

D60x90 Navigator[®]

Horizontal Directional Drill

Maintenance Manual



D60x90_m1_04
Serial No. 101 -
Order No. 105400BQ9



Vermeer[®]

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Introduction

This manual explains the proper operation of your machine. Study and understand these instructions thoroughly before operating or maintaining the machine. Failure to do so could result in personal injury or equipment damage. Consult your Vermeer dealer if you do not understand the instructions in this manual, or need additional information.

The instructions, illustrations, and specifications in this manual are based on the latest information available at time of publication. Your machine may have product improvements and features not yet contained in this manual.

The maintenance intervals are based on normal operating conditions. When operating under severe conditions, the maintenance intervals should be shortened.

To provide a better view, some photographs or illustrations in the maintenance sections may show the machine shields removed. **Never operate the machine with the shields removed - keep all shields in place.** If removing a shield is necessary, return it to its operating position before operating the machine.

Vermeer Corporation reserves the right to make changes at any time without notice or obligation.

This manual is supplied with each machine. Refer to it for all lubrication and maintenance procedures. Keep this manual with the machine for ready reference. Store it in a protected location when not in use.

Additional copies of the manuals, and Operations and Safety video, are available from your dealer. Use the reorder numbers on the front cover to order additional manuals.

Copies of this manual, and the Operations and Safety video, are available in Spanish from your dealer.

Su distribuidor dispone de ejemplares en español de este manual y del vídeo de Operaciones y Seguridad.

NOTICE TO OWNER

Replacement manuals are free of charge by registering your **used** Vermeer machine. Your machine's Operator's, Maintenance and Parts Manuals may be available online at www.myvermeer.com. For questions about online or printed manuals, or to register a used machine, contact the Customer Data Department by telephone: 800-829-0051 or 641-628-3141; email: customerdata@vermeer.com; internet: www.vermeer.com or www.myvermeer.com; or, letter: Customer Data Dept., Vermeer Corporation, PO Box 200, Pella IA 50219 USA.

SERVICE

Service instructions are contained in a separate service manual. Service manuals can be obtained by contacting your Vermeer dealer. If you are considering servicing the machine without the assistance of a Vermeer dealer, remember this is a complex machine which often involves complex service procedures.

There are also many components which are not user-serviceable. Do not attempt any service which you do not fully understand, nor any service that you cannot do accurately and safely with proper tools and equipment. If you encounter a problem that you do not understand or cannot solve, contact your Vermeer dealer.

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Section 10: Safety Messages

General safety messages appear in this Safety Messages section. Specific safety messages are located in appropriate sections of the manual where a potential hazard may occur if the instructions or procedures are not followed.

A signal word “**DANGER**”, “**WARNING**”, or “**CAUTION**” is used with the safety alert symbol.

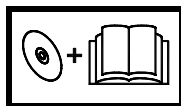
Safety signs with signal word “**DANGER**”, “**WARNING**”, or “**CAUTION**” are located near specific hazards.

DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related.

SAFETY SYMBOL EXPLANATION



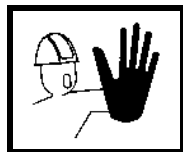
This is the safety alert symbol. This symbol is used in combination with an exclamation mark or other symbols to alert you to the potential for bodily injury or death.



WARNING: Read Operator’s Manual and safety signs, and watch the operations and safety video, before operating machine.



WARNING: Wear personal protective equipment. Wear close-fitting clothing and confine long hair. Always wear a hard hat, safety glasses, and safety shoes.

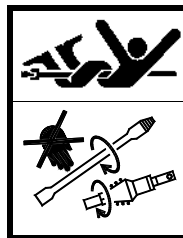


WARNING: Keep spectators away.



WARNING: Exhaust fumes can be fatal.

If operating in an enclosed area, remove exhaust fumes with an exhaust pipe extension to the outside.



DANGER: Rotating drill string or cutters can kill.

Stay away from rotating drill rod and cutting tool.

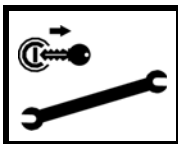


DANGER: Rotating drill string can kill. Unexpected start-up possible.

Lock out before working on drill string.



WARNING: Keep hands, feet, and clothing away from power-driven parts. Keep shields in place and properly secured.



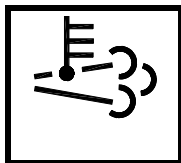
WARNING: Use Shutdown Procedure before servicing, cleaning, repairing or transporting machine. Follow [Shutdown Procedure](#), page [12-1](#).



WARNING: Make no modifications to this equipment unless specifically recommended by Vermeer Corporation.



WARNING: Be sure that all safety devices, including shields, are installed and functioning properly after servicing the machine.



WARNING: When *HEST (High Exhaust System Temperature) Light* is displayed, the exhaust gas temperature could exceed 1100°F (600°C) during regeneration. High temperature may cause in fire, burn, or explosion hazards, which may result in personal injury or death. Do not expose flammable material or explosive atmospheres to exhaust gas or to exhaust system components during regeneration.



WARNING: To prevent fires, routinely clear any combustible material from the engine exhaust system. Tier 4 Interim / Stage IIIB emission compliant exhaust systems use extreme high temperature that can ignite combustible material.



WARNING: Servicing machine during DPF regeneration can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and hot exhaust system components.



WARNING: If regeneration is performed within any indoor service/maintenance facility, ensure the exhaust removal system is capable of withstanding temperatures exceeding 1100°F (600°C).



WARNING: Failure to follow any of the preceding safety instructions or those that follow within this manual, could result in serious injury or death. This machine is to be used only for those purposes for which it was intended as explained in the Operator's Manual.

Section 11: Welding Precautions

WELDING ALERT - ELECTRONIC COMPONENTS

NOTICE: Electronic modules and controllers will be damaged from stray voltages and currents generated during welding if not unplugged **before welding**.

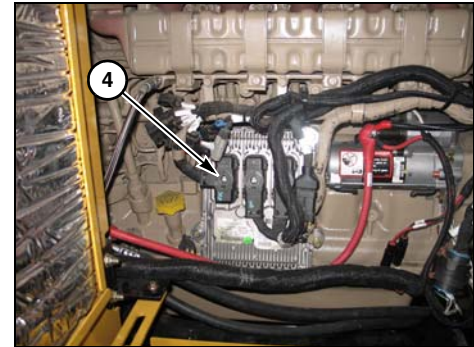
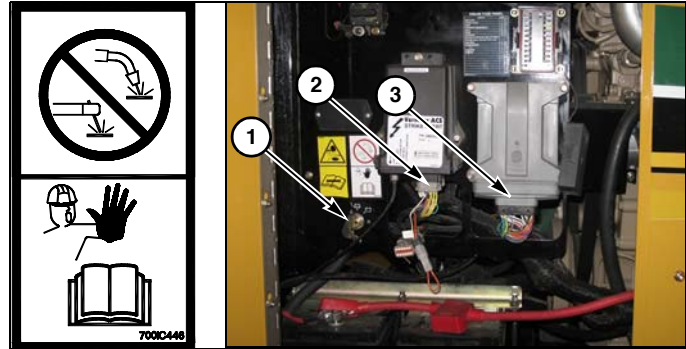
To prevent extensive and costly damage to the electrical components:

Step 1: Turn *Battery Disconnect Switch* (1) to DISCONNECT.

