration 238

2. Add multipurpose grease (MPGM) through track adjustment valve (1). Add the MPGM until dimension (A, B) is correct.
3. Operate the machine back and forth in order to equalize the pressure. Allow the machine to coast to a complete stop. Do not use the brakes.
4. Remeasure dimension (C).

Reference: See Operation and Maintenance Manual, "Front Idler Position - Check" for additional information on System One Undercarriage.

Tight Track Adjustment

1. Loosen relief valve (2) by one turn of 360 degrees. Allow the grease to escape.
2. Close the relief valve. Tighten the valve to a torque of 34 ± 7 N·m (25 ± 5 lb ft).
3. Add MPGM through track adjustment valve (1). Add grease until dimension (A, B, C) is correct.
4. Install the access cover.

Bolt Torque for Track Shoes

SystemOne Undercarriage

The track shoe bolts are 22.0 mm (0.87 inch). The torque requirement for track shoe bolts is 500 ± 70 N·m (370 ± 50 lb ft). Tighten the bolts by an additional turn of 120 degrees. If you are using bolts with a master link, tighten the master bolts to a torque of 500 ± 70 N·m (370 ± 50 lb ft). Then, turn each bolt by an additional turn of 180 degrees.

Track Pins - Inspect

WARNING

Fingers can be burned from hot pins and bushings.

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

Use the recommendations in order to extend the life of the undercarriage. Use the recommendations in order to avoid excessive downtime.

1. During the machine operation, listen for unusual squeaking and for unusual squealing. This noise can indicate a dry joint.
2. Check the machine for dry joints weekly. Check for dry joints immediately after machine operation. After machine operation, lightly touch the end of each track pin or bushing. Touch the track pin or the track bushing with the back of your hand. Make a mark on any dry track pin joint that is hot to the touch.

Consult the Custom Track Service expert at any Cat dealer if you detect dry joints or leaks. The Custom Track Service expert at the Cat dealer can perform track inspection.

Track Roller Frame Guides - Inspect

Measure the rotational movement of the front roller frame relative to the rear roller frame.

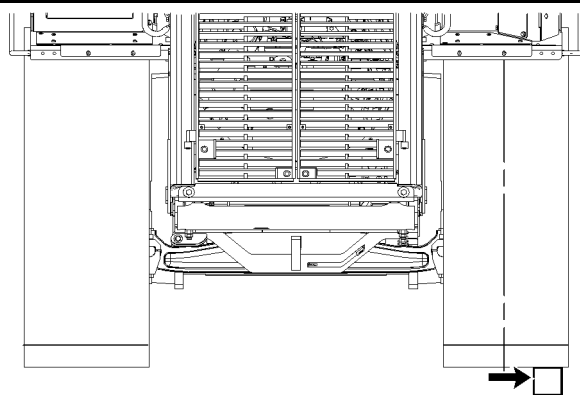


Illustration 239

Some components are removed for clarity.

1. Raise the front of the machine with the hydraulics of the dozer. Place a 100 mm (4 inch) block under the outside edge of a track grouser. Place the block near the track idler. Lower the machine onto the block.

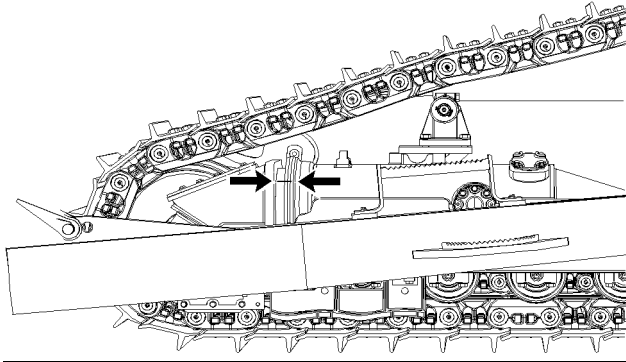


Illustration 240

2. Use a grease pencil to make a mark on the tubular section of the front roller frame. Make a mark on the rear of the roller frame. This mark should correspond with the mark that is on the tubular section.

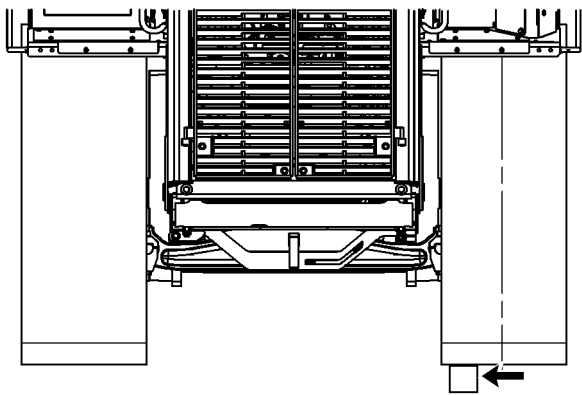


Illustration 241

Some components are removed for clarity.

3. Raise the front of the machine with the hydraulics of the dozer. Place the block under the inside edge of the same track grouser. Lower the machine onto the block.

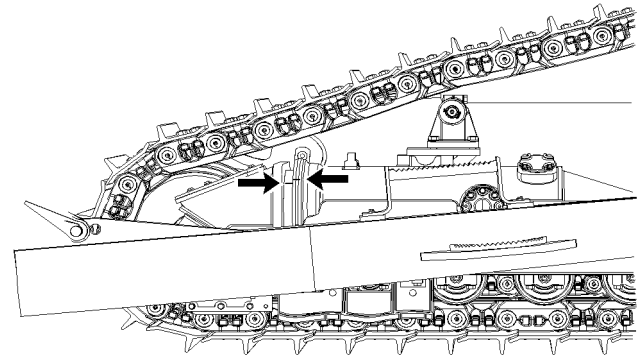


Illustration 242

4. Put a mark on the tubular section of the front roller frame. This mark should correspond with the mark on the rear roller frame. Measure the distance between the two marks on the front roller frame.

If the distance between the two marks is greater than 4.5 mm (.18 inch), inspect the track roller frame guides for wear.

Repeat the entire procedure for the other side of the machine.

NOTICE

Never build up the track roller frame guides with hard-face welding. This will cause serious wear damage to the guide slots in the front track roller frame.

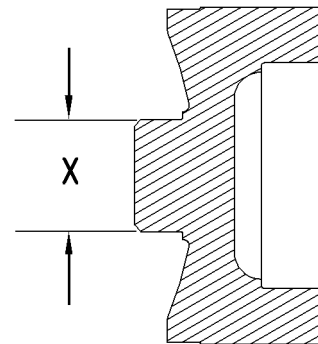


Illustration 243

If dimension (X) is less than 45.3 mm (1.78 inch), replace the track roller frame guides. Consult your Caterpillar dealer for information or for service.

Transmission Breather - Clean/Replace

Clean

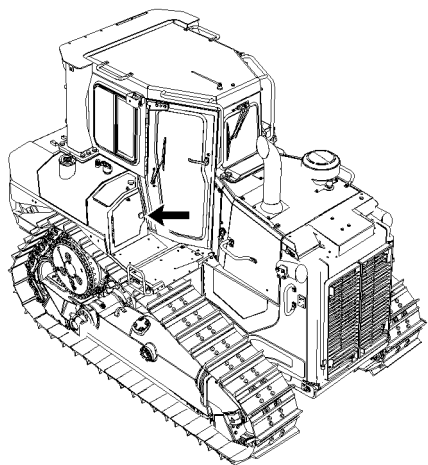


Illustration 244

1. Open the front access door on the right side of the cab.

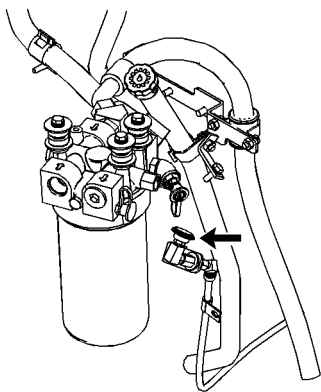


Illustration 245

2. The transmission breather is located on the bulk head bracket. Unscrew and remove the transmission breather.
3. Clean the breather in clean, nonflammable solvent.
4. Install the breather.
5. Close the front access door on the right side of the cab.

Replace

Replace the transmission breather if the breather is no longer capable of cleaning.

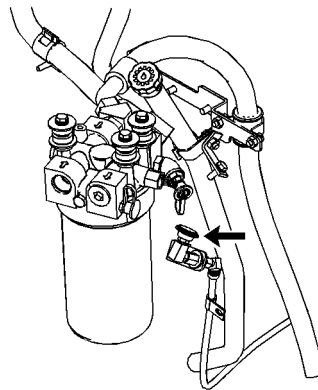


Illustration 246

1. The transmission breather is located on the bulk head bracket. Unscrew and remove transmission breather (1).
2. Install the new breather.
3. Close the front access door on the right side of the cab.

Transmission Magnetic Screen - Clean

When you change the transmission oil, clean the magnet assembly and the screen.

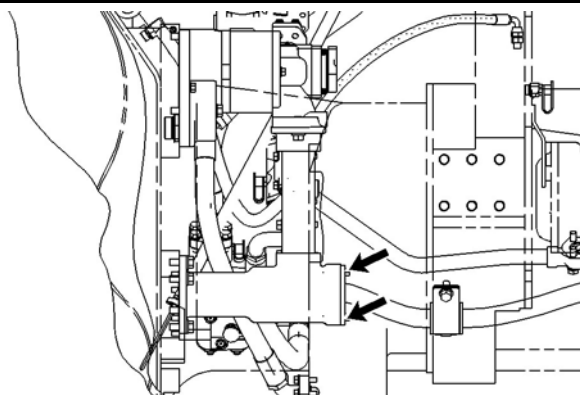


Illustration 247

1. Remove the bottom guard for access to the screen group.
2. Remove the nuts which hold the cover to the housing.
3. Remove the screen and the magnet assembly from the housing.

4. Wash the screen and the magnet assembly in a clean, nonflammable solvent.
5. Inspect the seal. If the seal is damaged, install a new seal.
6. Install the screen and the magnet assembly.
7. Install the cover on the screen housing.
8. Install the bottom guard.

Transmission Oil - Change

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "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.

Drain The Oil

Operate the machine in order to warm the power train oil. The machine must be level. Lower the attachments with slight down pressure.

See the Topic "Transmission Oil Filter - Replace" in this manual for the procedure to change the filters.

Use a 126-7538 Nozzle if the machine is equipped with the high speed oil change arrangement. The high speed oil change arrangement removes oil from the sump in the bevel gear case. The high speed oil change arrangement does not remove oil from the torque converter or from the transmission case.

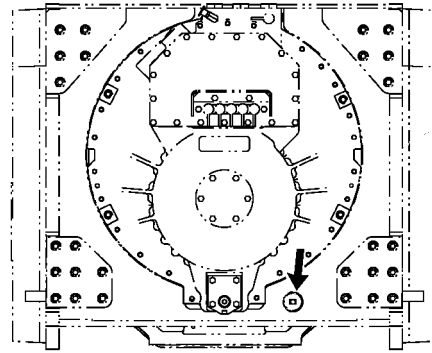


Illustration 248

1. Remove the plug from the drain in the bevel gear case. Install a 4C-8563 Swivel into the valve. Clamp a hose to the swivel. A 25.4 mm (1 inch) pipe and hose can be used. Use a 25.4 mm (1 inch) pipe with 1-11 1/2 NPTF threads. Do not tighten the pipe.
2. Turn the swivel or pipe clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.
3. Change the filter element. See the Topic "Transmission System Oil Filter-Replace" in this manual.
4. Remove the swivel or remove the pipe from the drain in the bevel gear case. The drain valve will close.
5. Clean the oil drain plug and install the oil drain plug.

Fill with Oil

1. Open the access cover on the right side of the cab in front of the hydraulic tank.

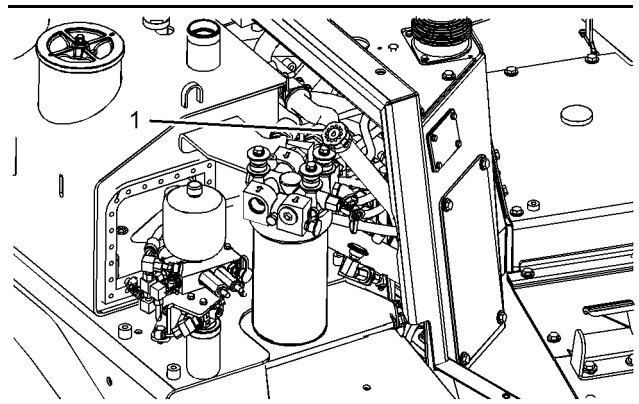


Illustration 249

2. Remove cap (1) from the transmission oil filler tube.

- Fill the bevel gear case with oil. See Topic “Refill Capacities” in this manual.

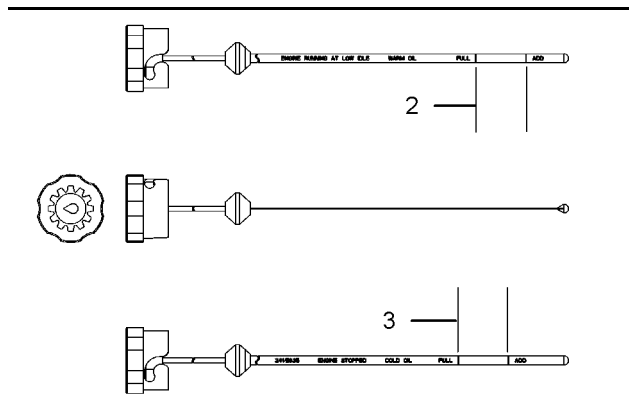


Illustration 250

- Warm oil
- Cold oil

- Maintain the oil level within the marks for the operating range on the dipstick. If the engine is at idle and the oil is warm, maintain the oil level within range (2). If the engine is stopped and the engine oil is cold, maintain the oil level within range (3).
- Clean the oil filler cap. Install the oil filler cap.
- Close the access door.

Transmission Oil Filter - Replace

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 “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.

If the transmission oil filter indicator in the monitoring panel comes on before 1000 hours, the filter should be changed.

The transmission oil filter is located behind the front access cover on the right side of the cab.

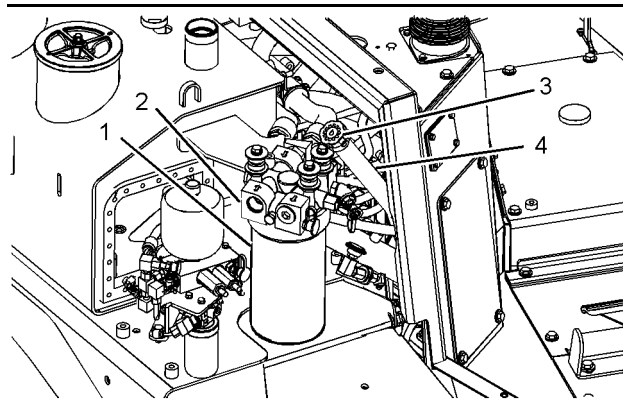


Illustration 251

- Remove transmission oil filter housing (1) from the transmission oil filter base (2).
- Remove the transmission oil filter element and properly dispose of the filter element.
- Clean the transmission oil filter housing with a clean cloth.
- Inspect the seal. If the seal is damaged, replace the seal.
- Install the new filter element into the oil filter housing. Then, install transmission oil filter housing (1) into base (2).
- Remove cap (3) from transmission oil filler tube (4).
- Fill the transmission system with oil.

Note: Lubricate the threads of the transmission oil filter housing.

Reference: See Operation and Maintenance Manual, “Lubricant Viscosities” in this manual for the correct viscosity grade of oil.

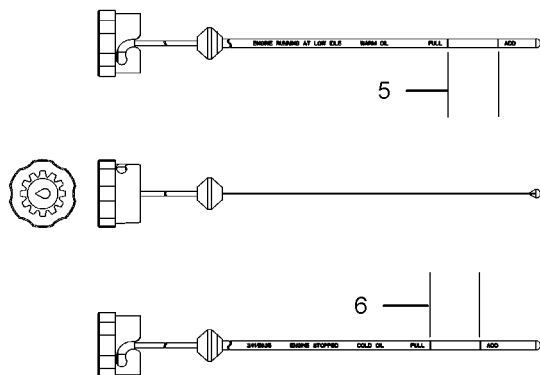


Illustration 252

Full marks

- (5) **Warm oil**
(6) **Cold oil**

8. Maintain the oil level within the marks for the operating range on the dipstick. If the engine is at idle and the oil is warm, maintain the oil level within range (5). If the engine is stopped and the engine oil is cold, maintain the oil level within range (6).

9. Clean filler cap (3) and install the filler cap.

10. Close the access cover (not shown).

Transmission Oil Level - Check

⚠ WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

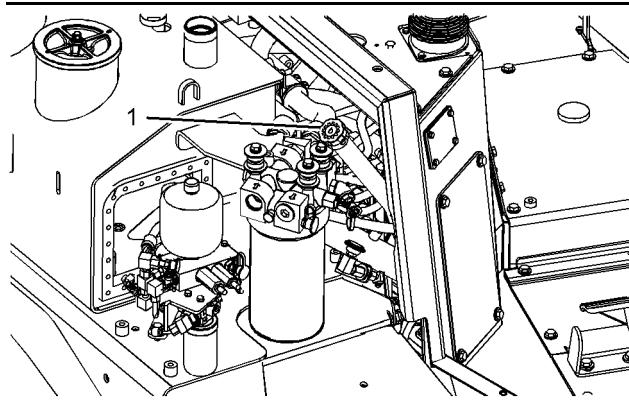


Illustration 253

1. Open the access cover on the right side of the cab in front of the hydraulic tank.

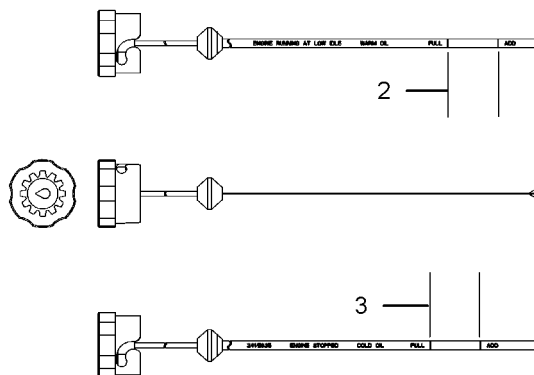


Illustration 254

- (2) **Warm Oil**
(3) **Cold Oil**

2. Remove the transmission oil level gauge (1). Maintain the oil level within the marks for the operating range on the dipstick. If the engine is at idle and the oil is warm, maintain the oil level within range (2). If the engine is stopped and the engine oil is cold, maintain the oil level within range (3).

Note: When you are operating the machine on severe slopes, the quantity of oil in the transmission can be increased up to 10 percent. When you are operating with the increased oil quantity, prolonged operation in some machines can cause high transmission oil temperatures. After the work on the severe slopes has been completed, drain the excessive oil quantity from the bevel gear case.

3. If necessary, add oil.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" in this manual.

4. Clean the filler cap and install the filler cap.

5. Close the access cover.

Transmission Scavenge Screen - Clean

When you change the transmission oil, clean the scavenge screen.

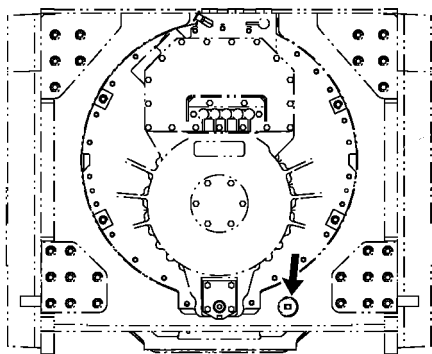


Illustration 255

1. Remove the cover from the rear of the transmission. The scavenge screen is located behind the cover.
2. Wash the screen in a clean, nonflammable solvent.
3. Inspect the seal. If the seal is damaged, replace the seal.
4. Install the screen and the cover.

Transmission System Oil Sample - Obtain

WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500 "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.

Obtain the sample of the transmission oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S·O·S oil analysis, establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

If the machine is operated under high load and/or under high temperature conditions, sample all fluids at the 250 hour interval.