NOTICE: Disconnecting the battery ground with the battery disconnect switch will not prevent damage to the electronic components during welding. Each of the modules must have the electrical connector unplugged from the module.

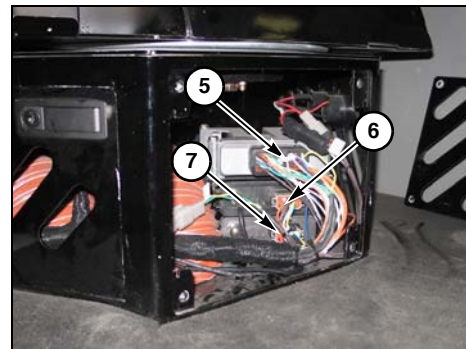
Step 2: Unplug Strike Alert (2) and pump controller (POM) modules (3).

Step 3: Unplug three engine ECUs (4).

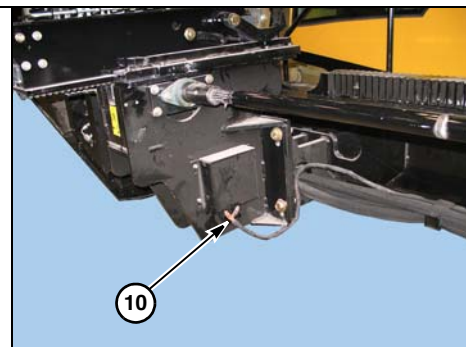
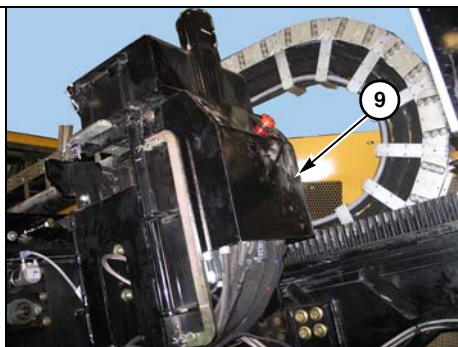
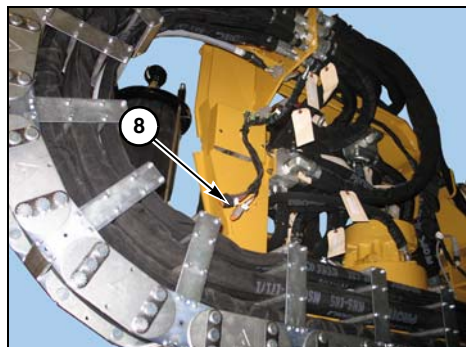


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Step 4: Under the seat, unplug three connectors, to the cab controller (5), the Remote Lockout (RLC) module (6) and the DCIM module (7).

In cab machine, access through foot panel in front of operator seat; in non-cab machine, tip seat forward and lift panel.



Step 5: Unplug carriage controller (CCU) (8), rack controller (ROM) (9), and vise controller (VOM) (10).



Section 12: Shutdown Procedure

Step 1: Shut off drilling fluid pump.

Step 2: Reduce engine speed to idle.

Step 3: Wait 2 minutes to shut off engine when shutting down after operating at full power.

Step 4: Shut off engine and remove key.

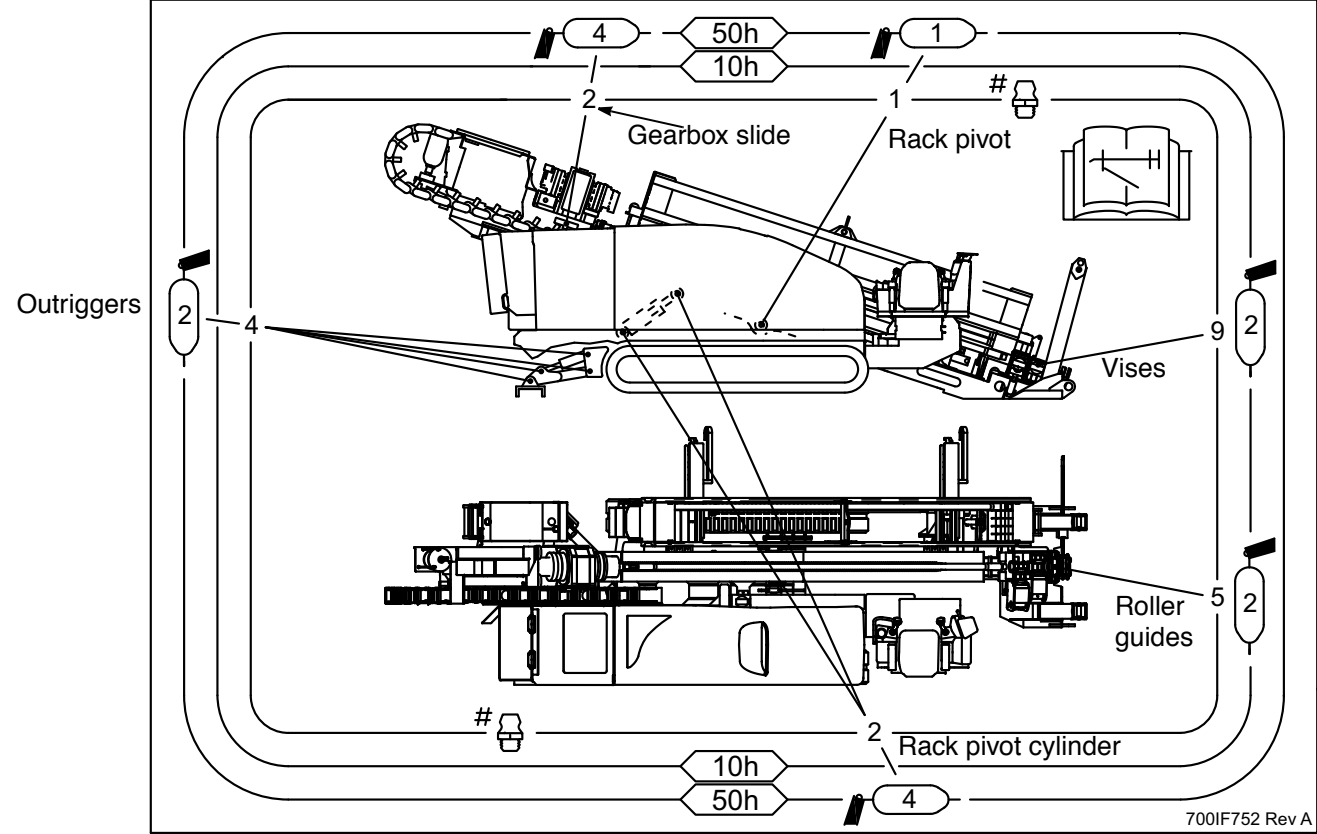
For your safety and the safety of others, use the shutdown procedure before working on the machine for any reason, including servicing, cleaning, unplugging, or inspecting.