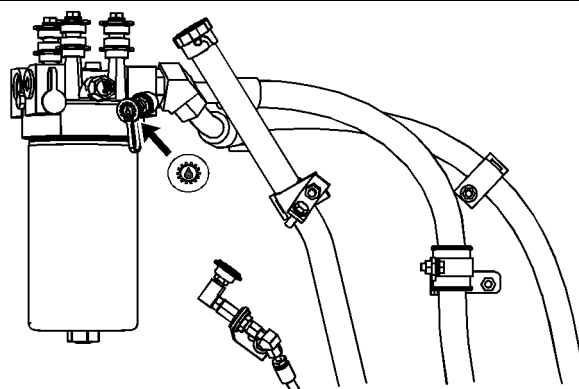


Illustration 256

The oil sampling valve for the power train is shown.

1. Open the access cover on the right side of the cab in front of the hydraulic tank.
2. Remove the protective cap.
3. Use 8T-9190 Fluid Sampling Bottle (1) to obtain a sample.
4. After you take a sample, remove the cap with the probe from the bottle. Discard the cap with the probe. Install the sealing cap that is provided with 8T-9190 Fluid Sampling Bottle (1).
5. Replace the protective cap.
6. Install the access cover.

Reference: Refer to , "Lubricant Viscosities" in the Maintenance Section of this manual for the correct fluid for your machine.

Window Washer Reservoir - Fill

NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.

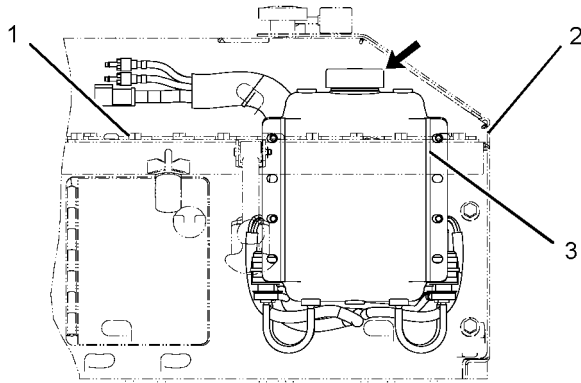


Illustration 257



Windshield Washer – Washer fluid bottle (3) is on the left side of the machine in a compartment between battery box (1) and fuel tank (2). Open the access cover.

Remove the fluid bottle cap in order to fill the washer fluid bottle.

Window Wipers - Inspect/Replace (If Equipped)

1. Inspect front window wiper blade (1), the left window wiper blade (4), and right window wiper blade (5).

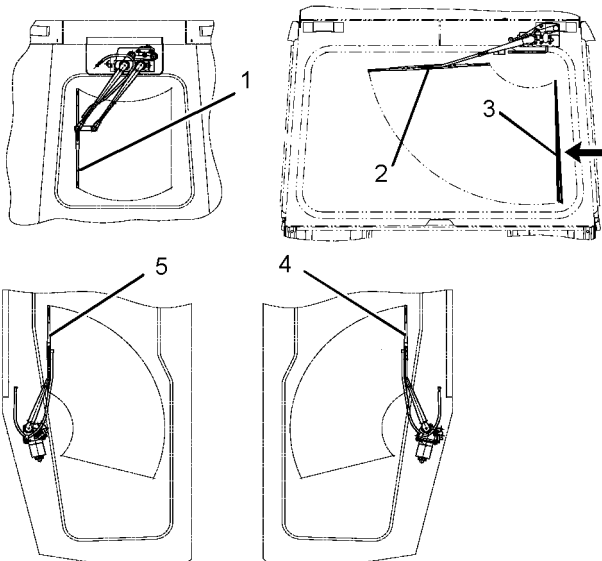


Illustration 258

2. Start rear wiper (2) and stop the wiper in the rightmost position (3). Inspect the rear window wiper blade or replace the wiper blade by using the appropriate three-point contact only.

Reference: See “Mounting and Dismounting” in this manual for additional information.

3. Replace any wiper blades that are damaged or worn. Replace any wiper blades that streak the window.

Windows - Clean

Use commercially available window cleaning solutions to clean the windows.

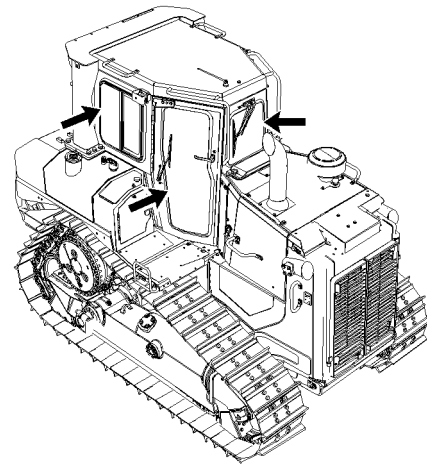


Illustration 259

Clean all the cab windows and the door windows.

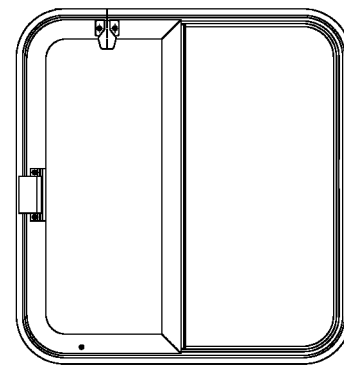


Illustration 260

Clean the inside of the side windows with the window in the CLOSED position.

Cleaning From Ground Level

Note: Use the following method in order to clean a solid rear window.

Clean the outside of the rear window from the ground or with the use of a man lift, unless appropriate handholds are available.

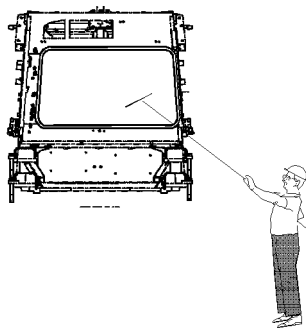


Illustration 261

Warranty Section (D6T LGP (OEM))

Warranty Information

Emissions Warranty Information

Caterpillar Inc. (Caterpillar) 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 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 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 Caterpillar application for certification for the warranty period.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in supplement Special Publication, SELF9001 "Federal Emission Control Warranty" and "Emission Control Warranty for California". Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty.

Reference Information Section (D6T LGP (OEM))

Reference Materials

Reference Material

The following literature can be obtained from any Cat dealer:

- Special Publication, SEBD0518 "Know Your Cooling System"
- Special Publication, SEBD0970 "Coolant and Your Engine"
- Special Publication, SEBD0717 "Diesel Fuels and Your Engine"
- Service Magazine, SEBD1587
- "What ROPS/FOPS Certification Means" **28October 1985**
- Special Instruction, SEHS6929, "Inspection, Maintenance, and Repair of Rollover Protective Structures (ROPS) and Attachment Installation Guidelines"
- Special Instruction, SEHS7392 "Storage of Diesel Engines"
- Special Instruction, SEHS7633 "Battery Test Procedure"
- Special Instruction, SEHS7768 "6V-2150 Starting/Charging Analyzer Group"
- Tool Operating Manual, NEHS0973 "271-8590 Analyzer Group (24 V)"
- Special Instruction, REHS0354 "Charging System Troubleshooting"
- System Operation, Troubleshooting, Testing and Adjusting, RENR8143, "Product Link PL522/523"
- Special Instruction, REHS2368, "An Installation Guide for the Product Link PL522/523 (Cellular)"
- Special Instruction, REHS1642 "Operation of the Product Link System"
- Special Publication, NENG2500 "Cat Dealer Service Tool Catalog"
- Special Instruction, SEHS9031 "Storage Procedure for Caterpillar Products"

- Special Instruction, REHS1110 "Installation and Removal of SystemOne Track"
- Special Instruction, REHS2403 "Installation and Removal of SystemOne Track with the Multi-Pitch SystemOne Track Press Tool"
- Special Instruction, REHS2350 "SystemOne Undercarriage Overview"
- Specifications, SENR3130, "Torque Specifications"
- Special Publication, SEBU5898 "Cold Weather Recommendations for all Caterpillar Equipment"
- Special Publication, SEBD0640 "Oil and Your Engine"
- Special Publication, SEBU6250 "Caterpillar Machine Fluids Recommendations"
- Special Publication, SEBU6981 "Emissions Control Warranty Information"
- Service Manual, SENR5664, "Air Conditioning and Heating R-134a All Caterpillar Machines"
- Service Manual, RENR2014 "Caterpillar Monitoring System"
- Operation and Maintenance Manual, SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC"
- Safety Manual, SEBU5311, "Crawler Tractor/Loader Safety Manual AEM Form CLT80-1"
- Service Manual, UENR2067, "D6T O.E.M. Track-Type Tractor"
- Parts Manual, SEBP5819, "PLR1-Up"

Operation and Maintenance Manuals are available in other languages. Consult your Cat dealer for information about obtaining these Operation and Maintenance Manuals.

Additional Reference Material

ASTM D2896, "TBN Measurements" This reference can normally be obtained from your local technological society, from your local library, or from your local college.

SAE J313, "Diesel Fuels" This reference can be found in the SAE handbook. Also, this publication can be obtained from your local technological society, from your local library, or from your local college.

SAE J754, "Nomenclature" This reference can normally be found in the SAE handbook.

SAE J183, "Classification" This reference can normally be found in the SAE handbook.

Engine Manufacturers Association, "Engine Fluids Data Book."

Engine Manufacturers Association
Two North LaSalle Street, Suite 2200
Chicago, Illinois, USA 60602
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(312) 644-6610

Facsimile –
(312) 827-8737

The "Society of Automotive Engineers (SAE) Specifications" can be found in your SAE handbook. This publication can also be obtained from the following locations: local technological society, local library and local college. If necessary, consult SAE at the following address:

SAE International
400 Commonwealth Drive
Warrendale, PA, USA 15096-0001
Telephone –
(724) 776-4841

The International Organization for Standardization (ISO) offers information and customer service regarding international standards and standardizing activities. ISO can also supply information on the following subjects that are not controlled by ISO: national standards, regional standards, regulations, certification and related activities. Consult the member of ISO in your country.

International Organization for Standardization (ISO)
1, rue de Varembe
Case postale 56
CH-1211 Genève 20
Switzerland
Telephone –
+41 22 749 01 11

Facsimile –
+41 22 733 34 30

E-mail –
central@iso.ch

web site –
<http://www.iso.ch>

Decommissioning and Disposal

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations. Consult the nearest Cat dealer for additional information.

Safety Section (Pipelayer Attachment Kit)

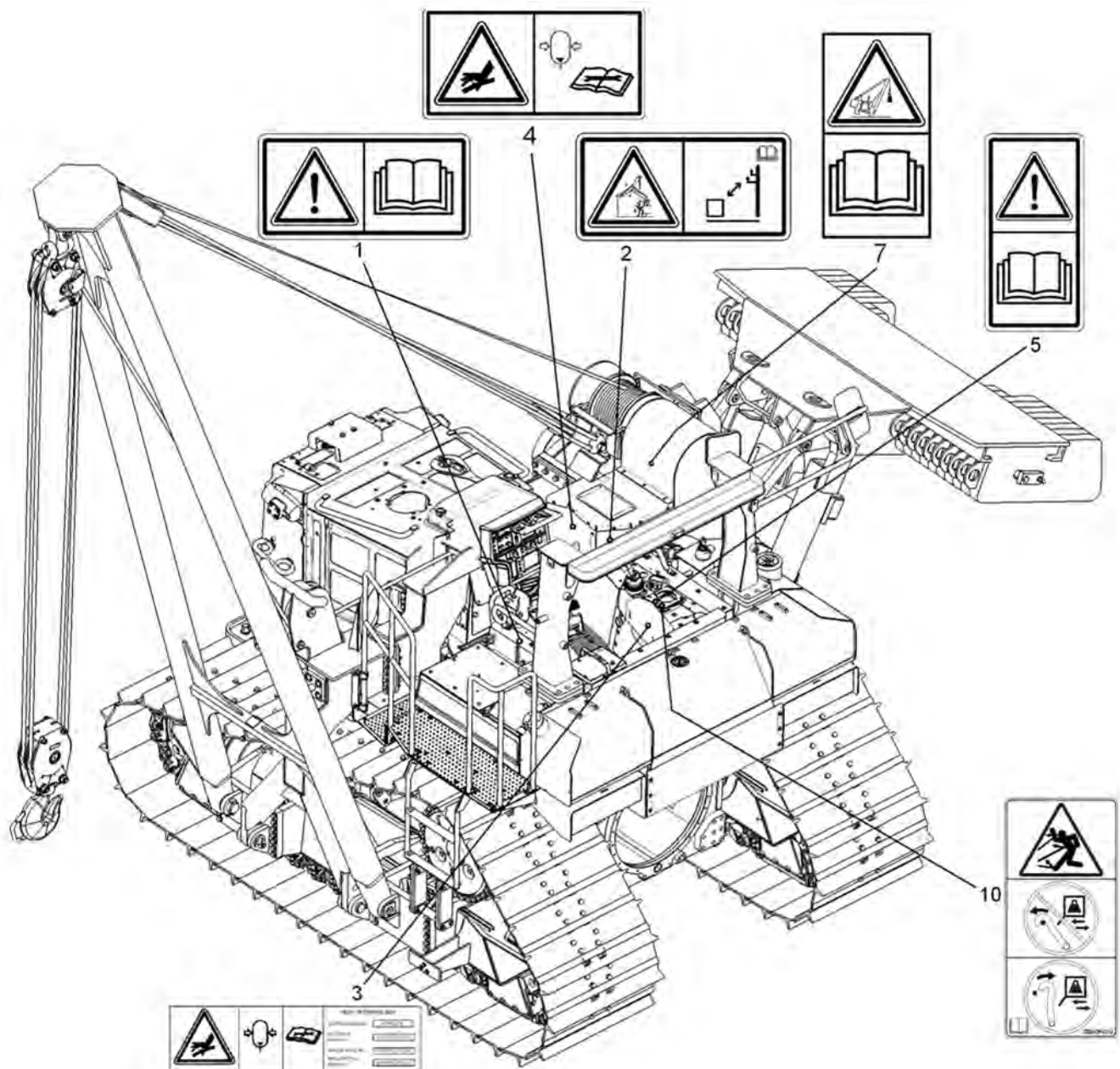
Certain conditions and precautions are peculiar to pipelaying operations. The following represents the minimum considerations for safe operations.

Safety Messages - 72H Pipelayer

NOTICE

Other safety precautions related to the operation of the tractor also apply.

Refer to CATERPILLAR Tractor Operation and Maintenance manual, Safety Section.



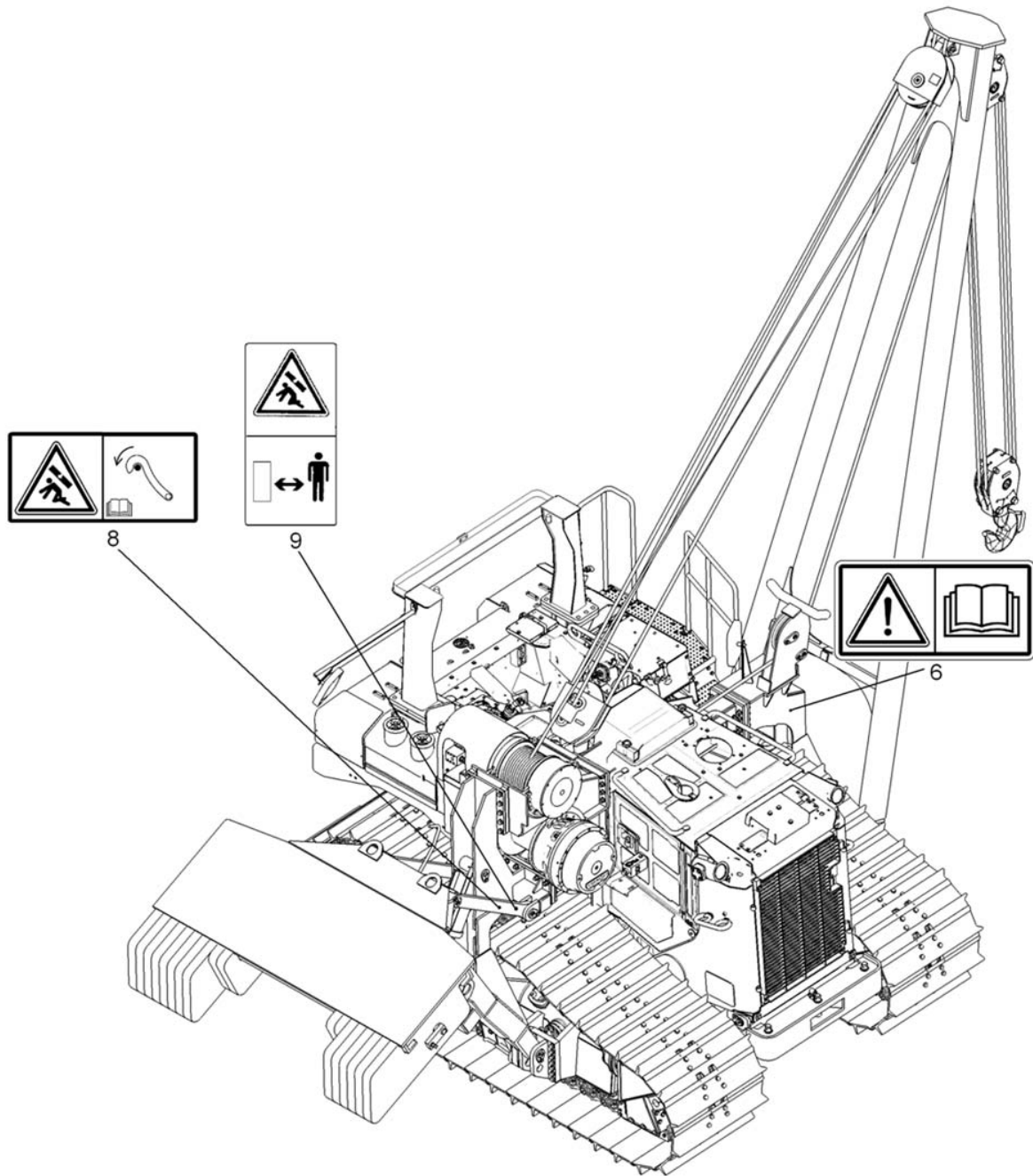


Illustration 263

Safety Messages 72H Pipelayer

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

Make sure that all of the safety messages are legible. Clean the safety messages or replace the safety messages if you cannot read the words. Replace the illustrations if the illustrations are not 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 messages. Loose adhesive will allow the safety message to fall. Do not use pressure washers to clean the warning signs.

Replace any safety message that is damaged or missing. If a safety message is attached to a part of the machine that is replaced, install a safety message on the replacement part.

Do Not Operate 1

Safety message (1) is located outside of the left hand operator console arm rest.

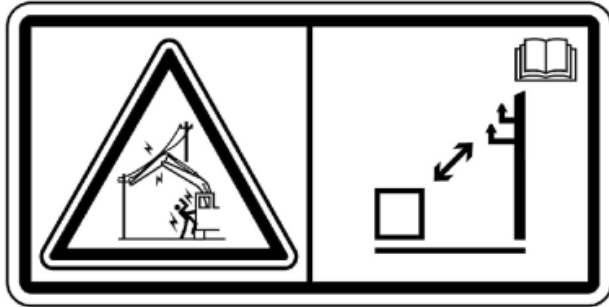


WARNING

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

Electrical Power Lines 2

Safety message (2) is located on the right side of the console, on the guarding to the front of the pipelayer controls.

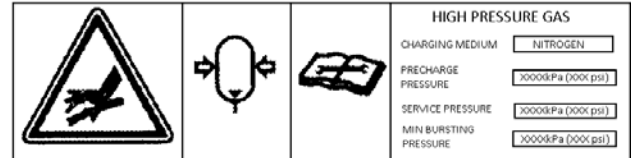


DANGER

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

Hydraulic Accumulator 3

Safety message (3) is attached to the hydraulic accumulator. The hydraulic accumulator is located behind the access cover to the right side of the operator seat.