If working on the drill string or drill tools at a remote location away from the machine, follow [Lockout Procedure - With Remote Lockout](#) or the [Lockout Procedure - Without Remote Lockout System](#) in the [Overview Section](#) of the [Operator's Manual](#).

A variation of the above procedure may be used if instructed within this manual or if an emergency requires it.

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Section 15: Grease Chart



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Section 20: Maintenance - 10 Service Hours or Daily

MACHINE - GREASE

As a general rule, grease machine after it is shut down for the day. This protects the metal under the seals from corrosion caused by condensation as the temperature drops.

Ensure all fittings and grease applicator nozzle are clean before applying grease. If any grease fittings are missing, replace them immediately.

MACHINE INSPECTION

- Inspect machine daily and check for leaks before starting.
- If stabilizer or rack hydraulic cylinders drift, contact your Vermeer dealer for repair.
- Check vise dies daily and remove accumulated debris or dirt. Clean with a wire brush.

ENGINE MAINTENANCE

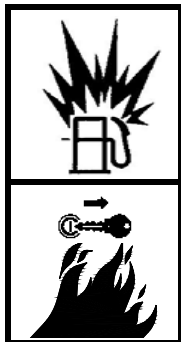
Visually inspect engine daily and make any necessary adjustments and repairs before starting.

Refer to the Engine Operation Manual supplied with each machine for complete instructions.

FLUID LEVELS - CHECK

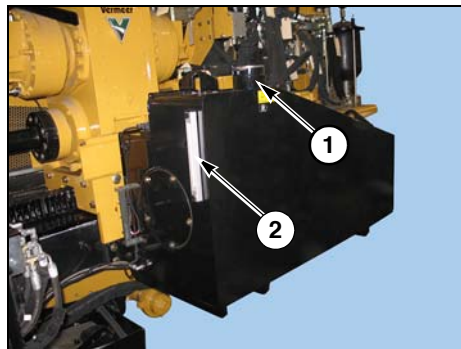
Check fluid levels daily before operating the machine. Refer to the Engine Operation Manual.

Fuel Tank - Fill



WARNING: Fuel and fumes can explode and burn.

Shut off engine before refueling. No flame. No smoking.



Fill tank before raising rack.

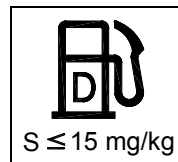
Fill fuel tank at the end of each day to prevent condensation. Do not fill to the very top, leave room for expansion.

- (1) Fill Cap
- (2) Fuel Gauge



To meet government emission requirements use diesel fuel with a low or ultra low sulfur content, less than 15 ppm or 0.0015% (15 mg/kg).

NOTICE: Use of higher content sulfur fuel will cause engine damage and void engine warranty.



Fuel/Water Separators - Check/Drain



WARNING: Fuel and fumes can catch fire or explode, resulting in serious burns or death.

Never work around fuel while smoking or near an open flame.

To access filters, remove four bolts (1) and panel (2).

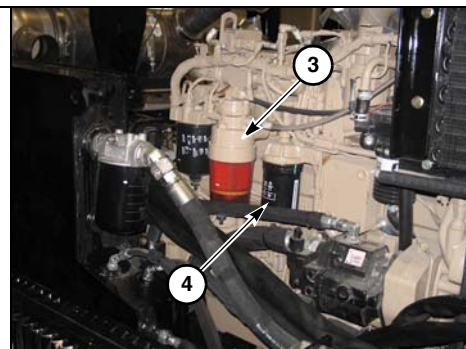
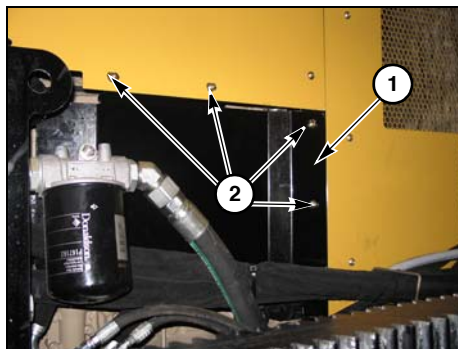
(3) Primary Fuel Filter with Water Separator

(4) Secondary Fuel Filter

Check fuel filters for water or debris. Drain water as needed based on daily visual inspection. Refer to "Fuel Filters - Replace," [page 40-2](#).

Do not spill fuel. Catch expelled fuel in an appropriate container.

Refer to the Engine Operation Manual supplied with the machine for instructions.



Hydraulic Fluid Level - Check

Clean hydraulic fluid is very important. Do not spill dirt or other contaminants into the tank. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank.

Follow [Shutdown Procedure](#), page [12-1](#). Check hydraulic fluid level.

Keep tank filled to mid-gauge level. Machine must be level and in transport position. Use proper fluid. Refer to “Lubricants,” [page 80-1](#).

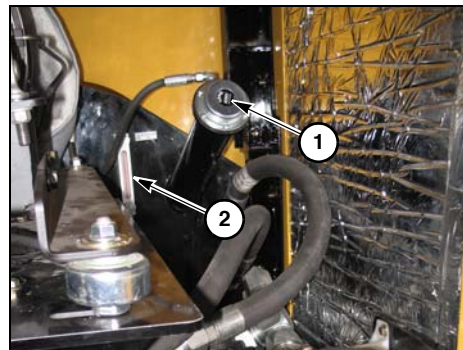
Step 1: Open engine cover.

Step 2: Remove fill cap (1).

Step 3: Fill to sight gauge level (2).

Step 4: Install fill cap.

Step 5: Close engine cover.



Engine Crankcase Oil - Check/Fill

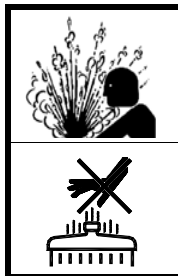
With engine level, fill to full mark on dipstick. Do not overfill.