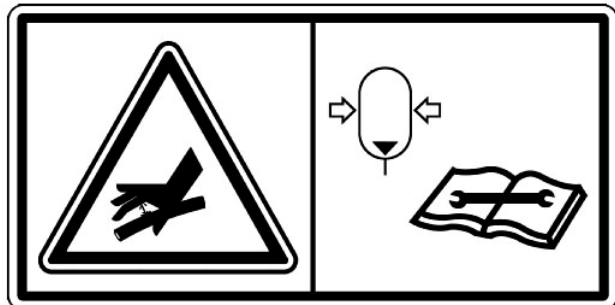


WARNING

High Pressure Cylinder: Rapid discharging from disconnecting or disassembly or failure to follow the instructions and warnings could cause an explosion, resulting in possible injury or death. Do not expose to fire. Do not weld. Do not drill. Do not remove any hydraulic system lines, taps or parts until pressure has been relieved. Relieve pressure before discharging. See Operation and Maintenance Manual "Accumulator" for charging and discharging. See your Dealer for tools and detailed information. Precharge only with dry nitrogen gas.

Hydraulic Accumulator 4

Safety message (4) is located on the lower right side of the console, below the pipelayer controls.

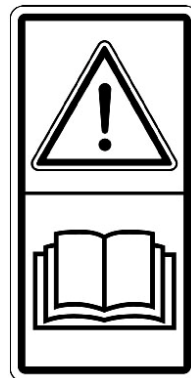


WARNING

High Pressure Cylinder: Rapid discharging from disconnecting or disassembly or failure to follow the instructions and warnings could cause an explosion, resulting in possible injury or death. Do not expose to fire. Do not weld. Do not drill. Do not remove any hydraulic system lines, taps or parts until pressure has been relieved. Relieve pressure before discharging. See Operation and Maintenance Manual "Accumulator" for charging and discharging. See your Dealer for tools and detailed information. Precharge only with dry nitrogen gas.

Free Fall Active - Do Not Operate 5

Safety message (5) is located on the right side, on the pipelayer control box.

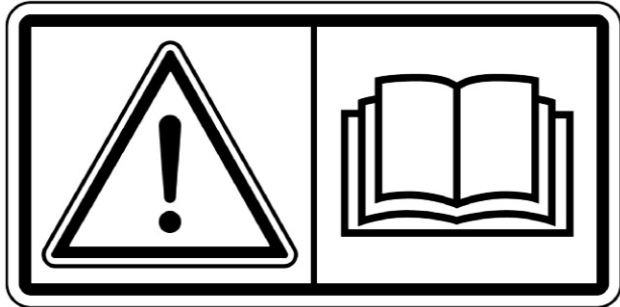


WARNING

Dropping load hazard! The free fall control remains live for several hours after the engine has been stopped. Operation of the free fall control could cause a sudden uncontrolled drop of any supported load. Do not operate the free fall control when personnel are near a suspended load, even with the engine stopped. See Operation and Maintenance Manual "Pipelayer Operation" for complete description of control operation.

Boom Stop Operation and Adjustment - Do Not Operate 6

Safety message (6) is located on the left side of the crossmember support, at the front, on the boom stop valve access panel.



WARNING

The Boom Stop system stops the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Defeating the boom stop valve could result in serious equipment damage, personnel injury, or even death. The boom stop function must be checked and verified daily. Do not Operate until it has been checked and properly adjusted. See the Operation and Maintenance Manual "Boom Stop Valve".

Tipover Hazard 7

Safety message (7) is located to the of the console, on the upper winch guarding.



WARNING

The machine may tip and personal injury may occur if the maximum load capacities are exceeded. Load capacities assume that the machine is stationary on a level concrete surface with the counterweight extended. Lift capacities will decrease on slopes or soft ground. See Operation and Maintenance Manual "Lifting Capacities".

Counterweight Crushing Hazard 8

Safety message (8) is located on the front and rear sides of the Counterweight arm.



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.

Use the lock to secure the counterweight when the machine is serviced. Refer to Operation and Maintenance Manual, "Counterweight Lock Lever" for details.

Counterweight Crushing Hazard 9

Safety message (9) is located on the front and rear sides of the upper counterweight frame, and on the front and rear counterweight swing links.



WARNING

Crushing Hazard! Be sure no one is under or near the counterweight before lowering the counterweight. 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. Keep all personnel away from the counterweight when lowering the counterweight to avoid possible personnel injury or death.

Counterweight Lock Lever Thrown or Flying Objects - Full Body Exposure 10

Safety message (10) located on the right side, near the counterweight control.



WARNING

Thrown or flying objects - full body exposure! Do not operate counterweight while the counterweight lock lever is engaged. Retracting the counterweight while the lock lever is engaged could cause serious equipment damage, personnel injury, or even death. Ensure the counterweight lock lever is fully disengaged before retracting the counterweight.

Visibility Information

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

While the machine is in operation, the operator should constantly survey the area around the machine. The operator needs to identify potential hazards as a hazard becomes visible around the machine.

Your machine may be equipped with mirrors or other visual aids. An example of a visual aid is Closed Circuit Television (CCTV). The operator should ensure that the visual aids are in proper working condition and that the visual aids are clean. Adjust the visual aids for the best visibility of all areas around the 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.

Before Operation

Clear all personnel from the machine and from the area.

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

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

Reference: Refer to Operation and Maintenance Manual, "Daily Inspection" in this manual and in the Tractor's manual.

Fasten the seat belt securely.

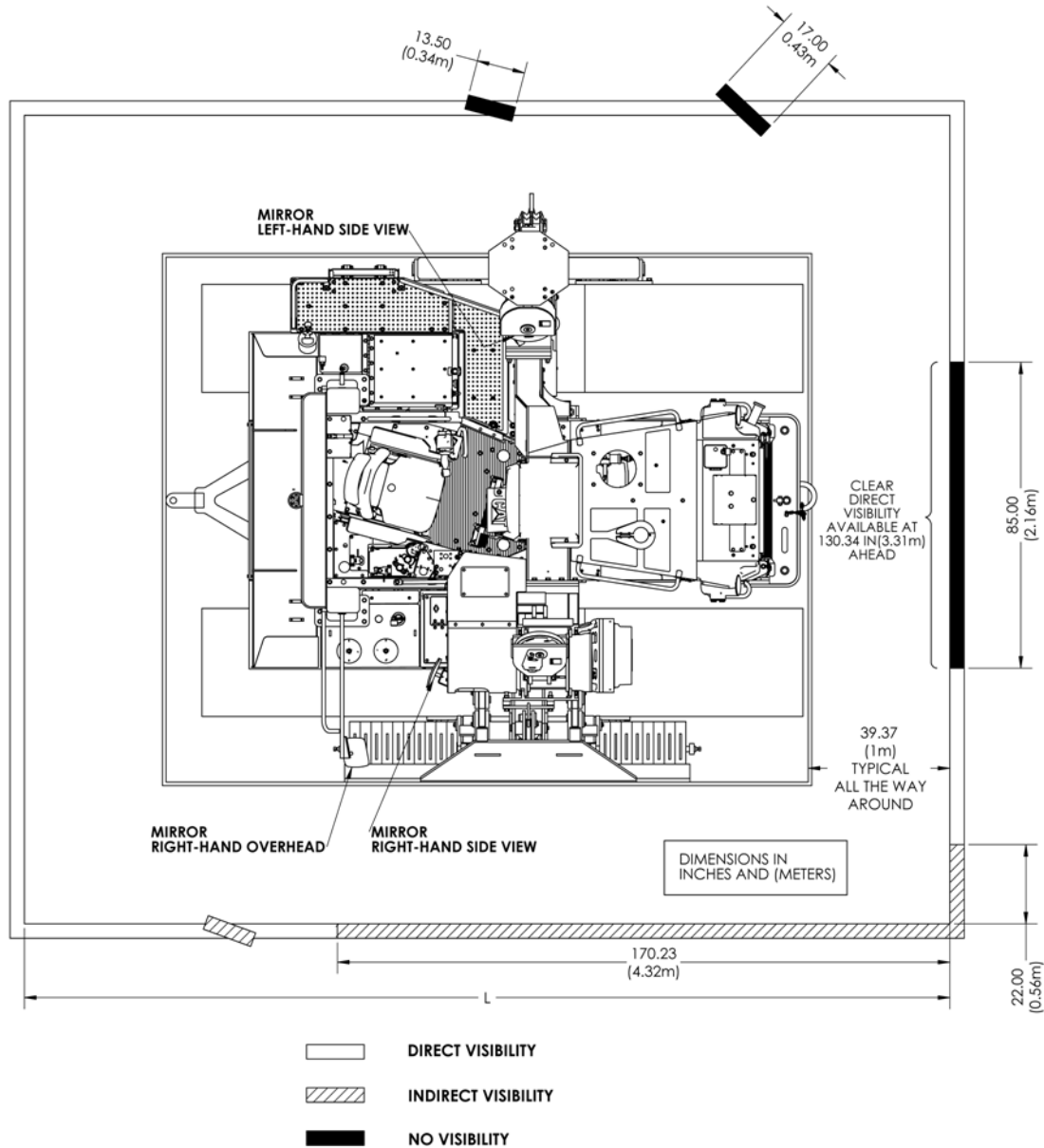


Illustration 264

Operator Field of View as per ISO 5006:2006

The operator is required to survey his/her field of vision when operating the machine.

The operator shall take notice of the areas of no visibility located at the front and front left of the machine (see figure).

Both the right-hand overhead mirror, and the right-hand side view mirror shall be adjusted so that a person walking 1m to the right of the machine, for the length L, can be seen in a length of at least 200mm either directly or indirectly at every position (see figure).

The left-hand side view mirrors shall be adjusted so the operator is comfortable with his/her vision to the rear of the machine.

Examples of job site organization include the following:

- Safety instructions
- Controlled patterns of machine movement
- Controlled patterns of vehicle movement
- 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

Operation

Machine Operating Temperature Range

The standard pipelayer component configuration is intended for use within an ambient temperature range of -40 °C (-40 °F) to 50 °C (122 °F). Special configurations for different ambient temperatures may be available. Consult your dealer for additional information. Refer to the specific tractor Operation and Maintenance manual for standard tractor capabilities.

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.

Before you move the machine, make sure that no one will be endangered.

Check for proper operation of all controls and protective devices while you operate the machine slowly in an open area. Do not allow riders on the machine unless the machine has the following equipment:

- additional seat
- additional seat belt

Report any needed repairs that were noted during operation.

Do not go close to the edge of a cliff, an excavation, or an overhang.

If the machine begins to sideslip, turn the machine downhill.

Be careful to avoid any condition which could cause the machine to tip. The machine can tip when you work on hills, banks, and slopes. Also, the machine can tip when you cross ditches, ridges, or other obstacles.

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

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

Be sure that the towing eyes and towing devices are adequate.

Towing eyes and towing devices should only be used to recover the machine.

Connect trailing equipment to a drawbar or to a hitch only.

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

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

Know the maximum dimensions of your machine.

Lifting Capacities

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

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

Wire rope limitations, soil conditions, and slope of terrain reduce actual capacity. All lifts must be made with the load line vertical, and the boom centerline directed toward the load.

To prevent cable from slipping off the drum, a minimum of five full-wraps of cable must remain on the winch drum at maximum working extension of the hook or boom.

Limitations on Lifting Loads That Exceed the Working Range

Do not load the boom beyond the maximum load capacity. See Operation and Maintenance Manual, "Lifting Capacities" for the load capacity of the boom.

When the load capacity is exceeded, refer to “American National Standards A.N.S.I. B3014”.

Also, follow the procedures that are listed below:

- Inspect the wire cable for defects prior to the lift operation.
- Inspect the wire cable for defects after the lift operation.
- Do not exceed the load capacity of the boom.
- The load must be handled safely in order to minimize tipping effects.
- The lift operation and the inspections must be made under controlled conditions by an authorized person.

Electrical Power Lines



WARNING

Serious injury or death by electrocution can result if the machine or attachments are not kept the proper distance from electrical power lines.

Use the following charts in order to determine the safe distance from high voltage wires during these conditions:

- machine operation
- machine transportation

Table 28

| When Operating Near High Voltage Power Lines | |
|--|----------------------------|
| Normal Voltage (Phase to Phase) | Minimum Clearance Required |
| 0 Volts to 50 kVolts | 3.05 Meters (10 Feet) |
| Over 50 kVolts to 200 kVolts | 4.60 Meters (15 Feet) |
| Over 200 kVolts to 350 kVolts | 6.10 Meters (20 Feet) |
| Over 350 kVolts to 500 kVolts | 7.62 Meters (25 Feet) |
| Over 500 kVolts to 750 kVolts | 10.67 Meters (35 Feet) |
| Over 750 kVolts to 1000 kVolts | 13.72 Meters (45 Feet) |

| While In Transit Near High Voltage Power Lines | |
|--|----------------------------|
| Normal Voltage (Phase to Phase) | Minimum Clearance Required |
| 0 Volts to .75 kVolts | 1.22 Meters (4 Feet) |
| Over .75 kVolts to 50 kVolts | 1.83 Meters (6 Feet) |
| Over 50 kVolts to 345 kVolts | 3.05 Meters (10 Feet) |
| Over 345 kVolts to 750 kVolts | 6.10 Meters (20 Feet) |
| Over 750 kVolts to 1000 kVolts | 7.62 Meters (25 Feet) |

Parking

Park on a level surface. If you must park on a grade, use blocks to prevent the machine from rolling.

Apply the service brake in order to stop the machine. Move the transmission control lever to NEUTRAL position and move the engine speed switch to the LOW IDLE position. Engage the parking brake.

Lower any load to the ground and fully retract the counterweight.

Refer to the tractor's operation and maintenance manual for the specific procedures regarding engine shut down and/or other implement attachments.

Slope Operation

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Note: Refer to the tractor's operation and maintenance manual for further specific requirements for safe operation on steep slopes.

Equipment Lowering with Engine Stopped

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure will cause immediate, rapid lowering of the load. 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.

Sound Information and Vibration Information

Sound Level Information

Hearing protection may be needed when the machine is operated with an open operator station and an open cab 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 Performance for Machines that are Offered in European Union Countries and in Countries that Adopt the EU Directives

The operator sound pressure level is 87 dB(A) when "ISO 6394:2008" is used to measure the value for an open operator station.

The sound power level that is labeled on the machine is 110 dB(A). The measurement of the sound power level was made according to the static test procedures and conditions that are specified in "ISO 6393:2008" and the criteria per "2000/14/EC".

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

Refer to the tractor operation and maintenance manual "The European Union Physical Agents (Vibration) Directive 2002/44/EC " for complete information, noting that the Information Concerning Whole Body Vibration Level will not be greater than the typical operating activity values given for dozing.

Guards

There are different types of guards that are used to protect the operator.

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.

Product Information Section (Pipelayer Attachment Kit)

General Information

Components

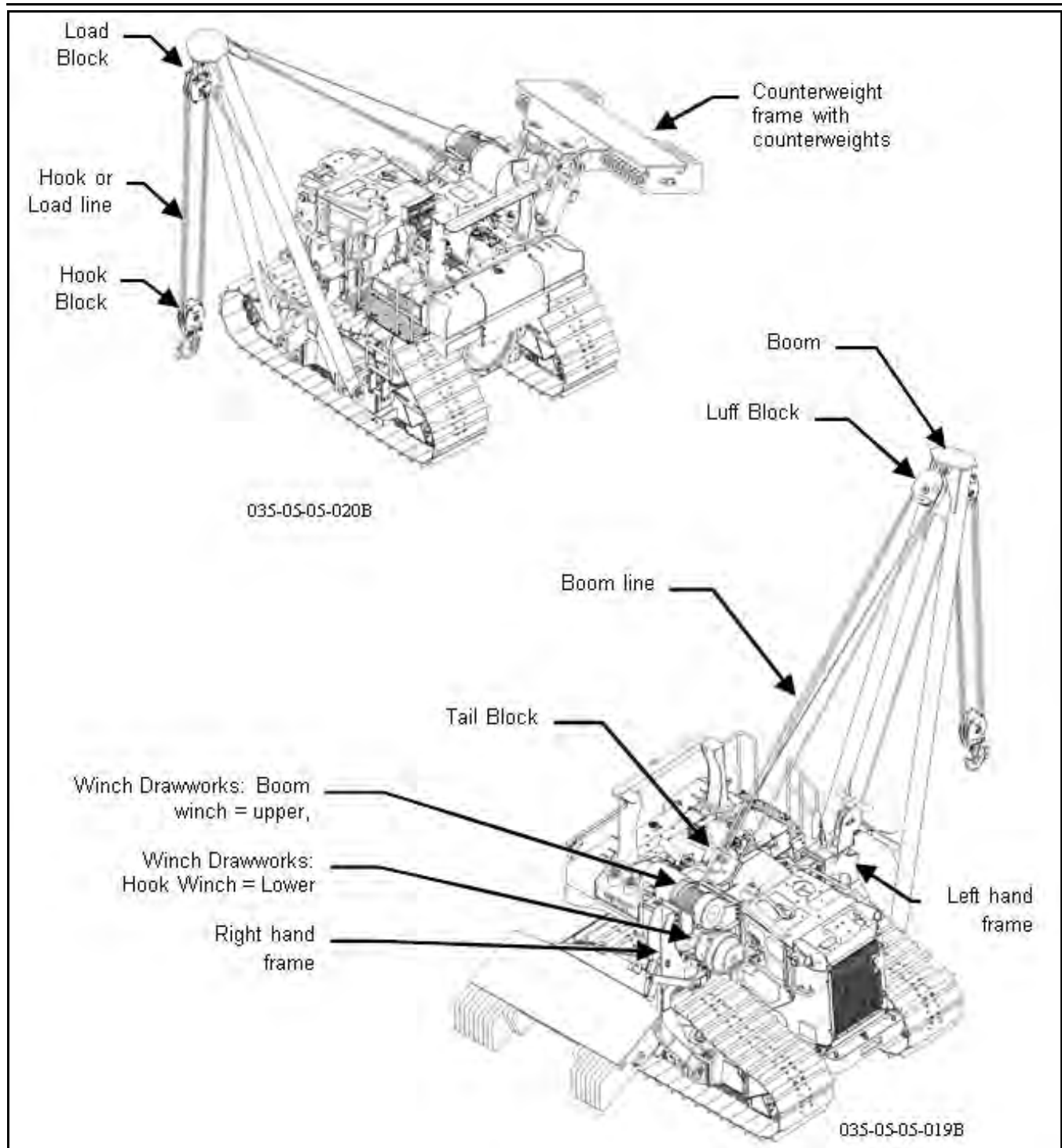


Illustration 265

Component Identification

Specifications

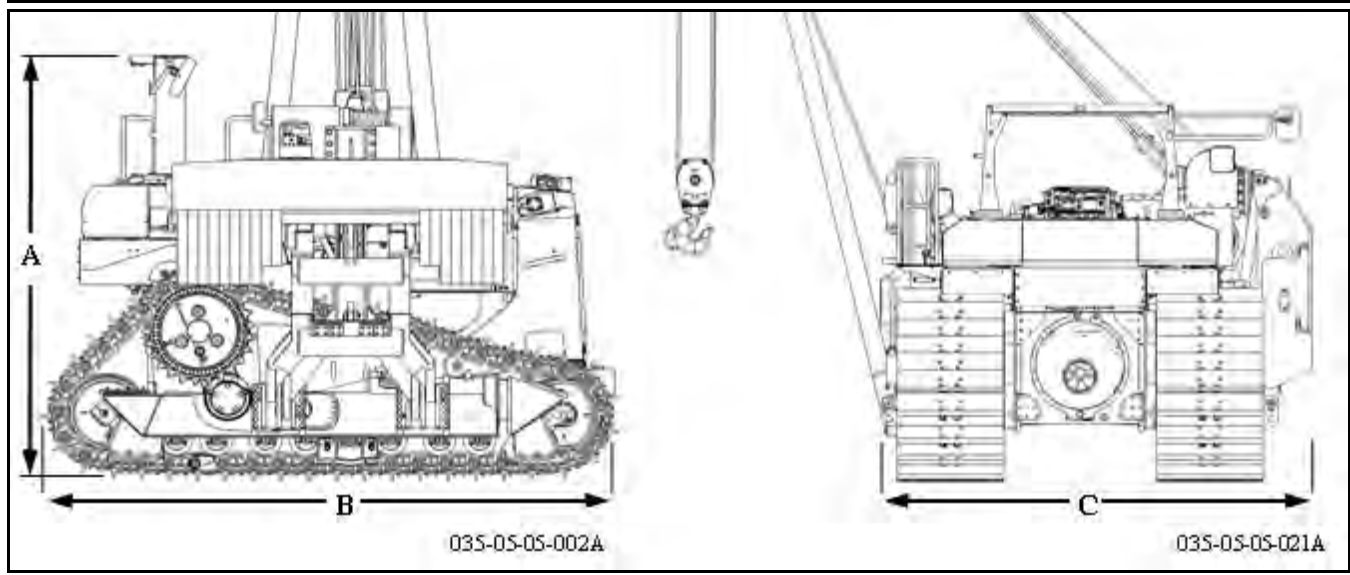


Illustration 266

Standard shipping specifications, height and width

Table 29

| 72H Pipelayer | |
|---|--|
| Approximate operating weight of the standard machine ⁽¹⁾ | 29 207 kg (64,390 lb)) |
| Approximate shipping weight of the standard machine ⁽²⁾ | 28 780 kg (63,450 lb) |
| Weight of the 20 ft boom, the boom sheave blocks, and the load blocks | 936 kg (2064 lb) [24 ft boom add 286 kg (630 lb)] |
| Height of the machine without the boom (A) | 3219 mm (10 feet 6-3/4 inch) |
| Length of the machine (B) | 4498 mm (14 feet 9 inches) |
| Width of the machine without the boom (C) | 3725 mm (12-feet 2 11/16-inch) |
| Height of the machine with the 20 ft boom | 6884 mm (22 feet 7 inch) [24 ft boom add 1223 mm (48-1/8 inch)] |
| Ground clearance of the machine | 434 mm (1-foot 5-inch) |

(1) Operating weight: Includes lubricants, coolant, 100% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (26 in) single grouser shoes, drawbar, counterweight, boom and pulley blocks and cable, and operator.