Use engine break-in oil during first 100 hours of operation.

(1) Dipstick and Fill Cap



Coolant Level - Check/Fill



WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

Do not remove overfill bottle cap (1) from a hot engine. Wait until the temperature has cooled before removing the overfill bottle cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove cap slowly to relieve coolant system pressure.

Make a 50/50 mixture of coolant and distilled or deionized water. Add to cold fill line when engine is cold; fill to hot fill line when engine is hot.

Radiator is located under the overfill bottle.

NOTICE: This machine was factory-filled with a 50/50 mixture of Shell Rotella ELC NF (Extended Life Nitrite Free) coolant for -34° (-37°C) protection. Compatible coolants include Chevron Delo ELC NF and Exxon Mobil Delvac ELC NF. Never add pure antifreeze to the system; always dilute to a 50/50 mixture.



AIR CLEANER RESTRICTION INDICATOR - CHECK

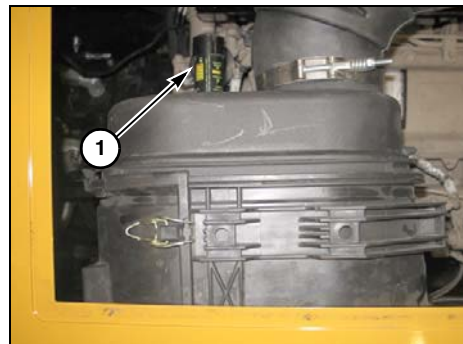
Check air cleaner restriction indicator daily. When the indicator (1) shows a colored band (usually red), filter elements must be replaced. Push button on top of indicator to reset.

- **Do not** remove the element until the indicator shows it needs to be replaced.
- **Do not** wash or blow out the element; **it must be replaced.**

Refer to “Air Cleaner Element - Replace,” [page 60-6](#).

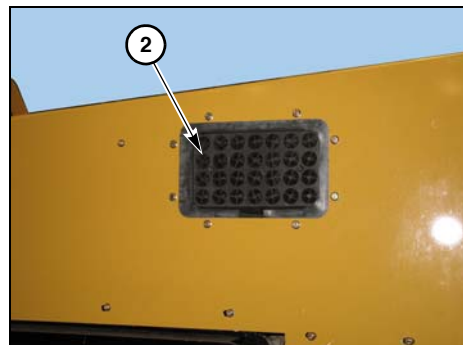
NOTICE: The air restriction indicator will not function properly if:

- Element is damaged or not seated properly in housing.
- Air cleaner housing or element is damaged. If so, unfiltered air may be entering engine.
- Air transfer duct between air cleaner and engine is damaged or its clamps are loose.
- Air duct between air cleaner and restriction indicator is damaged or pinched.



Air Intake Screen - Check/Clean

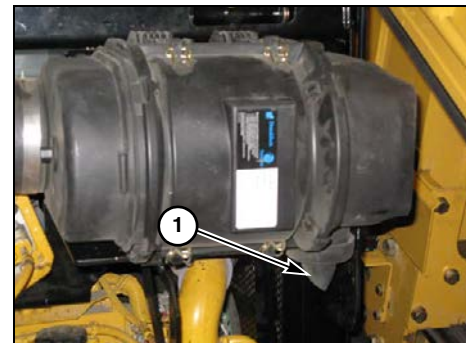
Blocked air flow increases engine temperature. Check air intake screen (2) for dirt and debris. Remove screen and clean with compressed air or water.



Dust Discharge Valve - Empty

Empty dust discharge valve (1) by pressing apart lips of discharge slot.

Remove any caked dirt by pressing together the upper section of the valve.



ACCUMULATOR PRESSURE - CHECK

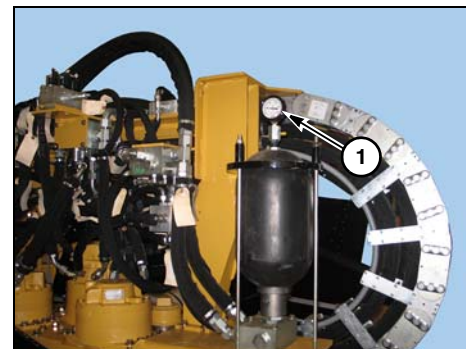


WARNING: Accumulator is under pressure. Do not attempt to disassemble or service accumulator. If accumulator requires service, contact your Vermeer dealer.

Check accumulator pre-charge pressure on gauge (1) **before** starting the machine each day. Machine must be shut down a sufficient length of time to allow hydraulic oil to cool to ambient temperature and residual pressures in the hydrostatic closed loops to bleed down to atmospheric pressure.

Pre-charge pressure should be 230–250 psi (16–17 bar). If pressure is too low, contact your Vermeer service dealer.

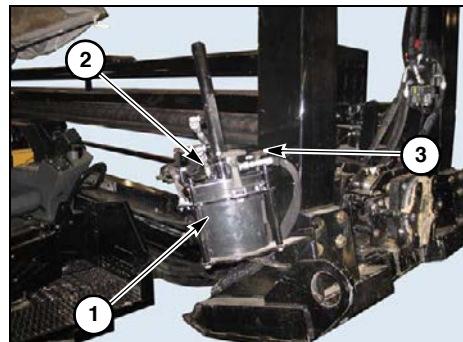
Operation of accumulator without sufficient pre-charge can cause bladder failure.



AUTO GREASER - CHECK/REFILL

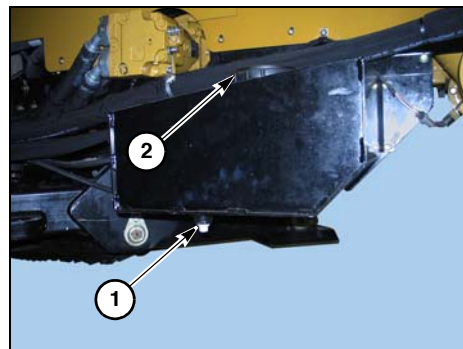
Check the level of grease in bucket (1) each day at start-up by removing top cap. Refill as needed.

To refill, pump grease into fitting (2), or open three latches (3) and replace bucket.



PISTON WASH WATER TANK - DRAIN/CLEAN/REFILL

Drain fluid from plug (1) on bottom of tank and flush out contaminants. Refill (2) using ethanol-based glycol RV-type anti-freeze if used in freezing temperatures.

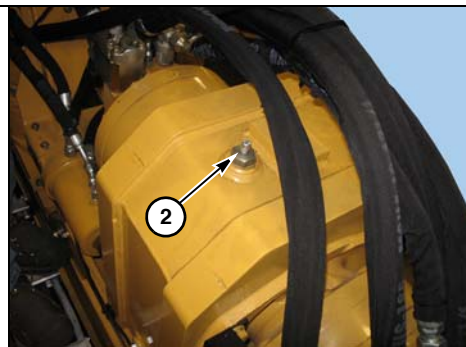
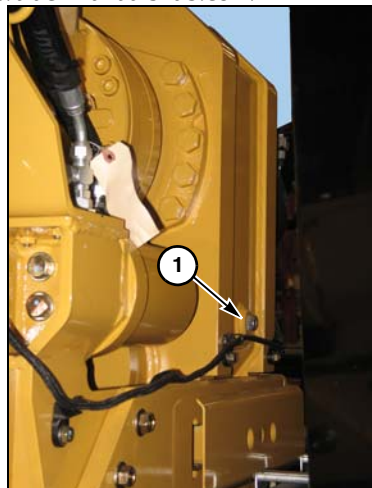


ROTATION GEARBOX OIL - CHECK

Maintain oil level at sight gauge (1). Fill at plug (2) on other side of gearbox. Refer to “Lubricants,” [page 80-1](#). Capacity is 6 qt (5.7 L).

DRILL ROD CARE AND INSPECTION

- Do not exceed bend radius of the drill rod.
- Do not over-torque or under-torque drill rods. Doing so will cause premature failure of the drill rod.
- Move leading rod to back of rod box after each job to prevent excessive wear on the lead rod.
- Inspect drill rod before and during each use.
- Remove any rod from drill string with damaged or worn ends.
- Remove any rod from drill string that are bent.
- Use proper thread or profile gauge to check for damaged thread.
- After rods are coupled together, check for fluid leakage at the joint.
- Leaking drill rod joints indicate damaged shoulders, which will not torque properly.
- Check shoulders for dents, gouges, or high spots.
- Dress damaged shoulders with a file.



WATER SWIVEL - CHECK

At the beginning of each workday, check that four cap screws (1) are in place and tight.

Greasing

Lubricate fitting (2) while swivel rotates until grease exits weep hole (3).

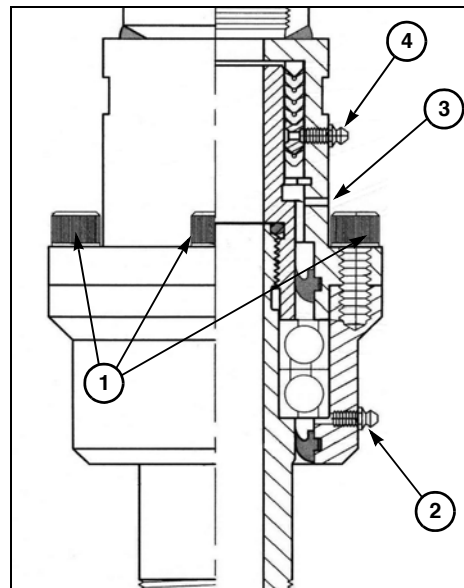
Packing Leaks

If water leaks from hole (3), the packing is leaking. Lubricate fitting (4) while swivel rotates until packing leak stops. If greasing fails to stop the leak, replace packing. Contact Vermeer dealer for instructions.

NOTICE: Failure to lubricate bearings and packing will cause premature bearing and packing failure.

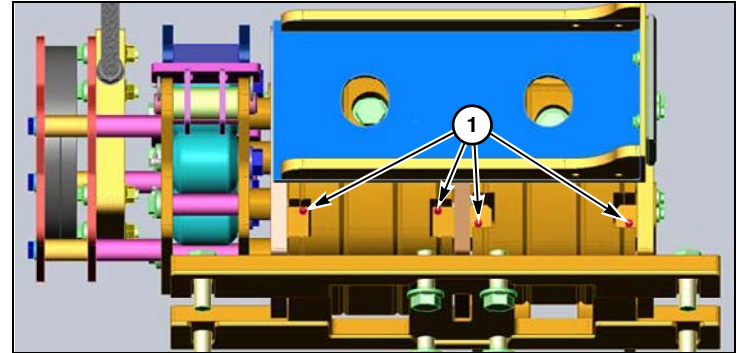
WISE DIES - INSPECT/CLEAN

Check vise dies daily and remove accumulated debris or dirt. Clean with a wire brush.



VICES - GREASE

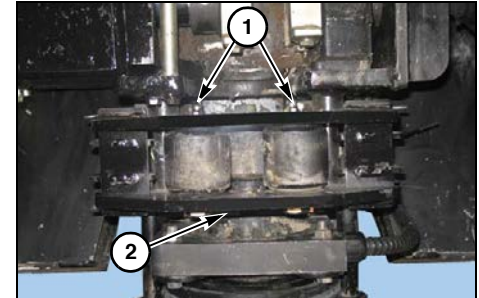
(1) 2 shots..... 8 fittings



FRONT ROLLER GUIDES - GREASE

(1) 2 shots..... 2 fittings

(2) 2 shots..... 3 fittings



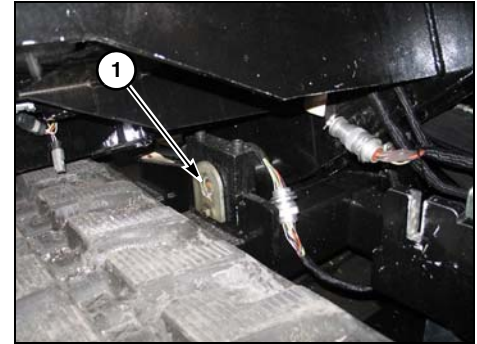
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Section 25: Maintenance - 50 Service Hours or Weekly