(2) Shipping weight: Includes lubricants, coolant, 10% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (26 in) single grouser shoes, drawbar, counterweight, and pulley blocks and cable.

Intended Use

This machine is a Pipelayer that is described in ISO 6165:2001. The machine is intended to perform the following functions: lift, handle, and lay down pipe with a side mounted boom.

Restrictions to Application and Configuration

Maximum approved operating weight is 29484 kg (65000 lb).

The maximum lift capacity is 40820 kg (90,000 lb).

The maximum fore and aft slope is 45 degrees or a 100 percent grade for the proper lubrication of the pipelayer components.

Refer to the tractor operation and maintenance manual for additional restrictions.

Lifting Capacities

WARNING

The machine may tip and personal injury may occur if the maximum load capacities are exceeded. Load capacities assume that the machine is stationary on a level concrete surface with the counterweight extended. Lift capacities will decrease on slopes or soft ground.

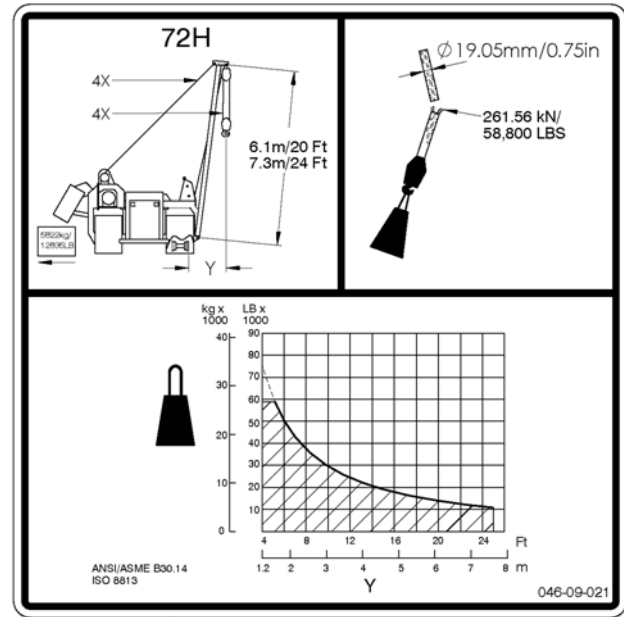


Illustration 267

Lifting Capacities

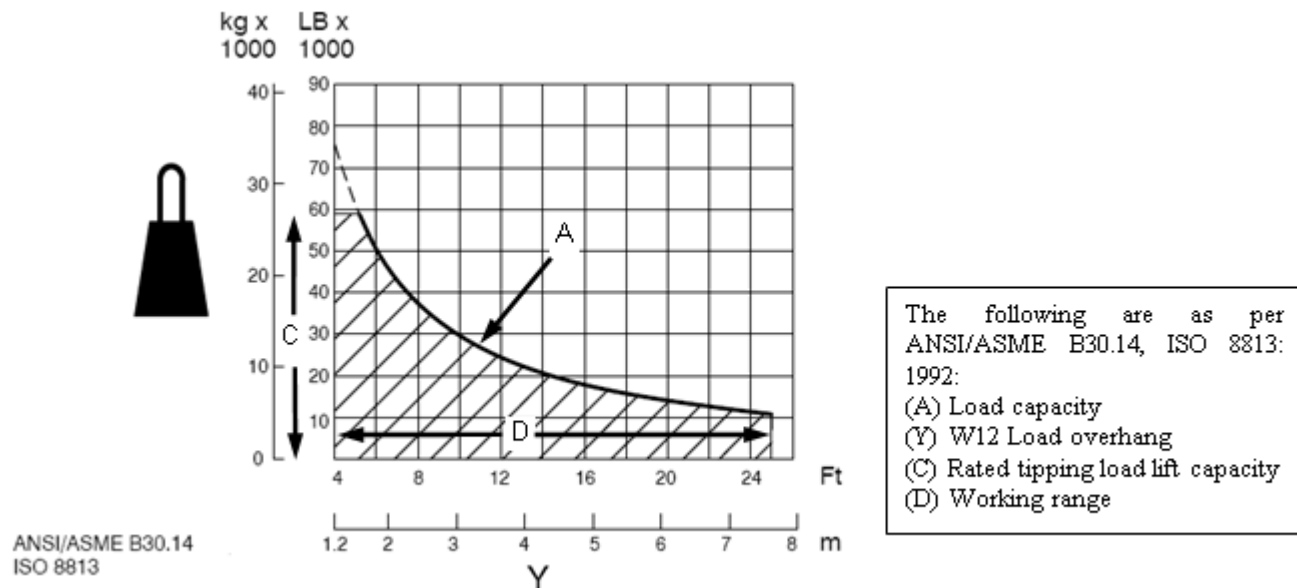


Illustration 268

Lift capacity chart

Note: Do not exceed the lifting capacity that is shown in the chart in illustration above.

The lift capacity chart is located on the right hand winch-guarding to the front of the controls. The lift capacities are based on a stationary machine with the following specifications:

Table 30

| 72H Pipelayer | |
|--|---|
| Wire rope diameter | 19.05 mm (0.75 inch) |
| Minimum breaking strength of the wire rope | 261.56 kN (58,800 lb) |
| 4 part load line | |
| 4 part boom line | |
| Mass of the extended counterweight | 5822 kg (12 835 lb) |
| Standard boom length | 6.1 m (20 ft) |
| Total operating weight of the machine ⁽¹⁾ | 29 127 kg (64,215 lb) [24 ft boom add 286 kg (630 lb)] |

(1) Operating weight: Includes lubricants, coolant, 100% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (26 in) single grouser shoes, drawbar, counterweight, boom and pulley blocks and cable, and operator.

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

Operation Section (Pipelayer Attachment Kit)

Before Operation

Mounting and Dismounting



Illustration 269

Mounting and dismounting machine

Use steps and handholds whenever you mount the machine. Use steps and handholds whenever you dismount the machine. Before you mount the machine, clean the step and the handholds. Inspect the step and handholds. Make all necessary repairs.

Face the machine whenever you mount the machine and whenever you dismount the machine. Maintain a three-point contact with the step and with 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 try to mount the machine when you carry tools or supplies. Do not try to dismount the machine when you are carrying tools or supplies. 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.

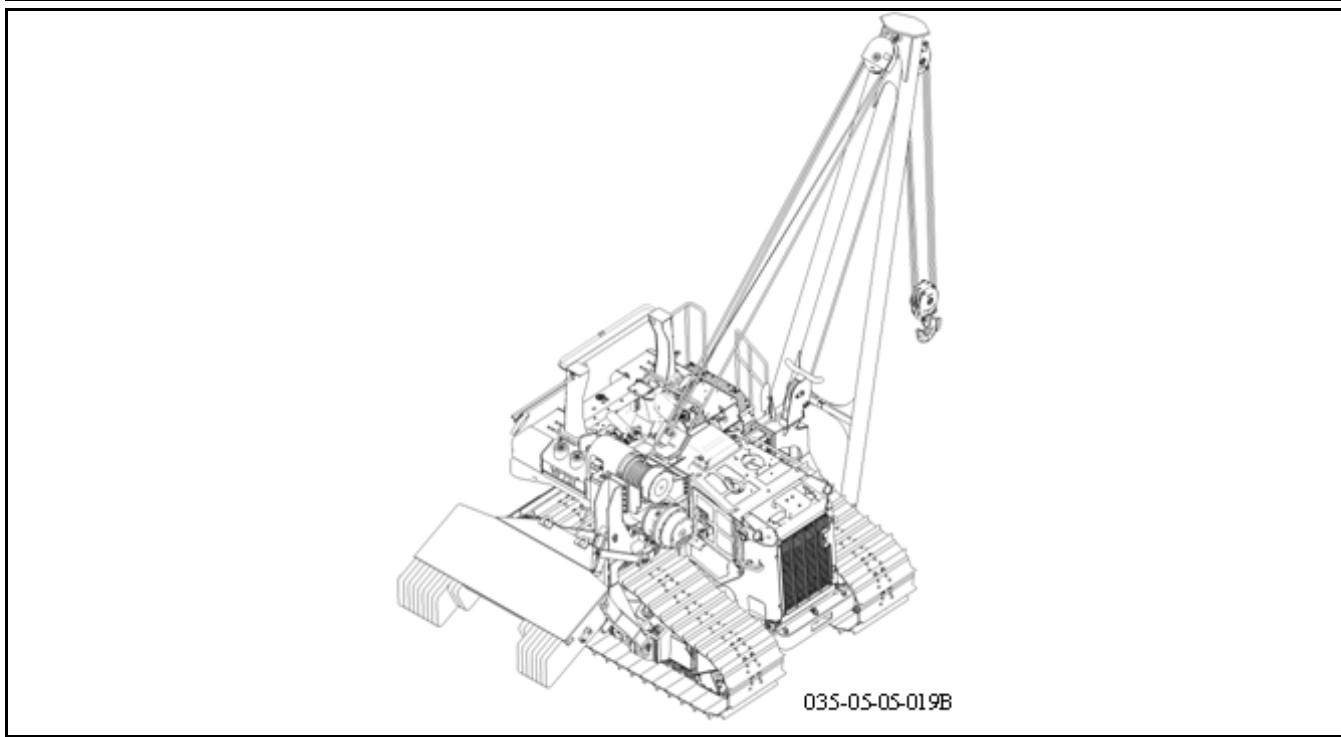


Illustration 270

Daily inspection walk around

For maximum service life of the machine, perform a daily walk-around inspection.

Note: Watch closely for leaks. If leaking is observed, find the source of the leak and correct the leak. If leaking is suspected or leaking is observed, check the fluid levels more frequently.

Inspect the machine for the following items:

- Inspect the hydraulic system for leaks. Repair any hydraulic system leaks. Inspect the hoses, the seals, and the flanges.
- Inspect the winch final drive for leaks. Repair any final drive leaks.
- Inspect covers and the guards for damage, for loose bolts, and for missing bolts.
- Inspect the condition of the steps and of the handholds. Inspect the steps and the handholds for cleanliness. If necessary, repair the steps or clean the steps.
- Inspect the operator compartment for cleanliness. Remove any trash buildup and any dirt buildup.
- Inspect mirrors and make sure they are in good condition and replace if broken.

Note: Refer to the tractor operation manual for detailed information on the specific daily inspection of the tractor unit.

NOTICE

Accumulated grease and oil on a machine is a fire hazard.

Remove debris with steam cleaning or high pressure water, at the specified interval in the Maintenance Interval Schedule or each time any significant quantity of oil is spilled on the machine.

Daily Checks

After you inspect the machine, perform the daily maintenance that is listed in the maintenance interval schedule. Perform the daily maintenance before you mount the machine in order to operate the machine.

Refer to Operation and Maintenance Manual, "Maintenance Interval Schedule" for the correct procedures for the following checks:

- "Boom Pivot Pins - Lubricate"
- "Cooling System Coolant Level - Check"
- "Counterweight Cylinder Bearings - Lubricate"

- "Counterweight Hinge Pins - Lubricate"
- "Fairlead Sheave - Lubricate"
- "Hook and Wire Cable Inspect"
- "Hydraulic System Oil Level - Check"
- "Sheave Block Bearings - Lubricate"
- "Boom Stop Valve - Check operation"

Tractor Operation

Refer to the tractor operation and maintenance manual for the specific procedures regarding complete Tractor Operation.

Hydraulic Oil Temperature

Refer to the tractor operation and maintenance manual "Gauges" for the specific procedures regarding hydraulic oil temperature indication and operating temperature.

Pipelayer Operation

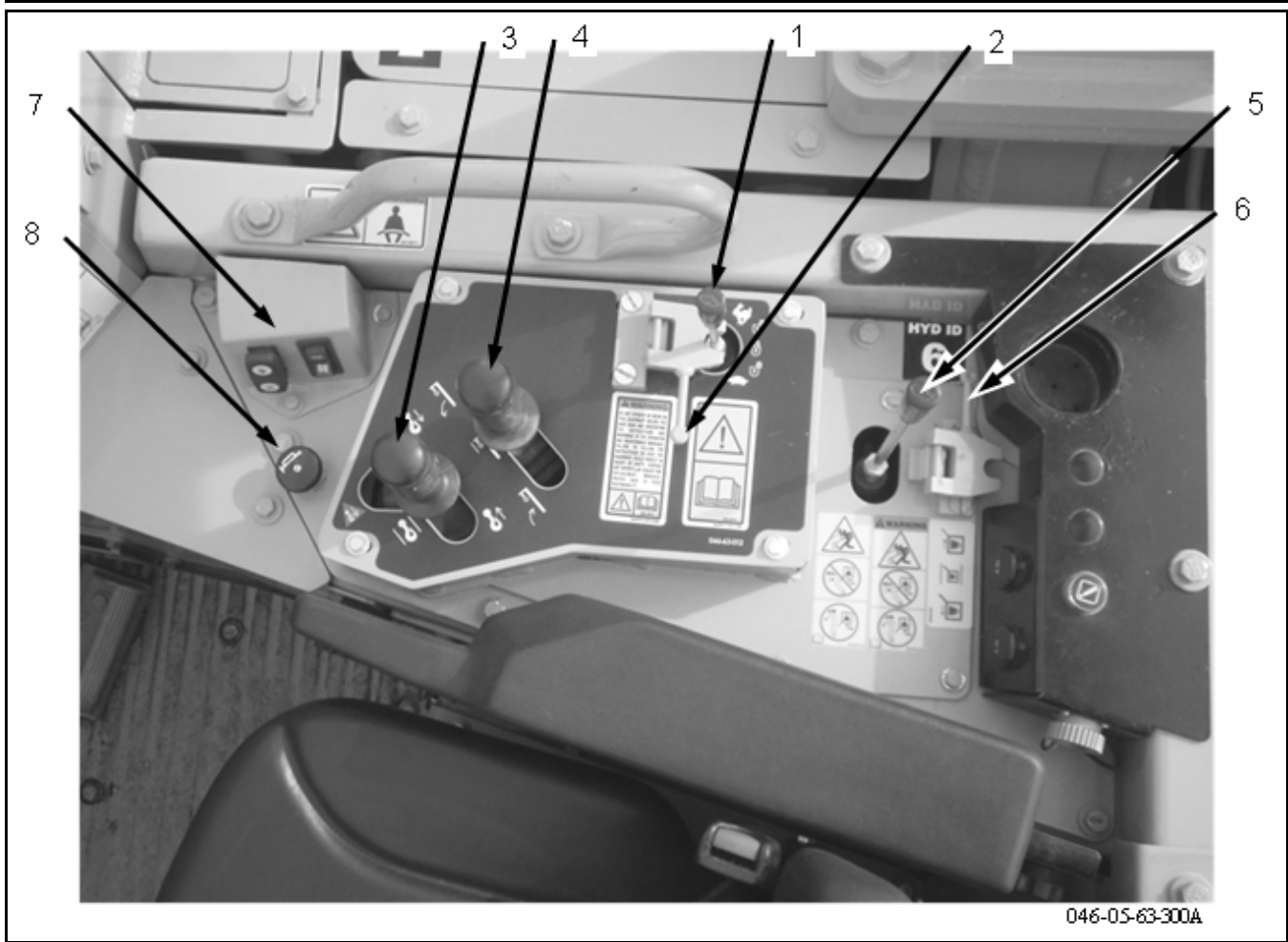


Illustration 271

Controls for pipelayer

Speed/Lockout Control Lever (1)

The speed/lockout control lever has three positions that controls the speed range of the hook winch and prevents accidental actuation of the pipelayer-controls while not in use.



HIGH SPEED MODE—WINCH CONTROLS UNLOCKED – Push the speed/lockout control lever forward for the hook winch at high speed range, the maximum hook winch pull is reduced; the boom winch speed is unaffected.



LOCKED MODE—WINCH AND CONTROLS LOCKED – To prevent accidental actuation of the hook and boom winch controls while not in use, move the speed/lockout control lever to the centre position and flip the speed/lockout control lock to engage the lever (2) and lock it in position. In this mode, the hook and boom winch controls do not function. Always place the speed/lockout control lever in the LOCKED MODE and engage the speed/lockout control lock whenever the machine is left unattended, or when inadvertent control operation could result in a dangerous situation arising.



LOW SPEED MODE—WINCH CONTROLS UNLOCKED – Pull the speed/lockout control lever back for the hook winch low speed range, maximum hook winch pull is available; the boom winch speed unaffected.

Speed/Lockout Control Lock (2)

Use the speed/lockout control lock lever (2) to lock the speed/lockout control lever (1) in the LOCKED MODE position.

Move the boom control lever to HOLD position. Move the hook control lever to HOLD position. Move the speed/lockout control lever to the centre position. Flip the speed/lockout control lever over the control lever in order to lock the lever in the LOCKED MODE position. This locks the boom controls and the hook controls in HOLD in order to prevent accidental boom movement or hook movement.

Flip speed/lockout control lock away from the speed/lockout control lever in order to allow actuation of the speed/lockout control lever. Move the speed/lockout control lever to the desired speed range in order to operate the winches.

Always move the speed/lockout control lever to the "LOCKED" position before shutting off the engine or immediately after the engine quits running to prevent unintentional load release or--after the engine is restarted-- unintentional drawworks operation.

Hook Control (3)



HOLD – : The lever self centres to this position whenever it is released. In this position, the load winch brake will set, and the hook will stop and remain at the position it is in.



WARNING

Component failure! Re-engaging the free fall while the load is dropping causes shock loads which could cause component structural failure, resulting in possible personnel injury or death.



(Emergency Lower) Free Fall – I- Move the hook control lever to this position to lower the load fast in an emergency. The load winch's free fall brake will release, and the hook will move down under the weight of the load. The lever will return to the "HOLD" position when released, the load winch's free fall brake will; upon activating the free fall function the load will drop and must be allowed to fall to its end travel without re-engagement.

NOTICE

The Free Fall is used for a full release of a suspended load up to the maximum lift capacity of the hook winch. Upon activating the free fall function the load will drop and must be allowed to fall to its end travel without re-engagement.

Note: Free Fall is only available in pipelayer HIGH or LOW SPEED modeæWinch Controls Unlocked.



LOWER: – Move the lever to this position to lower the hook with controlled winch power. The further the lever is pushed away from HOLD, the faster the hook will lower. The closer the lever is toward HOLD, the slower the hook will lower. When the lever is released, it will return to the HOLD position, the winch brake will set, and the hook will stop and remain at the position it is in. Hook winch line speed varies with engine throttle setting. Hook control is smoothest at engine speeds faster than idle.