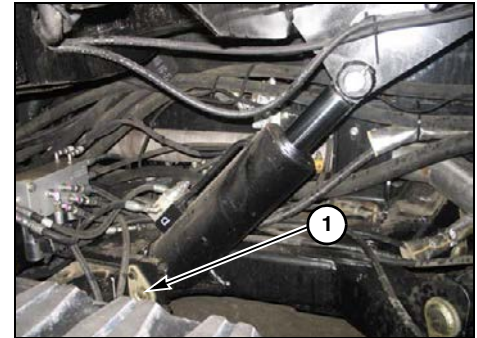
RACK FRAME PIVOT - GREASE

(1) 1 shot 1 fitting



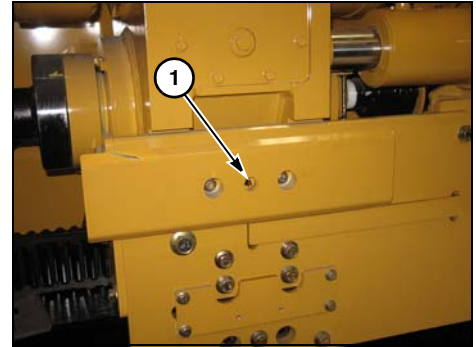
RACK FRAME PIVOT CYLINDERS - GREASE

(1) 4 shots.....1 fitting



GEARBOX SLIDE - GREASE

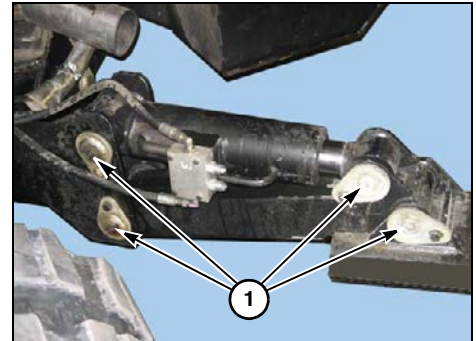
- (1) 4 shots 2 fittings, 1 on each side of gearbox



REAR OUTRIGGERS - GREASE

Lower each outrigger to level ground. Fittings are recessed in holes.

- (1) 2 shots 4 fittings on each outrigger

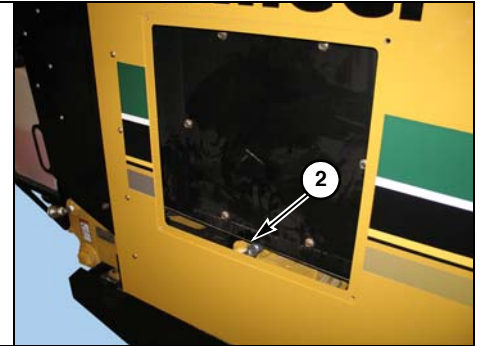


DRILLING FLUID PUMP CRANKCASE OIL LEVEL - CHECK

Remove four bolts and panel (1).

Keep crankcase filled to petcock (2)
level.

Refer to “Lubricants,” [page 80-1](#).



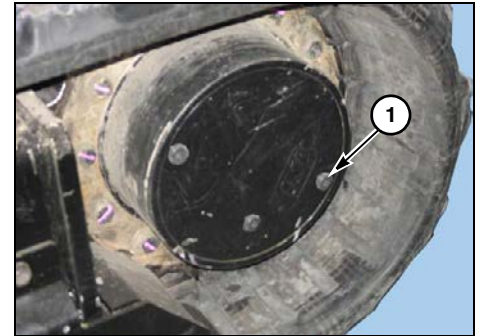
TRACK PLANETARY GEARBOX OIL LEVEL - CHECK

Check at 50 hours or weekly, more often if tracking machine for long periods of time.

Check oil level with plug at 3:00 or 9:00 position. Fill to check plug level.

(1) Check Plug

Refer to “Lubricants,” [page 80-1](#).



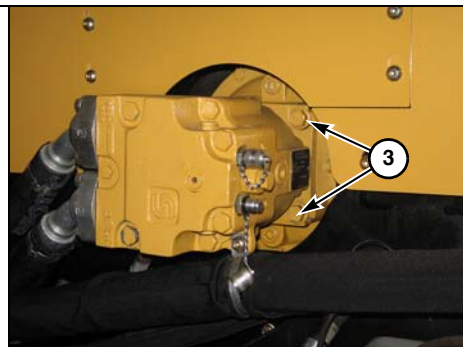
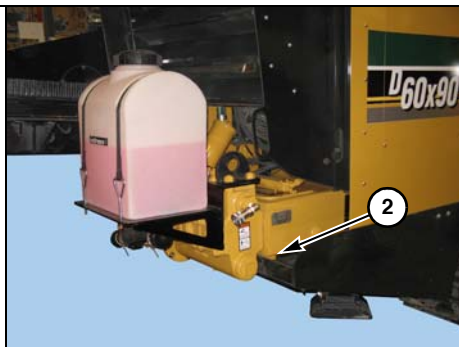
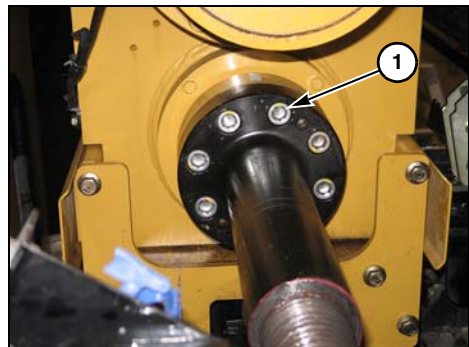
BOLTS - CHECK

Check bolts weekly and tighten as needed.

Check gearbox/drive chuck bolts (1) and tighten to 340 ft-lb (461 Nm).

Check four water pump mounting bolts (2) and tighten to 127 ft-lb (172 Nm).

Check four water pump hydraulic motor bolts mounting bolts (3) and tighten to 260 ft-lb (353 Nm).



Section 30: Maintenance - 100 Service Hours

ENGINE MAINTENANCE

Refer to the Engine Operation Manual supplied with each machine for complete instructions.

Engine Oil and Filter - Initial Change/Replacement

- (1) **Engine Oil Drain Plug**
- (2) **Engine Oil Filter**
- (3) **Engine Oil Fill Cap/Dipstick**

Step 1: Drain oil. Dispose suitably.

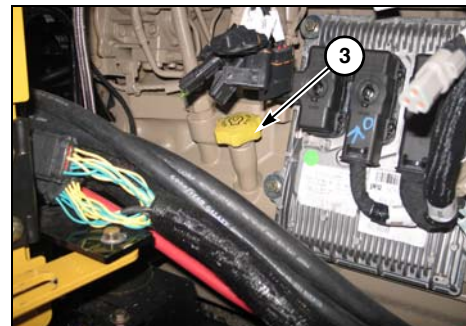
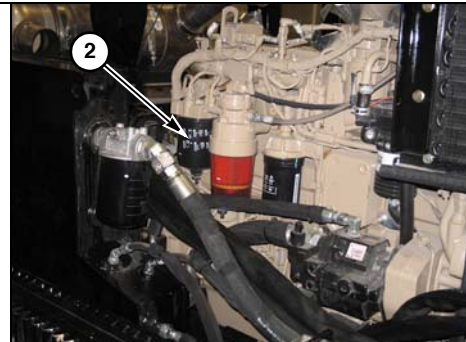
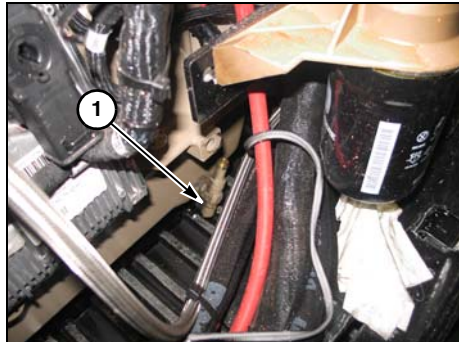
Step 2: Replace drain plug and filters.

Step 3: Add oil. Refer to “Lubricants,” [page 80-1](#).

Step 4: Start engine and check for oil leaks.

Step 5: After 10 minutes, shut off engine and check level.

Under normal operating conditions, change oil and replace filter every 500 hours.



RADIATOR AND OIL COOLER - CLEAN

Clean fins with water or air pressure. Partially blocked fins will increase engine coolant and/or hydraulic oil operating temperature.

BATTERY VOLTAGE - CHECK

Electrical/hydraulic systems may not function with a low battery voltage.

Low battery voltage will be indicated by a loss of hydraulic power at the drill unit. If low voltage is suspected, shut down machine and determine the cause. Follow [Shutdown Procedure](#), page [12-1](#).

SAFETY SIGNS MAINTENANCE

Safety signs located on your machine contain important and useful information that will help you operate your equipment safely. Refer to the [Parts Manual](#) for locations.

To assure that all safety signs remain in place and in good condition, follow the instructions given below:

- Keep safety signs clean. Use soap and water - not mineral spirits, abrasive cleaners, or other similar cleaners that will damage the sign.
- Replace any damaged or missing safety signs. When attaching safety signs, the temperature of the mounting surface must be at least 40°F (5°C). The mounting surface must be clean and dry.
- When replacing a machine component with a safety sign attached, replace the safety sign also.

Replacement safety signs can be purchased from your Vermeer equipment dealer.

OVERALL MACHINE - CHECK

Shields and Guards - Check that all shields and guards are installed and are fastened securely to the machine. Replace and repair any shields or guards that are damaged or have missing parts.

Hardware - Check machine for loose, worn, or missing parts and hardware. Tighten any loose parts and replace any worn or missing parts. Refer to the [Parts Manual](#) for replacement parts.

Frame - Check frame and contact dealer immediately if you notice any bending or cracking.

Fire Prevention - Keep engine compartment, battery, hydraulic lines, fuel tank, and operator's station clean of accumulated trash, grease, and debris.

Slip Resistant Material - Check for worn or missing slip-resistant strips. Replace at once if damaged. Refer to the [Parts Manual](#) for replacement parts.

Electrical Harness - Check that electrical harness and all wires are properly supported and not rubbing on any sharp corners. Support any loose wires hanging under machine frame.

BACKUP ALARM - CHECK

The backup alarm must operate correctly to alert workers in the area when the machine is moving in reverse.

Check that the backup alarm sounds when the machine is propelled in Reverse direction.

HYDRAULIC SYSTEM - CHECK



WARNING: Pressurized fluid can penetrate body tissue and result in serious injury or death. Leaks can be invisible. Keep away from any suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing any other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

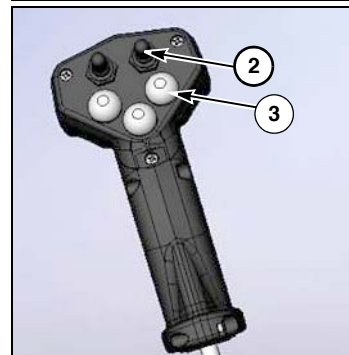
- Ensure all connections are tight and hoses are in good condition before applying pressure to the system.
- Check hydraulic cylinders for leaks and damage. Repair or replace as required.
- Examine condition of hoses. Check for leaking hoses, kinked hoses, and for hoses that rub against other hoses or other parts of the machine.
- Replace all deteriorated or damaged hoses. When a hose with a protective sleeve is replaced, always install a new protective sleeve over the new hose.

HYDRAULIC ENABLE - CHECK

A *Hydraulic Enable Button (1)* on the operator's panel must be pressed after starting the engine and while sitting in the seat to enable hydraulics for the power vise, rod loader, and water system ball valve.

- Step 1:** Sit in operator's seat and start engine. Without pressing the *Hydraulic Enable Button*, push *Front Vise Switch (2)* forward to clamp vise. The front vise **should not function**.
- Step 2:** Pull *Front Vise Switch* back to release position.
- Step 3:** Press *Rod Lift Button (3)*. The rod lifter should not function.
- Step 4:** Press *Hydraulic Enable Button (1)*.
- Step 5:** Push *Front Vise Switch (2)* up. The front vise should clamp.
- Step 6:** Press *Rod Lift Button (3)*. The rod lifter should move.

Contact a Vermeer dealer if Hydraulic Enable system does not work properly.



OPERATOR PRESENCE SYSTEM - CHECK

The machine is equipped with an Operator Presence system. This system is intended for operator safety and must be maintained in good functional condition.

Rod thrust and rotation drive will not function if operator is not seated at the controls. Transport radio remote transmitter controls will not function with operator seated at controls.

To check Operator Presence system:

- Step 1:** Press and hold *Run Button* on remote lockout transmitter for two seconds to enter remote lockout RUN mode.
- Step 2:** Push *Thrust / Pullback Joystick* forward. The gearbox should move forward.
- Step 3:** While gearbox is moving, partially stand to remove your weight from the seat. **The gearbox must stop moving.**
- Step 4:** Sit in operator's seat.
- Step 5:** Pull *Drill Rotation Joystick* back to rotate drill rod.
- Step 6:** While rod is rotating, partially stand to remove your weight from the seat. **Rod rotation must stop.**
- Step 7:** With operator in seat, move the *Joysticks* out of NEUTRAL. The tracks must not move.

Contact a Vermeer dealer if the Operator Presence system does not work properly.

NEUTRAL START INTERLOCK - CHECK

- Step 1: Move and hold *Thrust Control Joystick* out of NEUTRAL position.
- Step 2: Start the engine. Thrust must not move until joystick is returned to NEUTRAL, then moved back out of NEUTRAL, and *Hydraulic Enable Key* is pressed. Shut off engine.
- Step 3: Move and hold *Rotation Control Joystick* out of NEUTRAL position.
- Step 4: Start the engine. Rotation must not move until joystick is returned to NEUTRAL, then moved back out of NEUTRAL, and *Hydraulic Enable Key* is pressed.
- Step 5: Return joystick to NEUTRAL.
- Step 6: Increase engine speed to full RPM. Rotation, thrust and ground drive must not move with controls in NEUTRAL and engine at full RPM with operator seated at the controls.