RAISE: – Move the lever to this position to raise the hook. The further the lever is pulled away from "HOLD", the faster the hook will raise. The closer the lever is toward "HOLD", the slower the hook will raise. When the lever is released, it will return to the "HOLD" position and the hook will stop and remain at the position it is in. Hook winch line speed varies with engine throttle setting. Hook control is smoothest at engine speeds faster than idle.

Note: The hydraulic pilot system and some machine controls, namely the hook quick drop, are "LIVE" for as long as the accumulator holds a charge, even if the engine is not running. This pressure charge will take approximately four hours or more to bleed off. Refer to the operation and maintenance manual "Free Fall Active" for dropping load hazard warning. Refer to the operation and maintenance manual "Accumulator - Relieving Charge" to bleed off the residual pressure if required and when safe to do so.

Accumulator - Relieving Charge

To relieve the accumulator charge, with no load on the hook and the engine stopped, move the hook control lever from "HOLD" to "RAISE" 10 times.

Boom Control (4)



HOLD – The lever self centres to this position whenever it is released. In this position, the boom winch brake will set, and the boom will stop and remain at the position it is in.



LOWER – Move the lever to this position to lower the boom. The further the lever is pushed away from HOLD, the faster the boom will lower. The closer the lever is toward HOLD, the slower the boom will lower. When the lever is released, it will return to the HOLD position, and the boom will stop and remain at the position it is in. Boom winch line speed varies with engine throttle setting. Boom control is smoothest at engine speeds faster than idle.



RAISE – Move the lever to this position to raise the boom. The further the lever is pulled away from HOLD, the faster the boom will raise. The closer the lever is toward HOLD, the slower the boom will raise. When the lever is released, it will return to the HOLD position, and the boom will stop and remain at the position it is in. Boom winch line speed varies with engine throttle setting. Boom control is smoothest at engine speeds faster than idle.

Boom Stop Valve

The Boom Stop valve is a safety device that is intended to automatically stop the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Refer to the Operation and Maintenance manual, Boom Stop Valve Adjustment, for correct operation and adjustment. Check its function daily.

Counterweight Control (5)

NOTICE

In order to prevent machine damage, check to make sure the counterweight lock lever is not locked in the extended position before you operate this control lever. Refer to Operation and Maintenance manual, "Safety Section".

Hold - When the operator releases the counterweight control from any position, the control will return to the HOLD and the counterweight will remain in position.

Out - Move the counterweight control to this position in order to move the counterweight outward. When the counterweight control is released, it returns to the HOLD position and the counterweight will remain in position.

Refer to the Operation and Maintenance Manual, "Counterweight Lock Lever" for the procedure to mechanically lock the counterweight in the fully extended position when you service the machine.

In - Move the counterweight control lever to this position in order to move the counterweight inward. When you release the counterweight control lever the lever returns to the HOLD position and the counterweight will remain in position.

Counterweight Control-Lockout Lever (6)

Use the counterweight control-lockout lever (6) to lock the counterweight control (5) in the HOLD position in order to avoid accidental actuation of the counterweight. Move the counterweight control (5) to the HOLD position. Flip the counterweight control-lockout lever (6) forward in order to lock the counterweight control (5) in the HOLD position.

Flip the lock lever (6) to the rear position in order to allow actuation of the counterweight control.

Throttle control switch & Operator Heater switch (7)

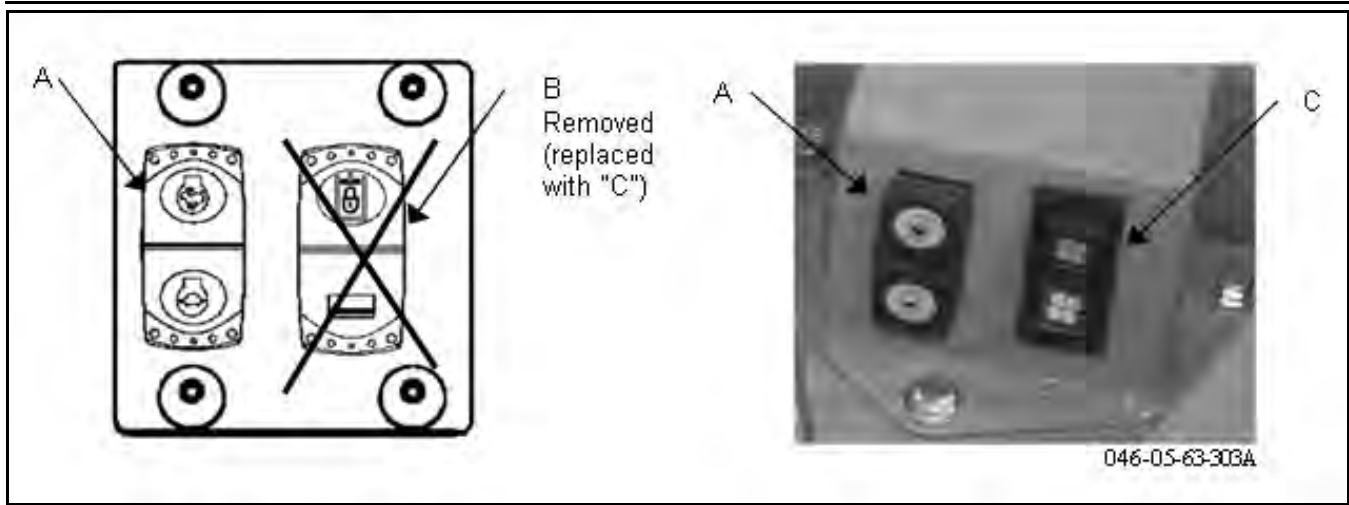


Illustration 272

Control Switches

Throttle Control Switch, Refer to tractor's operation and maintenance manual for correct operation

Hydraulic lockout switch—Removed [use Speed/Lockout Control Lock (2) and Counterweight Control-Lockout Lever (6)]

Operator Heater switch, if equipped. Use the switch to vary the flow of heated air to the operator station: High-flow, Low-flow, or Off in the middle position.

Horn location moved (8)

NOTE: New location of this tractor's control, refer to the tractors operation and maintenance manual for correct operation.



Illustration 273

Counterweight Lock Lever (1) locked in the extended position, front view (1)

Counterweight Lock Lever

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.

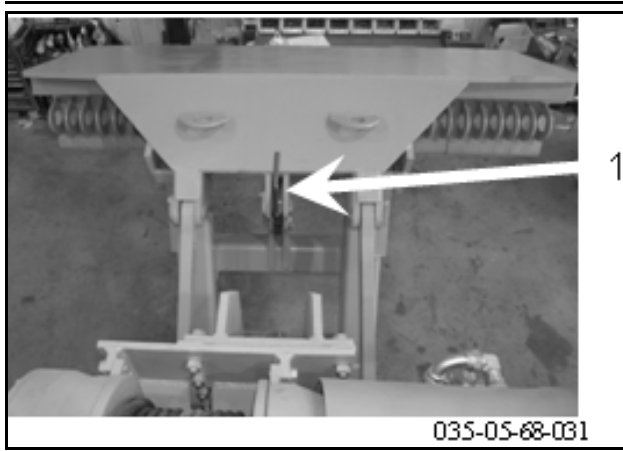


Illustration 274

Counterweight Lock Lever (1), locked in the extended position, side view (1)

Locked - Extend counterweight cylinders to maximum length Engage the lock lever (1).

Slowly retract the counterweight slightly until there is pressure on the lock lever (1). Do not continue to retract the counterweight against the lock lever once the lock lever is engaged. Refer to Operation and Maintenance manual, Safety Section "Counterweight Lock Lever Thrown or Flying Objects – Full Body Exposure".

Unlocked - Unlock the counterweight control-lockout (2) in the operator station. Extend counterweight cylinders to maximum length. Disengage the lock lever (1). Retract the counterweight.

The locking mechanism will hold the counterweight in position in the event of a hydraulic failure.



Illustration 275

Counterweight control-lockout (2), open position

NOTICE

When you engage the locking device for the counterweight or when you disengage the locking device for the counterweight use the Counterweight Control-Lockout lever for the counterweight controls. Lock the counterweight controls in HOLD in order to avoid the inadvertent movement of the counterweight. Refer to the topic "Counterweight Control-Lockout Lever" in the Operation and Maintenance Manual, "Operator Controls".

Lock the counterweight control-lockout (2) in the operator station when you service the machine.

Lock the counterweight when you service the machine.

Equipment Lowering with Engine Stopped

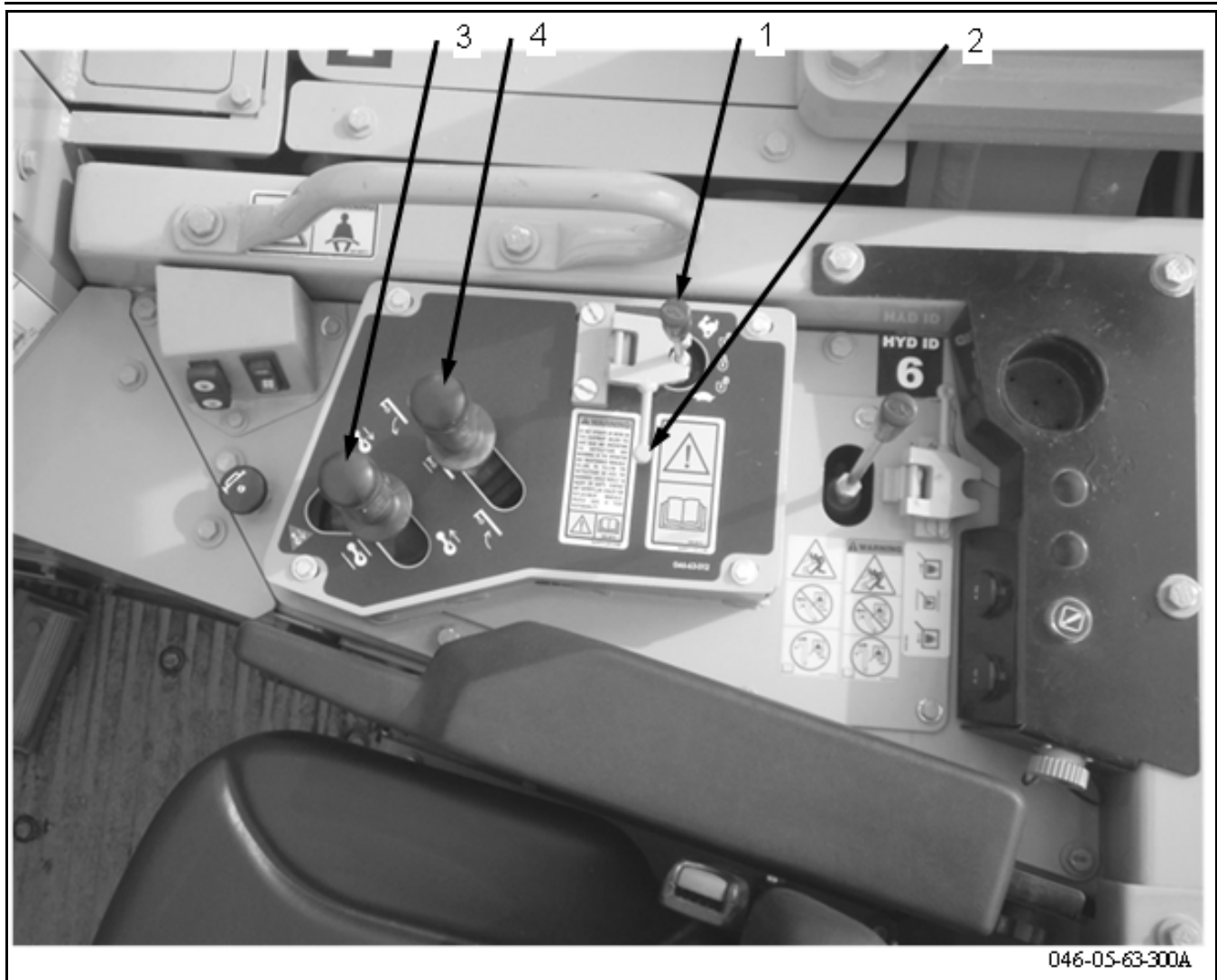


Illustration 276

Controls for Equipment lowering with engine stopped

NOTICE

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure will cause immediate, rapid lowering of the load. Refer to Operation and Maintenance Manual, "Hook Control" for complete control function description.

If the machine does not have engine power, in order to lower the equipment follow these steps:

- Unlock the Speed/Lockout Control Lock (2) and move the Speed/Lockout Control Lever (1) to LOW SPEED MODE—WINCH CONTROLS UNLOCKED or to HIGH SPEED MODE—WINCH CONTROLS UNLOCKED
- Move the hook control (3) to
- (Emergency Lower) Free Fall.



- (Emergency Lower) Free Fall.

- The accumulator will provide pilot pressure that will allow the hook to be immediately lowered fast under the weight of the load.
- Do not release the hook control to re-engage the Free Fall until the load is completely lowered.

Transportation Information

Shipping the Machine

Investigate the travel route for overpass clearances. Make sure that there is adequate clearance for the machine that is being transported.

Remove ice, snow, or other slippery material from the loading dock and from the truck bed before loading. Removing ice, snow, or other slippery material will prevent slippage while you load the machine. Removing ice, snow, or other slippery material will prevent the machine from slipping in transit.

NOTICE

Obey all state and local laws governing the weight, width, and length of a load. Observe all regulations governing wide loads.

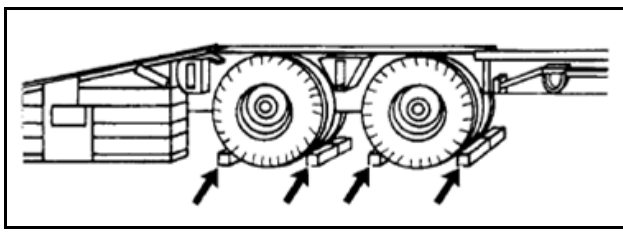


Illustration 277

1. Place blocks under the trailer wheels or under the rail car wheels before loading, as shown.
2. Move the transmission control lever to the NEUTRAL position.
3. Engage the parking brake switch.
4. Stop the engine.
5. Turn the start switch key to the OFF position. Remove the key and lock the parking brake switch.
6. Turn the battery disconnect switch to the OFF position. Remove the key.
7. Attach any vandalism protection and lock the access covers.

8. Install the tie-downs at several locations and chock the tracks in the front and in the rear.
9. Cover the opening for the engine exhaust in order to prevent rotation of the turbocharger that is caused by the force of the wind.

NOTICE

Rotation of the turbocharger without engine operation can result in damage to the turbocharger. Cover the exhaust opening or secure the rain cap in order to prevent the turbocharger from wind milling in transit. Refer to the tractor operation and maintenance manual for additional requirements and information.

Removal of the Boom

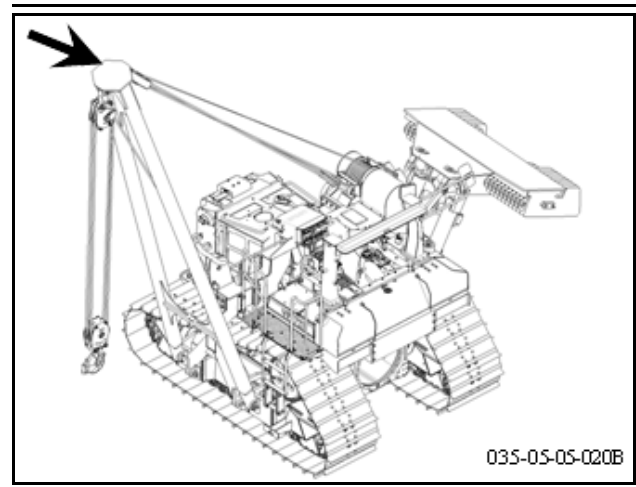


Illustration 278

Removal of the boom

1. Lower the boom enough to remove the load blocks and the sheave block.

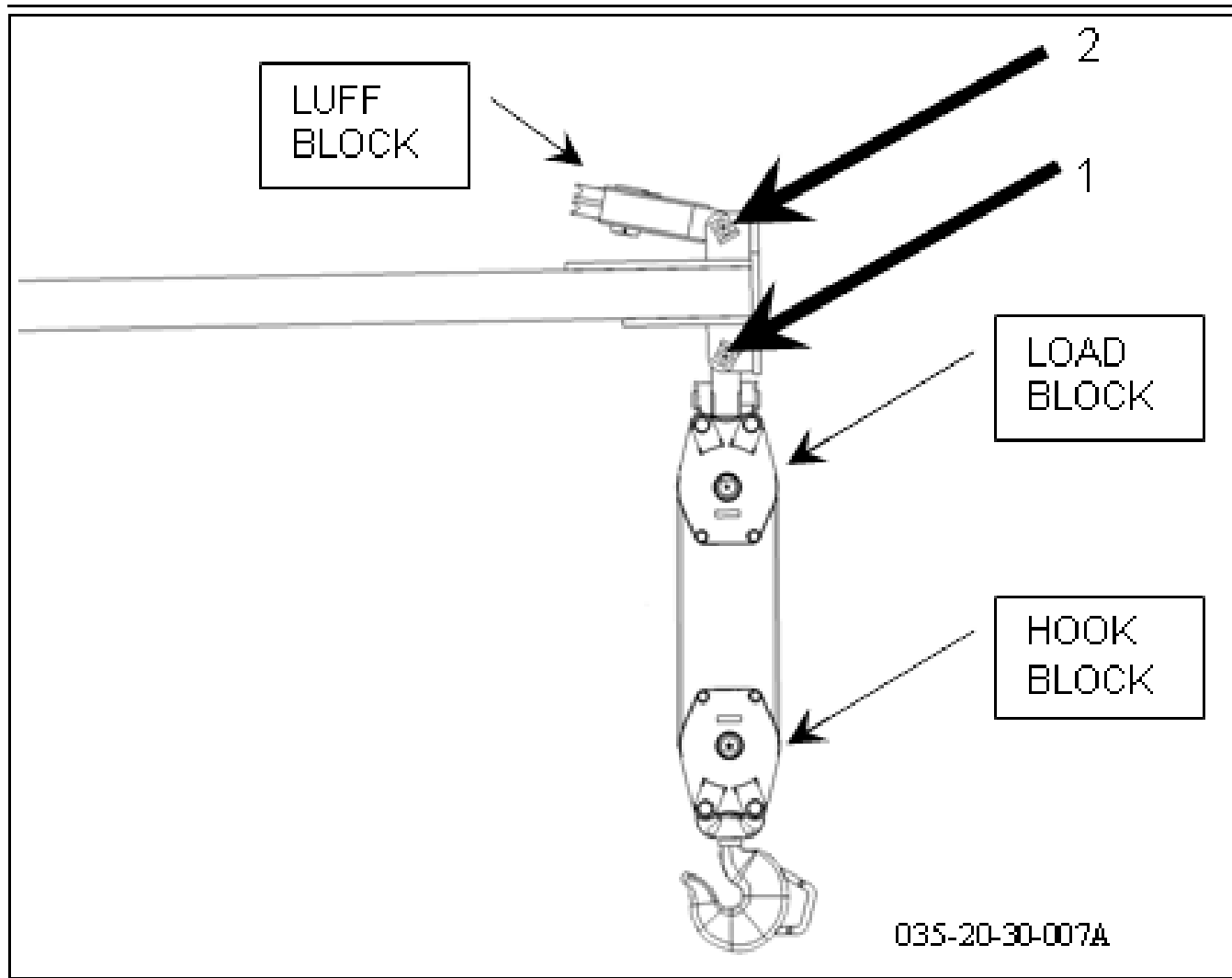


Illustration 279

Removal of boom, steps 1, 2

2. Remove cotter pin, the retainer, and pin (1). Lower the load block and the hook block to the ground. The approximate weight of the load block is 88 kg (194 lb). The approximate weight of the hook block is 100 kg (220 lb). The combined weight of the load block and the hook block is approximately 188 kg (414 lb).
3. Replace the pin (1) in the boom. Fasten the load block and the hook block to the machine for shipping as illustrated below. Draw in the excess hook load line.

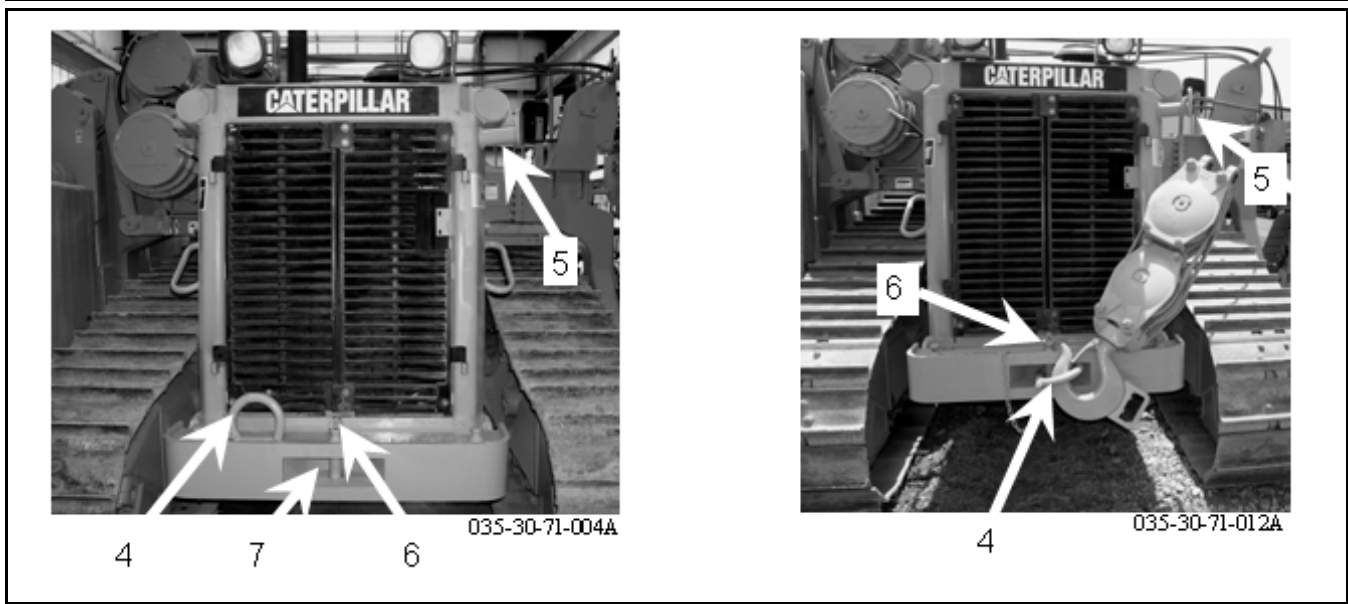


Illustration 280

Fastening of Load Blocks for Transport

4. Remove pin (6) and insert stowing-link (4) into bumper pocket (7) and reinstall pin (6).
5. Place hook load line over guide (5).
6. Slowly draw in the excess hook load line, when the load block and hook block are suspended by the load line, swing in the load block and hook block and lock into stowing-link (4) and tighten up the load line, being careful not to kink or damage load cable.
7. To remove load block and hook block from stowing-link, reverse the above steps, and ensure the stowing-link is placed firmly back into the slot in bumper.
8. Lower the boom to the horizontal position onto wood blocks that are sufficient to support the boom.
9. Remove the cotter pin, the retainer, and pin (2). The approximate weight of the luff block is 76 kg (168 lb).
10. Replace the pin and the retainer (2) in the boom.
11. Move the luff block clear of the boom and area; it will be secured after the boom has been removed.

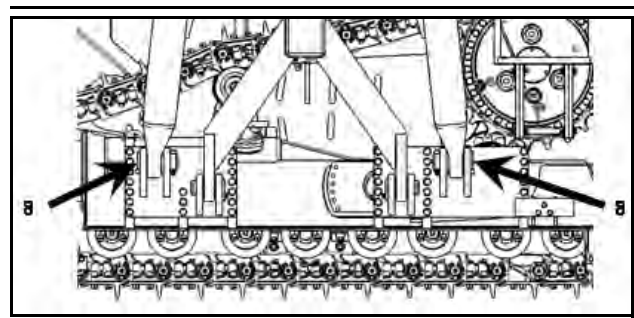


Illustration 281

Location of pins for removal of boom

12. Fasten an appropriate lifting device to the boom. The approximate weight of the boom is 936 kg (2064 lb).
13. Remove the cotter pins, the retainers, and the pins (8) from both sides of the support.
14. Remove the boom from the machine. Replace the pins in the support.

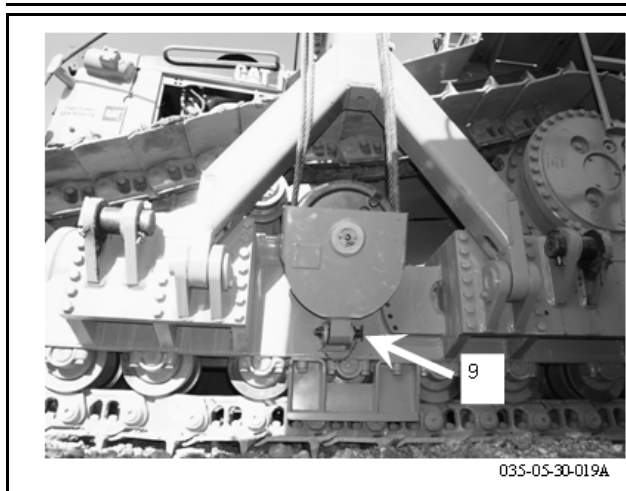


Illustration 282

Location of Luff Block stowing point and stowing pin (9)

- 15.** Draw in the line for the boom and fasten the luff block to the machine at the luff block stowing point on the track frame for shipping using stowing-pin (9).
- 16.** Draw in the excess line for the boom, ensuring not to over tighten the cables to avoid causing kinks.

Maintenance and Lubrication Section (Pipelayer Attachment Kit)

Lubricant Viscosities

General

- Follow tractor manufacture's maintenance and lubrication instructions for tractor service as required.
- Follow tractor and/or winch manufacture's lubrication instructions for the pipelayer hydraulic system.
- To prevent corrosion damage to the winch interiors, if not used regularly, cycle the winches up and down several times at least once every two weeks.

Selecting the Viscosity

The proper oil viscosity grade is determined by the minimum outside temperature. This is the temperature when the machine is started and when the machine is operated. In order to determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table in order to select the oil viscosity grade for operating the machine at the highest temperature that is anticipated. Use the highest oil viscosity that is allowed for the ambient temperature when you start the machine.

Machines that are operated continuously should use oils that have the higher oil viscosity in the final drives and in the differentials. The oils that have the higher oil viscosity will maintain the highest possible oil film thickness. Consult your dealer if additional information is needed.

Lubricant Viscosities for Ambient Temperatures

Table 31

| Lubricant Viscosities for Ambient Temperatures | | | | | | |
|--|-----------------------------|---------------------------|-----|-----|-----|-----|
| Compartment or System | Oil Type and Classification | Oil Viscosities | °C | | °F | |
| | | | Min | Max | Min | Max |
| Hydraulic System | Caterpillar HYDO | SAE 0W20 | | | | |
| | Caterpillar DEO | | -40 | 40 | -40 | 104 |
| | Caterpillar TDTO | SAE 0W30 | -40 | 40 | -40 | 104 |
| | Caterpillar MTO | SAE 5W30 | -30 | 40 | -22 | 104 |
| | Global DHD-1 | SAE 5W40 | -30 | 40 | -22 | 104 |
| | API CH-4 | SAE 10W | -20 | 40 | -4 | 104 |
| | API CG-4 | SAE 30 | 10 | 50 | 50 | 122 |
| | API CF-4 | SAE 10W30 | -20 | 40 | -4 | 104 |
| | API CF | SAE 15W40 | -15 | 50 | 5 | 122 |
| | commercial TO-4 | Caterpillar MTO | -25 | 40 | -13 | 104 |
| | Caterpillar TDTO-TMS | Biodegradable | | | | |
| | Caterpillar Biodegradable | Hydraulic Oil HEES (4) | -40 | 43 | -40 | 110 |
| | Hydraulic Oil (HEES) (1) | | | | | |
| | commercial BF-1 (1) | TDTO-TMS (2) | -20 | 50 | -4 | 122 |

(1) Commercial Biodegradable Hydraulic Oil (HEES) must meet the Caterpillar BF-1 specification.

Capacities (Refill)

Table 32

| APPROXIMATE REFILL CAPACITIES | | | |
|-------------------------------|--------|--------|-----------------|
| Compartment or System | Liters | US gal | Imperial gallon |
| Hydraulic Oil (Tank only) | 76 | 20 | 16.65 |

S-O-S Information

S O S Services is a highly recommended process for Caterpillar customers to use in order to minimize owning and operating cost. Customers provide oil samples, coolant samples, and other machine information. The dealer uses the data in order to provide the customer with recommendations for management of the equipment. In addition, S O S Services can help determine the cause of an existing product problem. Refer to Caterpillar Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations" for detailed information concerning S O S Services.

Refer to the Operation and Maintenance Manual, "Maintenance Interval Schedule" for a specific sampling location and a service hour maintenance interval.

Consult your dealer for complete information and assistance in establishing an S-O-S program for your equipment.

Maintenance Interval Schedule (MIS)

Ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed. The user is responsible for the performance of maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components. Use mileage, fuel consumption, service hours, or calendar time, **WHICH EVER OCCURS FIRST**, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance.

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed. Perform the following servicing at **EVERY** interval they occur; for example, the 10 hour and 50 hour service are also performed at the 200 hour interval, etc.

When Required

| | |
|--------------------------------|-----|
| Boom Line – Install | 214 |
| Hook Load Line – Install | 220 |

Every 10 Service Hours or Daily

| | |
|--|-----|
| Controls for proper operation of boom and hook– Check | |
| Boom Stop operation – Check, adjust if required | 214 |
| Boom Pivot Pins – Lubricate | 217 |
| Counterweight Cylinder Bearings – Lubricate | 218 |
| Counterweight Hinge Pins – Lubricate | 218 |
| Fairlead Sheave – Lubricate | 219 |
| Hook and Wire Cable (Boom and Hook lines) – Inspect | 219 |
| Hydraulic System Oil Level – Check | 225 |
| Hoses and fittings for leaks – Check | |
| Sheave Block Bearings – Lubricate | 226 |
| Pipelayer structures and components for loose bolts, cracks, damage, etc. – Inspect | |
| Inspect the hook for any distortion, bends, twists, etc. Inspect the hook for any wear, cracks, nicks, or gouges. Refer to American National Standard Institute ANSI/ASME B30.14 | |
| Blocks, and yokes for wear or damage – Inspect | |
| Ensure that area between tractor tracks and pipelayer-tractor attachment structures are free from dirt, debris, ice, snow, etc. – Inspect | |

Every 50 Service Hours or Weekly

Thoroughly check Boom Stop system operation and adjustment, lubricate boom stop valve roller and actuator.

Lightly lubricate wire rope with recommended engine or hydraulic oil.

Every 500 Service Hours

| | |
|--|-----|
| Hydraulic System Oil Sample - Obtain | 225 |
|--|-----|

Every 500 Service Hours or 3 Months

| | |
|--|-----|
| Hydraulic System Oil Filter – Replace | 223 |
| Hydraulic System Case Drain Filter - Replace | |

Every 2000 Service Hours or 1 Year

| | |
|-------------------------------------|-----|
| Hydraulic System Oil - Change | 221 |
|-------------------------------------|-----|

Accumulator

WARNING

This system contains high pressure gas. Failure to follow the instructions and warnings could cause an explosion, resulting in possible injury or death. Do not expose to fire. Do not weld. Do not drill. Do not remove any hydraulic system lines, taps or parts until pressure has been relieved. Relieve pressure before discharging. See Operation and Maintenance Manual "Accumulator - Relieving Charge". See Operation and Maintenance Manual "Accumulator" for charging and discharging. See your Dealer for tools and detailed information.

Accumulator must be charged with dry nitrogen (N₂) gas by qualified personnel only. The accumulator must be at the same temperature as the surrounding air before being checked or charged. Charge the accumulator depending on the ambient air temperature according to the table below. Access the accumulator to charge from the rear of the tractor, above the tow-winch drive.

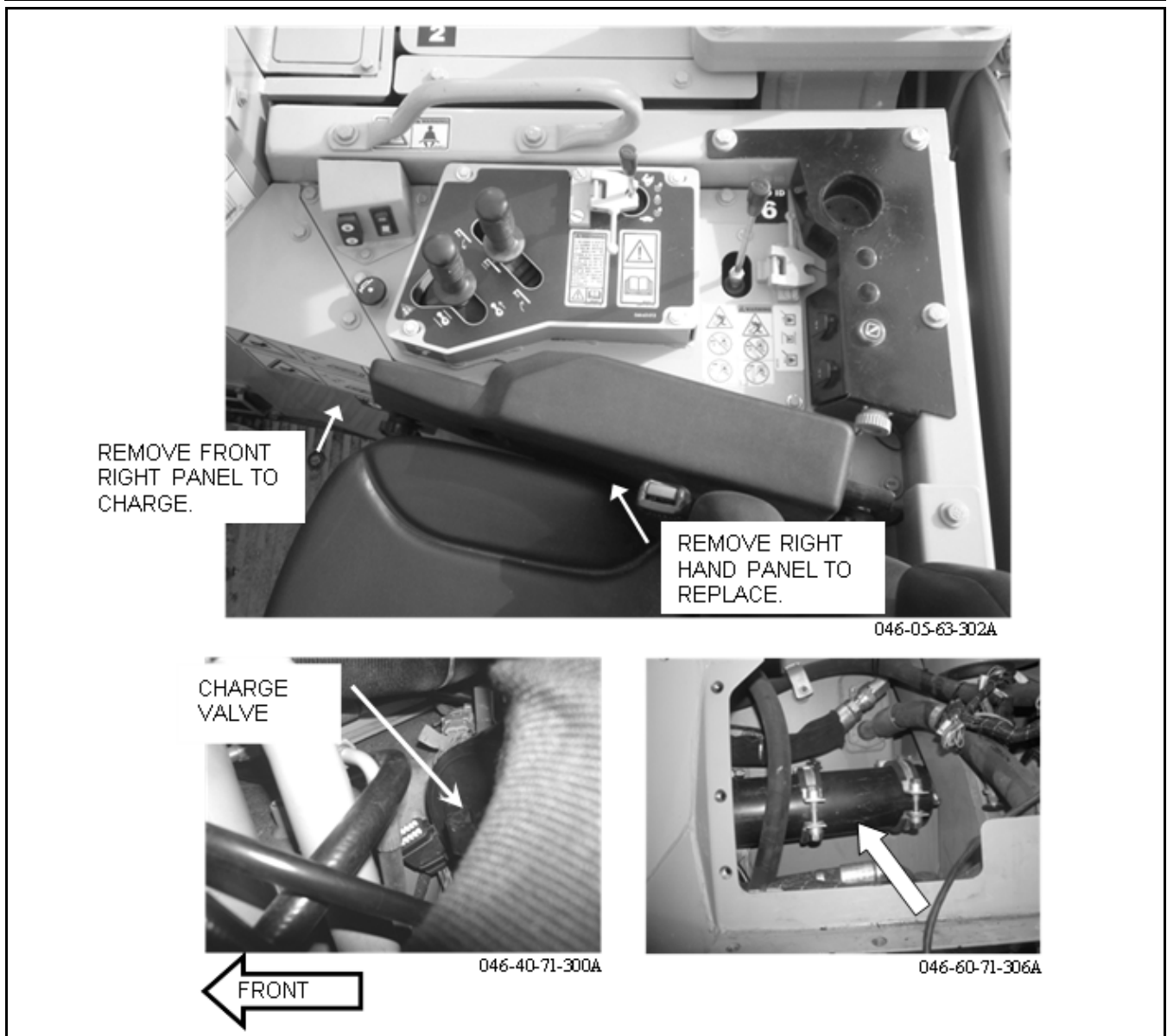


Illustration 283

Accumulator located behind access panels to right of operator seat.

Table 33

| Ambient air temperature [°C (°F)] | Accumulator precharge pressure [kPa (psi)± 70 kPa (10 psi)] |
|--------------------------------------|---|
| -7°C (20°F) | 3100 kPa (450 psi) |
| -1°C (30°F) | 3170 kPa (460 psi) |
| 4°C (40°F) | 3240 kPa (470 psi) |
| 10°C (50°F) | 3310 kPa (480 psi) |
| 16°C (60°F) | 3375 kPa (490 psi) |
| 21°C (70°F) | 3445 kPa (500 psi) |
| 27°C (80°F) | 3515 kPa (510 psi) |
| 32°C (90°F) | 3580 kPa (520 psi) |
| 38°C (100°F) | 3650 kPa (530 psi) |
| 43°C (110°F) | 3720 kPa (540 psi) |
| 49°C (120°F) | 3790 kPa (550 psi) |

Boom Stop Valve Operation and Adjustment

WARNING

The Boom Stop system stops the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Incorrectly adjusting, or defeating the boom stop valve could result in serious equipment damage, personal injury, or even death. Its operation must be checked and verified daily.

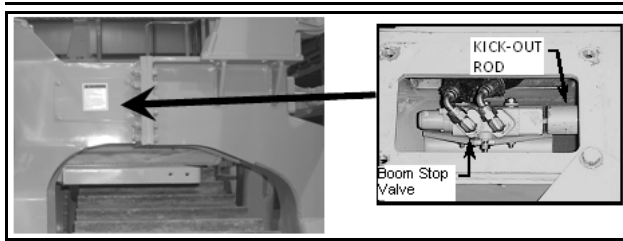


Illustration 284

Boom stop valve located behind access cover in Left Hand tower.

- To check the operation, boom in slowly taking care not to over tension the boom lines when the boom goes vertical. When the boom is vertical, the boom winch should stop. No increase in tension should occur once the boom comes into contact with the left hand tower. If the boom winch does not stop and continues to increase the cable tension, STOP the operation at once and lower the boom to release the tension. Adjust the boom stop valve as set out below.

- Raise the boom vertical so that it is JUST in contact with the tower; the boom kick-out rod is fully retracted into the tower. Do not over tighten the lines to the point that the boom or structures are overly stressed.
- Remove the boom stop valve access panel from the tower.
- Loosen the boom stop valve nuts.
- Move the valve so that it just contacts the boom kick-out rod.
- Move the valve an additional 10 mm (3/8-in) towards the boom so that the valve's piston is fully depressed.
- Tighten the valve in position with the valve nuts.
- Test the boom stop valve to see that it works properly. Lower the boom until the boom stop valve piston is free from the kick-out rod.
- Replace the boom stop valve access panel from the tower.
- Boom in slowly taking care not to over tension the boom lines when the boom goes vertical. When the boom is vertical, the kick-out rod will move the boom stop valve piston in 9.5 mm (3/8 in), and the boom winch should stop with the boom vertical. No increase in tension should occur once the boom comes into contact with the left hand tower, readjust the boom stop valve as required.

Boom Line – Install

WARNING

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

WARNING

Personal injury or death can result from worn wire rope cable. Worn or frayed cable could break causing injury. Check the wire rope cable. If cable is worn or is frayed install new cable. Wear gloves when handling the wire rope cable. Proper care is your responsibility.

NOTICE

Make sure that the construction of the wire rope is 6x25 IWRC XIPS (Independent Wire Rope Core, eXtra Improved Plow Steel) USA MADE. Also, the established grade of the wire rope is the improved plow bolt (steel), 26670 kg (58 800 lb) minimum breaking strength.

Table 34

| SPECIFICATIONS (WIRE ROPE) Boom Line Cable | | |
|---|----------------------|-----------------|
| Boom Length | Diameter of Cable | Length of Cable |
| 6.1 m (20 ft) | 19.05 mm (0.75 inch) | 40.2 m (132 ft) |
| 7.3 m (24 ft) | 19.05 mm (0.75 inch) | 45.7 m (150 ft) |

Table 7: Boom line wire rope specifications

1. Lower the boom to the ground and support the boom.

Note: The loaded force in the winch drum must be neutralized before removing the wire rope from a loaded drum.

2. Remove the anchor for the wire rope from the drum for the boom. Remove the old wire rope.
3. Unroll the new wire rope from the spool.

Note: Weld the cable ends in order to prevent fraying.

NOTICE

Unroll all of the cable from the spool. Lay the wire rope on a flat surface. Never lift the wire rope off the spool in coils.

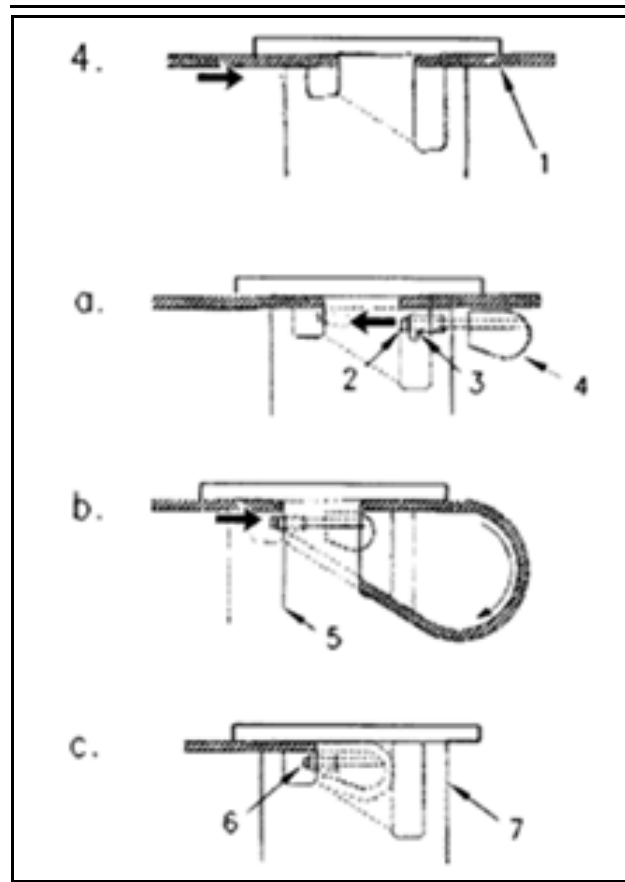


Illustration 285

Installing boom line, cable anchor assembly

4. Install the cable (1) into the small slot and through the larger slot in the drum for the boom.
 - Make sure that 2 to 4 threads of capscrew (2) are engaged into the cable anchor assembly (4). Start with the capscrew and insert the cable anchor assembly into the longer slot as far as allowed.
 - Make sure that the lip of retainer (3) faces the top edge (5) of the small slot in order to hold the retainer in place. Make a loop with the end of the wire rope and insert the end into the slot past the cable anchor assembly.
 - Pull the wire rope until the wire rope and anchor assembly are securely seated inside the slot. Tighten the capscrew to a torque (6) of $44 \pm 3 \text{ N}\cdot\text{m}$ ($32 \pm 2 \text{ lb}\cdot\text{ft}$).
5. Wind one half of the wire rope on the drum (7.) Wind the wire rope evenly across the drum.

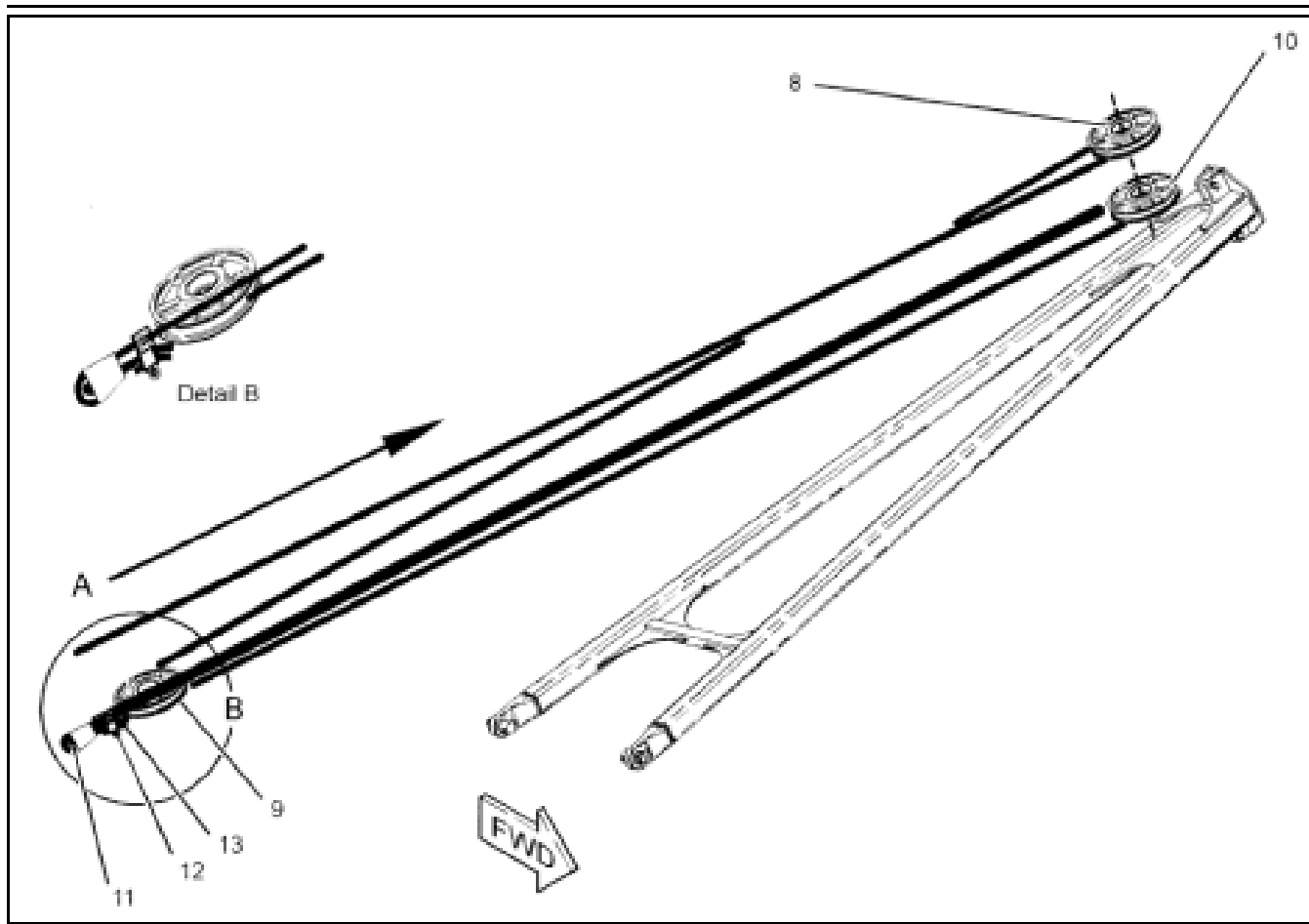


Illustration 286

Installing boom line

(A) Wire rope from the winch

(B) Detail B

6. Install the wire rope from the winch to sheave (8) in the upper sheave block. Install the wire rope over sheave (8) from the front of the machine toward the rear of the machine.
7. Install the wire rope under sheave (9) in the lower sheave block.
8. Install the wire rope over sheave (10) in the upper sheave block.

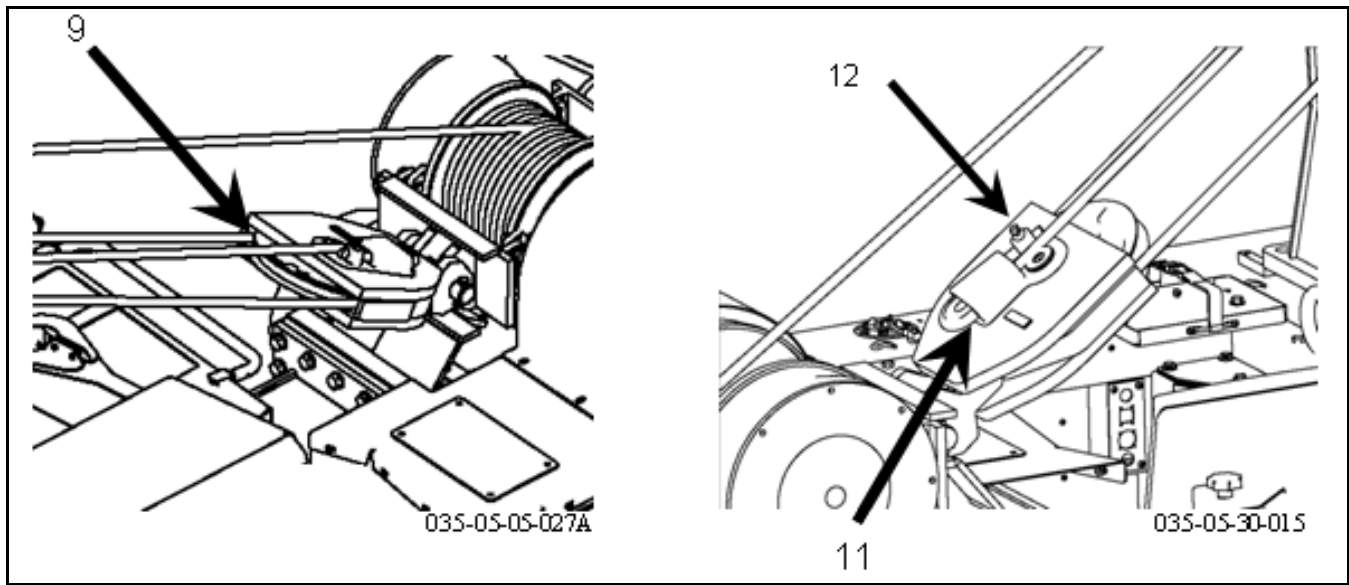


Illustration 287

Inserting wire rope into cable anchor

9. Insert the wire rope into the pocket and around the wedge (11). Allow an additional length of cable to form a tail end (six inch minimum). Use a mallet to tap the wedge and the wire rope into the pocket.
10. Insert the tail end of the wire rope through clamp (12). Add a short piece of wire rope through clamp (12) in order to secure the clamp, as needed. Tighten the nuts on the clamp.

Note: Do not clamp the loaded end of the wire rope and the tail end of the wire rope together.

11. Apply the first load in order to seat wedge (11).

Boom Pivot Pins – Lubricate

The grease fittings for lubricating the boom pivot pins are located on the left side of the machine.

There is one grease fitting for each pin. The grease fittings are located on the end of the pin on the outside face of the boom.

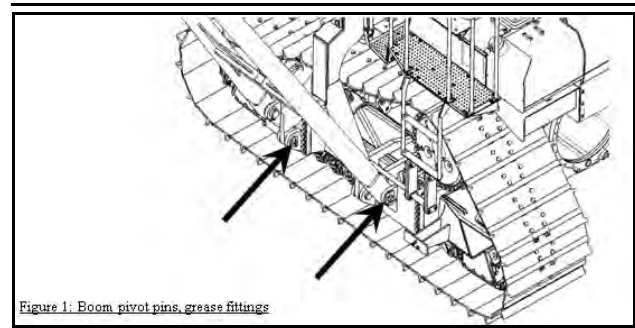


Illustration 288

Boom pivot pins, grease fittings

Lubricate the boom pivot pins through the two fittings.

Counterweight Cylinder Bearings – Lubricate

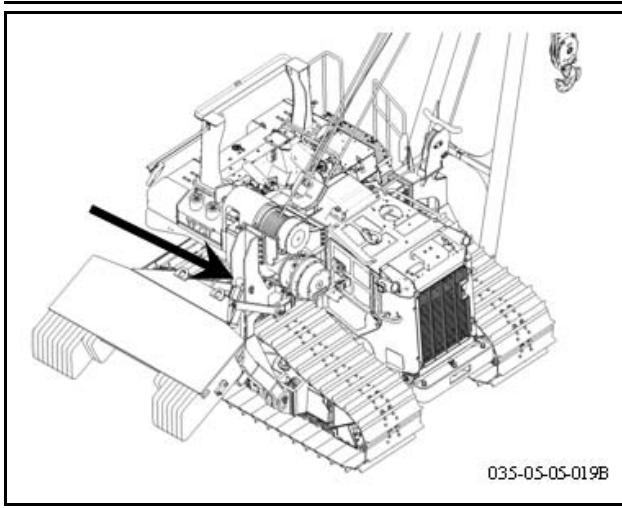


Illustration 289

Counterweight cylinder bearings fittings location

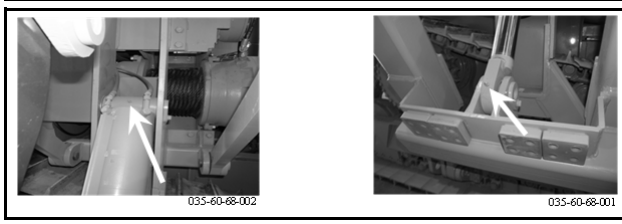


Illustration 290

Counterweight cylinder bearings location

1. Extend the counterweight and lock the counterweight into position.

Refer to the Operation and Maintenance Manual, "Counterweight Lock Lever" for the proper procedure to lock the counterweight into position.
2. Lubricate the upper grease fitting that is located in the head end of the cylinder.
3. Lubricate the grease fitting that is located in the rod end of the cylinder.
4. Follow the procedure to unlock the counterweight and retract the counterweight.
5. Follow the procedure to unlock the counterweight and retract the counterweight.

There are two grease fittings for the counterweight cylinder.

Counterweight Hinge Pins - Lubricate

WARNING

Use a stable work platform placed in a secure location when lubricating the counterweight hinge pins. If a secure location is not available, use the appropriate safety equipment to prevent falling off of the machine. Failure to work from a secure location may result in injury or death from a slip or a fall.

Lubricate the six pins through the grease fittings. There are three grease fittings that face toward the front of the machine and there are three grease fittings that face toward the rear of the machine.

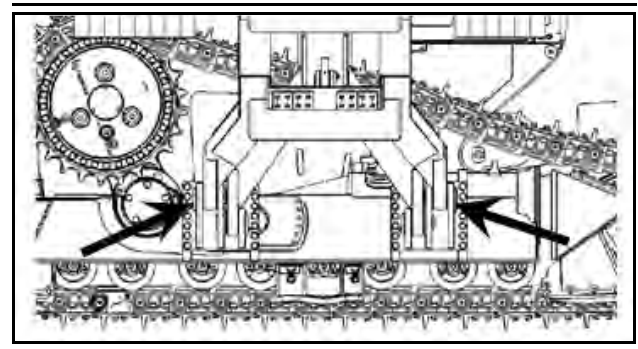


Illustration 291

Counterweight hinge pins located right side of machine

Lubricate the two lower pins through the grease fittings.

Note: If the counterweight is fully extended, install the counterweight lock lever in order to lubricate the counterweight hinge pins. Refer to Operation and Maintenance Manual, "Counterweight Lock Lever" for more details.

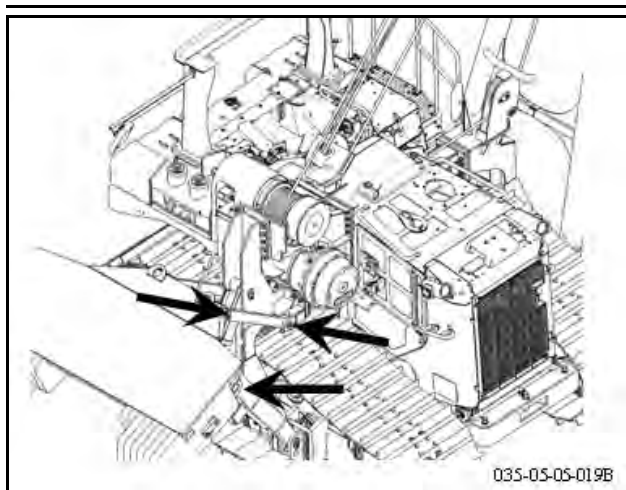


Illustration 292

Counterweight hinge pins lubrication points

Fairlead Sheave – Lubricate



Illustration 293

Fairlead sheave lubrication points

Lubricate one fitting in the lower sheave and lubricate one fitting in the upper pin.

Hook and Wire Cable – Inspect

Inspect the Hook

Inspect the hook frequently. The inspections should include observation of the hook during operation of the hook. A designated person determines if the conditions that are found during the inspections constitute a hazard. The designated person will determine if a more detailed inspection is required.

- Inspect the hook for any distortion such as bends in the hook or twists in the hook.
- Inspect the hook for any wear.
- Inspect the hook for cracks, nicks, or gouges.
- If a latch is provided, inspect the latch. Make sure that the latch engages properly. Inspect the latch for any damage. Make sure that the latch is not malfunctioning.
- Inspect the hook assembly and the means for securing the hook assembly.
- For additional information on the proper maintenance and on the proper inspection of hooks, refer to "American National Standard Institute ANSI/ASME B30.14".

Inspect Wire Cable - Boom and Hook lines

Make a visual inspection of all running cables that are in continuous use. Make the inspection of the running cables on a daily basis before the machine is placed in operation. Inspect all of the cables on a monthly basis.

All inspections shall be performed by a designated person. Keep a dated report of the condition of the cable on file in a location that is available to designated personnel. Perform a close inspection of the sections of the cable that are normally hidden during the visual inspection and the maintenance inspection. (This includes the sections of the cable that pass over the sheaves.) These points are the sections of the cable that are most likely to fail.

Note any deterioration that results in a notable loss of the original strength. (See the conditions that are described below.) Determine if further use of the cable will constitute a hazard.

Inspect the cable on a daily basis for the following conditions:

- Inspect the cable for a reduction in the diameter of the cable below the nominal diameter. A loss of support in the cored wire of the cable may be caused by internal corrosion, external corrosion, or wear of the outside wires.
- Inspect the cable for broken outside wires. Check for the degree of distribution of the broken outside wires. Check for the concentration of outside broken wires.
- Inspect the cable for worn outside wires.
- Inspect the cable for corroded wires and for broken wires at the connection on the wire cable end.
- Inspect the cable end for connections that are corroded, cracked, bent, worn, or improperly installed.
- Inspect the cable for sections that are crushed or kinked and for any loose wire strands.

Excessive wear or broken wires may occur in sections of the cable that are in contact with saddles, equalizer sheaves, or other sheaves. Excessive wear or broken wires can also occur when cable travel is limited. Take care to inspect the ropes at these locations.

When a machine is shutdown for a month or more, inspect all of the cables thoroughly. When a side boom machine has been in storage for a month or more inspect all of the cables thoroughly. The inspection should be completed before the machine is returned to operation.

The inspection should be for all types of deterioration. The inspection should be performed by a designated person or by an authorized person. The authorized person's approval is required for further use of the cable.

A dated report on the condition of the cable should be kept on file.

Take care in the inspection of cable that is resistant to rotation.

Any new poured socket or swaged socket assembly that is used as a standing cable (guy) shall be proof tested. Test the cable to the lift capacity of the side boom machine or to the manufacturer's recommendation.

Never give the cable a rating that is greater than 50 percent of the wire rope's nominal strength or of the structural strand's nominal strength.

Note: For additional information on the proper maintenance and on inspection of the cable, refer to "American National Standards Institute ANSI/ASME B30.14".

Hook Load Line – Install

WARNING

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death. Proper care is your responsibility.

WARNING

Personal injury or death can result from worn wire rope cable. Worn or frayed cable could break causing injury. Check the wire rope cable. If cable is worn or is frayed install new cable. Wear gloves when handling the wire rope cable.

NOTICE

Make sure that the construction of the wire rope is 6x25 IWRC XIPS (Independent Wire Rope Core, eXtra Improved Plow Steel) USA MADE. Also, the established grade of the wire rope is the improved plow bolt (steel), 26670 kg (58 800 lb) minimum breaking strength.

Table 35

SPECIFICATIONS (WIRE ROPE) Hook Load Line Cable

| Boom Length | Diameter | Length |
|---------------|-------------------------|-----------------|
| 6.1 m (20 ft) | 19.05 mm (0.75 inch) | 50.3 m (165 ft) |
| 7.3 m (24 ft) | 19.05 mm (0.75 inch) | 57.3 m (188 ft) |

1. Lower the boom to the horizontal position.
2. Remove the anchor for the wire rope from the drum for the hook. Remove the old wire rope.
3. Unroll the new wire rope from the spool.

Note: Weld the cable ends in order to prevent fraying.

NOTICE

Unroll all of the cable from the spool. Lay the wire rope on a flat surface. Never lift the wire rope off the spool in coils.

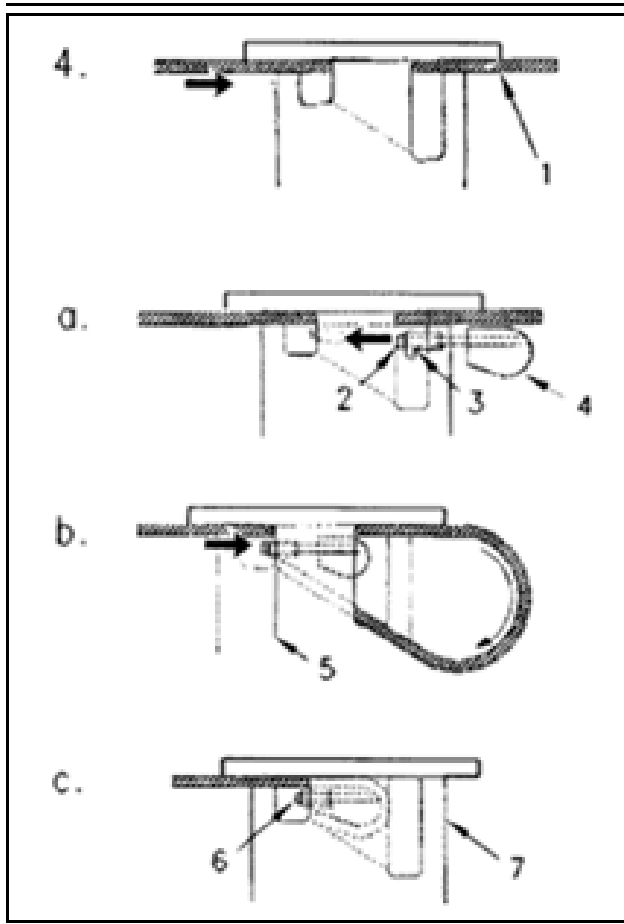


Illustration 294

Installing hook load line, cable anchor assembly

1. Install the cable (1) into the small slot and through the larger slot in the drum for the hook load line.
 - Make sure that 2 to 4 threads of capscrew (2) are engaged into the cable anchor assembly (4). Start with the capscrew and insert the cable anchor assembly into the longer slot as far as allowed.
 - Make sure that the lip of retainer (3) faces the top edge (5) of the small slot in order to hold the retainer in place. Make a loop with the cable end and insert the cable end into the slot past the cable anchor assembly.
 - Pull the cable until the cable and anchor assembly are securely seated inside the slot. Tighten the capscrew to a torque (6) of 44 ± 3 Nm (32 ± 2 lb ft).
2. Wind one half of the cable evenly across the load drum (7).

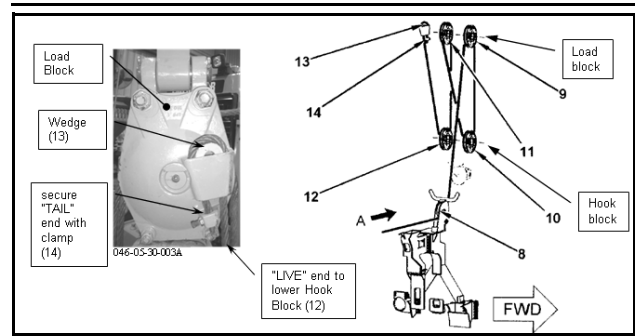


Illustration 295

Installing hook load line

(A) Wire rope from the winch.

3. Install the hook load line from the winch drum onto the sheave blocks in the following manner:

- Install the cable for the hook winch from the winch drum to fairlead sheave (8).

Note: The cable for the hook winch should go over upper sheave (9) which is toward the front of the machine. Anchor the cable for the hook winch toward the rear of the machine.

- Install the cable over upper sheave (9).
- Install the cable under lower sheave (10).
- Install the cable over upper sheave (11).
- Install the cable under lower sheave (12).
- Insert the cable into the pocket and around wedge (13). Allow an additional length of cable to form a tail end (six inch minimum). Use a mallet to tap the wedge and the wire rope into the pocket.
- Insert the tail end of the wire rope through clamp (14). Add a short piece of wire rope through clamp (14) in order to secure the clamp, as needed. Tighten the nuts on the clamp.
- Pull the cable until the line is tight in order to seat wedge (13). Lift the lower block above the ground.
- Raise the boom.

Hydraulic System Oil - Change

Refer to the specific tractor Operation and Maintenance Manual "Hydraulic System Oil - Change" for complete requirements and procedures.

⚠ WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

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 and component containing fluids.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the oil.

Park the machine on level ground. Engage the parking brake and stop the engine.

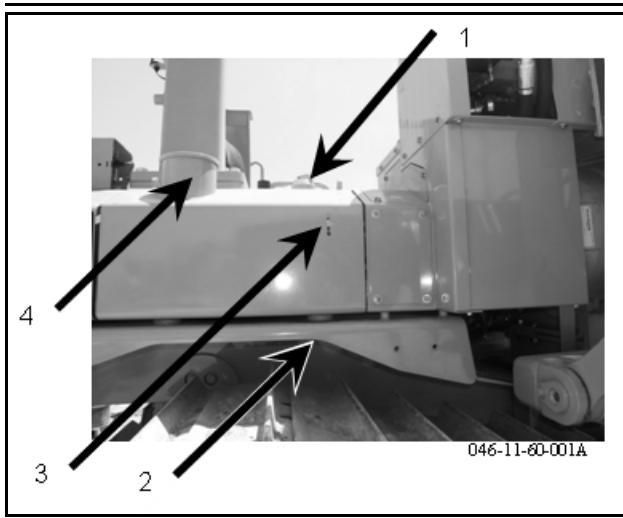


Illustration 296

Hydraulic tank filler cap

Remove the hydraulic tank filler cap (1) slowly in order to relieve any pressure.

1. Wash the filler strainer and the filler cap in a clean nonflammable solvent.
2. Remove oil drain plug (2).
3. Attach a hose to a 1 inch NPT pipe nipple. This 1 inch NPT pipe nipple should have a length of 100 mm (4 inch).

4. Install the pipe nipple into the drain plug opening.
5. Rotate the pipe nipple clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.
6. Remove the pipe nipple. The valve for the hydraulic tank will close.
7. Clean drain plug (2) and install drain plug (2). Tighten drain plug (2) to a torque of 68 ± 7 Nm (50 ± 5 lb ft).
8. See the Operation and Maintenance Manual, Maintenance and Lubrication section, "Hydraulic System Oil Filter – Replace". Change the hydraulic system filter (4).
9. See the Operation and Maintenance Manual, Maintenance and Lubrication section, "Hydraulic System Case Drain Filter – Replace". Change the hydraulic system case drain filter (5).
10. Install the filler strainer.

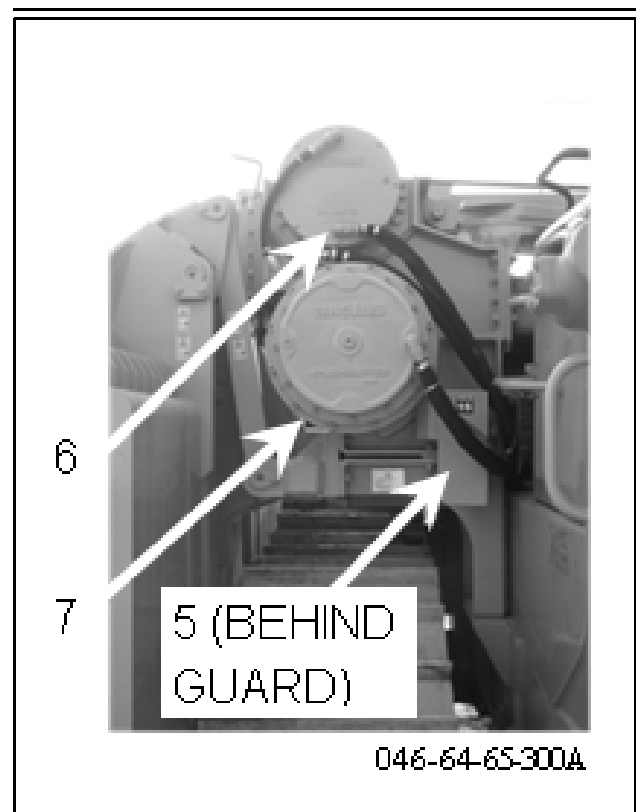


Illustration 297

Winch Drains and Case Drain Filter

11. Drain the oil from both of the winches (6 & 7) into a suitable container.

12. See the Operation and Maintenance Manual, "Capacities (Refill)" in order to determine the amount of hydraulic oil that is needed to fill the hydraulic oil tank. Fill the hydraulic oil tank.
13. Inspect the filler cap gasket. Install a new gasket if damage or wear is evident. Install the filler cap.
14. Start the engine. Run the engine for a few minutes. Check for leaks.
15. Maintain the oil level to the "FULL" mark in sight gauge (3). Add oil, if necessary. Stop the engine.

Hydraulic System Oil Filter - Replace

WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

1. Slowly remove the hydraulic tank filler cap in order to relieve the system pressure.
2. Open the access door that is located on the right side of the machine next to the filler cap.

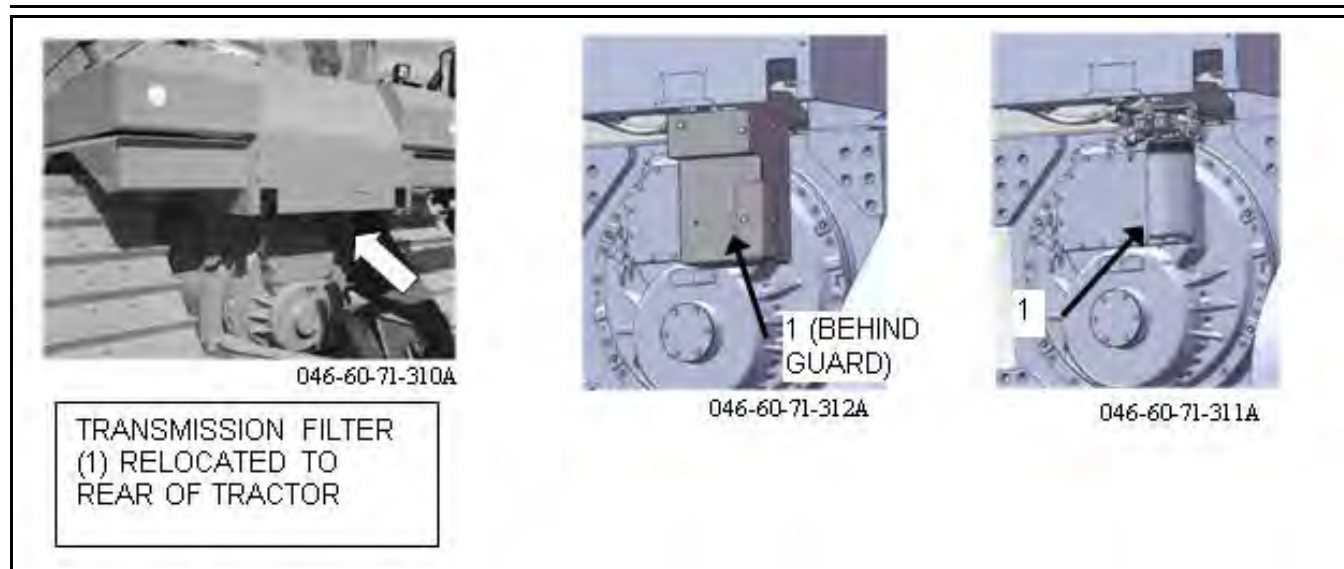


Illustration 298

Filter locations

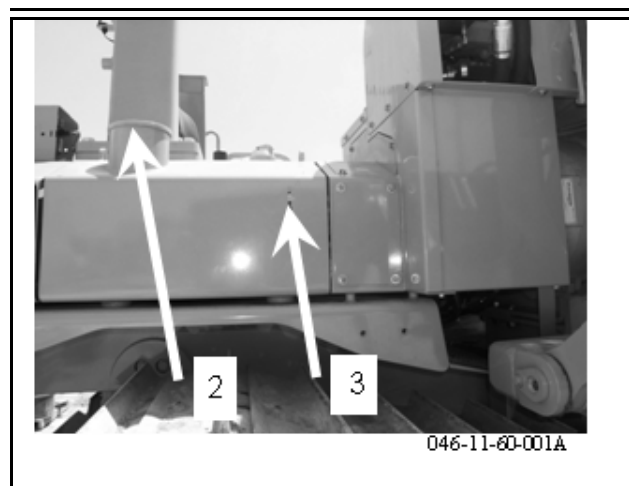


Illustration 299

Filter locations

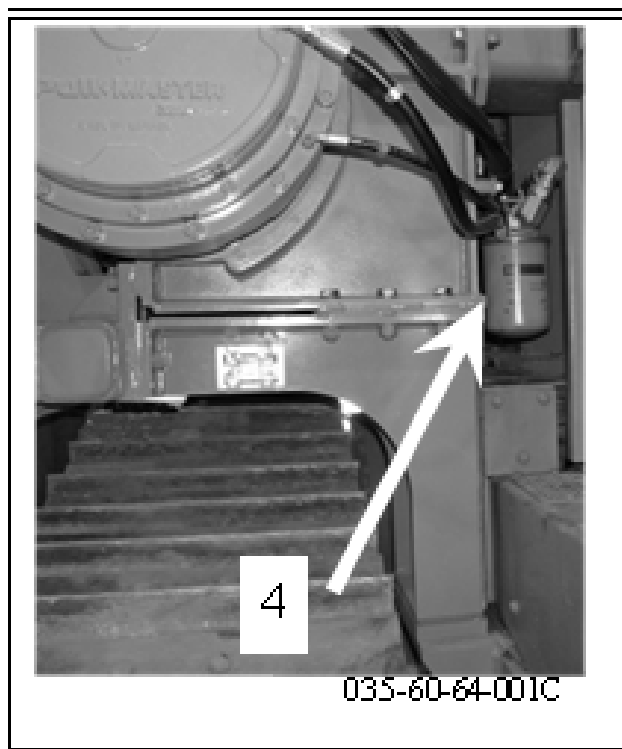


Illustration 300

Filter location

- (1) Transmission oil filter
- (2) Hydraulic system filter
- (3) Hydraulic Tank filler cap
- (4) Case drain filter pipelayer

3. Remove filter (1, 2, and 4).

Note: Remove case drain hydraulic filter (1). Discard the used filter. Filter (1) must be removed for access to hydraulic system filter (2). Replace both of the filters at the same time.

4. Inspect the seal on the filter housings for filter (1, 2, and 4). If the seals are damaged or worn, install new seals. Install a new filter element into the filter housing for (1, 2, and 4).

Hydraulic System Oil Level – Check

WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

The hydraulic tank is on the right rear corner of the machine.

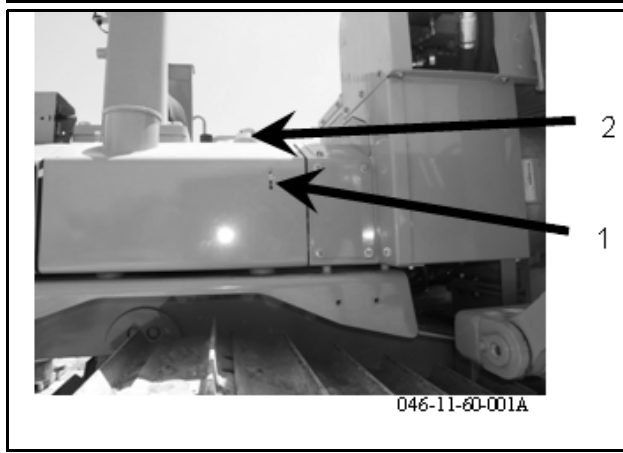


Illustration 301

Hydraulic Tank

1. The counterweight should be fully retracted when you check the oil level.
2. Maintain the oil level to the “FULL” mark in sight gauge (1).

3. If the hydraulic system requires additional hydraulic oil, remove filler cap (2) and add oil. Clean filler cap (2) and install filler cap (2).

Hydraulic System Oil Sampling

Refer to the tractor's operation and maintenance manual for the specific procedures regarding Hydraulic System Sampling.

Oil Filter Inspection

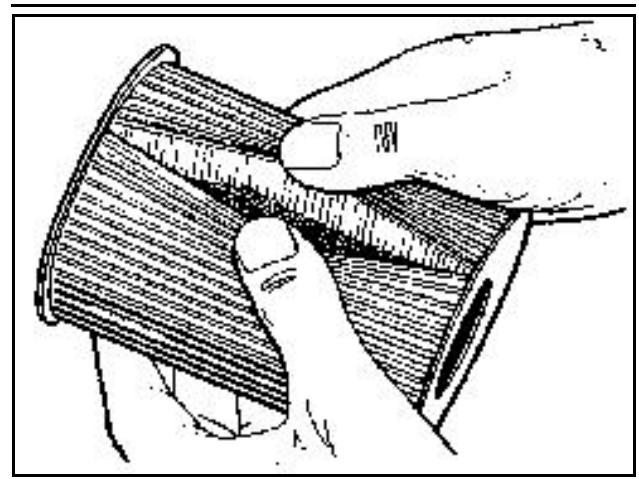


Illustration 302

Oil filter.

Use a Filter Cutter - CAT# 4C-5084, or similar to cut the filter element open. Spread apart the pleats and inspect the element for metal and 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 would indicate wear on steel parts and on cast iron parts. Non ferrous metals would indicate wear of the brass or aluminum part of the hydraulics such as main bearings, pump sleeves, etc.

Small amounts of debris may be found in the filter element. This could be caused by friction and 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 could result in severe damage. This could result in larger particles in unfiltered oil. These particles could enter the system and cause damage.

Sheave Block Bearing – Lubricate

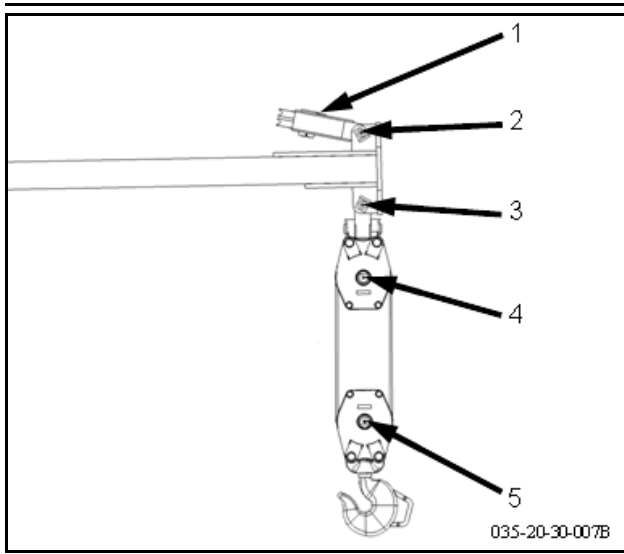


Illustration 303

Rigging Grease Nipples

1. Lubricate (1) in the luff block.

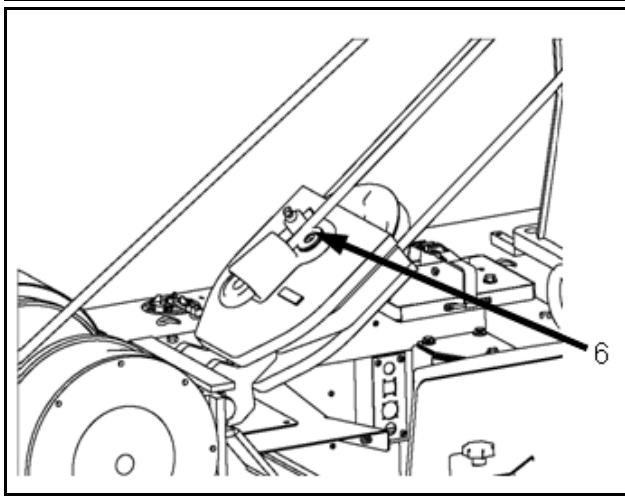


Illustration 304

Rigging Grease Nipples - Tail Block

2. Lubricate fitting in the pins for boom luff block (2 & 3) and load sheave block.
3. Lubricate pin (4) in load sheave block and the pin (5) in the hook sheave block.
4. Lubricate pin (6) on tail block.

Tractor Maintenance

Refer to the tractor's operation and maintenance manual for the specific procedures regarding complete Tractor Maintenance.

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