DRILLING FLUID SYSTEM - CHECK

Check drilling fluid system for leaks, kinked or collapsed hoses, and hoses or other parts that rub against each other.

GROUND DRIVE SYSTEM - INSPECT

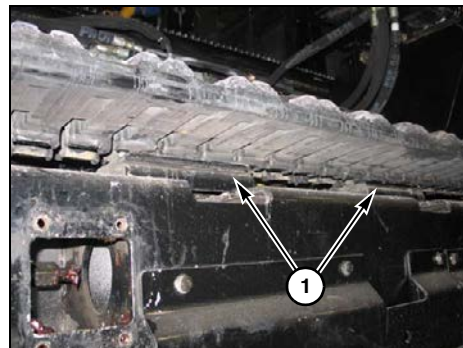
Check condition of wear plates. Replace if missing or if thickness is less than 1/16" (1.6 mm).

(1) Upper Track Wear Plates

Two on each side. The forward edge is visible at the location indicated.

Track Tension - Check

Refer to "Track Tension - Adjust," [page 60-9](#).



Section 35: Maintenance - 250 Service Hours

HYDRAULIC FLUID FILTERS - INITIAL REPLACEMENT

Replace hydraulic fluid filters:

- after the first 250 hours; every 500 service hours thereafter
- each time hydraulic fluid is changed

(1) **Return Filter (left side of engine)**

(2) **Charge Filters (right side of engine)**

Step 1: Follow *Shutdown Procedure*, page 12-1.

Step 2: Thoroughly clean area around filter(s) to keep contaminants out of hydraulic system.

Step 3: Use a filter wrench to turn filter body (1) and (2) counterclockwise to remove filters.

Step 4: Carefully clean mating surface of filter head. Look for cracks or pitting in filter head. If needed, replace filter head.

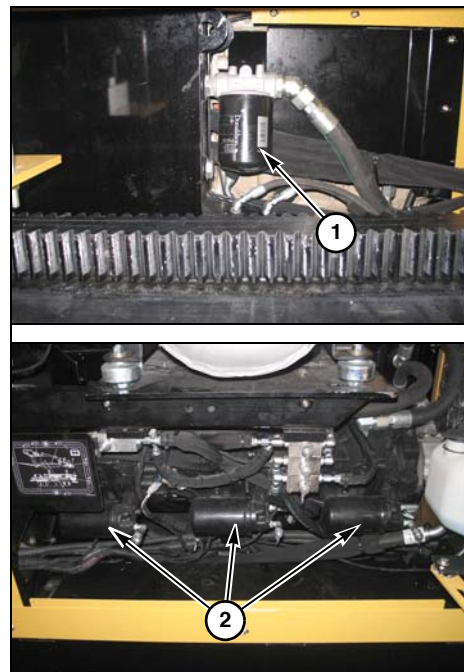
Step 5: Apply a thin film of oil to gasket of new filter.

Step 6: Thread filter onto filter head and tighten by hand until snug.

Step 7: Use a filter wrench to tighten filter an additional 1/10 turn. **Do not overtighten.**

Step 8: Start engine and operate it at idle for 1 minute. Ensure thrust and rotation pressures are 300 psi (21 bar).

Step 9: After 1 minute, press *Hydraulic Enable Button* and cycle all hydraulic cylinders and drill functions to fill all components. Shut down and check hydraulic fluid level. Check for leaks around filter.



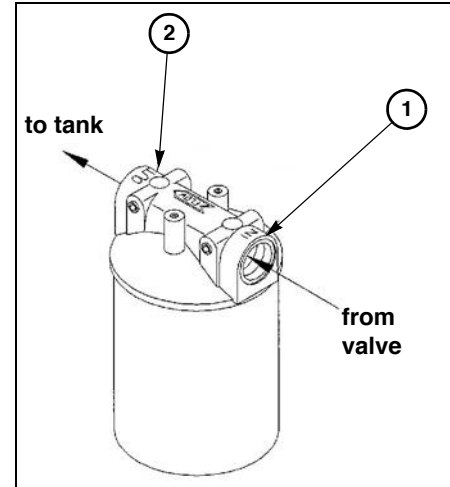
If leaks are found, tighten filter only enough to stop the leak.

Hydraulic Fluid Flow Direction

When replacing a filter head, note that IN (1) and OUT (2) are stamped above the ports, with an arrow to indicate the direction of flow through the filter head.

The filter head has a built-in relief, which will open and bypass the filter element if the hydraulic fluid is cold or the filter is dirty or clogged.

If filter head is installed backwards, the relief will not function and cold fluid or a clogged filter can cause damage to the hydraulic system.



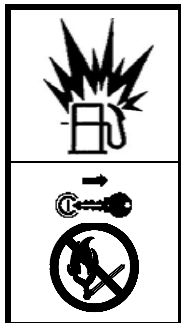
Section 40: Maintenance - 500 Service Hours or Yearly

ENGINE MAINTENANCE

Refer to the Engine Operation Manual supplied with each machine for complete instructions.

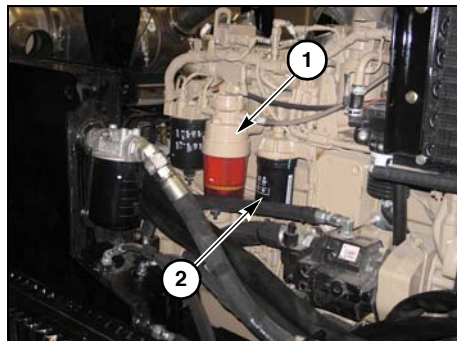
- Engine Mounts - Check
- Automatic Belt Tensioner Spring Tension and Belt Wear - Check
- Crankcase Vent System - Check
- Air Intake System - Check
- Electric Ground Connections - Check
- Cooling System - Check/Pressure Test
- Engine Coolant Concentration - Check
- Drive Belt Wear and Tension - Check
- Engine Speeds - Check

Fuel Filters - Replace



WARNING: Fuel and fumes can explode and burn.

Shut off engine before refueling. No flame. No smoking.
Clean up any spilled fuel.



Replace fuel filters sooner than 500-hour interval if engine loses power.

(1) Primary Fuel Filter with Water Separator

(2) Secondary Fuel Filter

Step 1: Clean area around fuel filters.

Do not spill fuel. Catch expelled fuel in an appropriate container.

Step 2: Loosen plug and drain primary fuel filter element (1).

Step 3: Rotate element assembly to remove it.

Step 4: Remove bowl (do not discard it); inspect and clean.

NOTICE: Do not fill elements with fuel before installing. The fuel could be contaminated and damage engine.

Step 5: Place new filter element in bowl and rotate until properly indexed and seated on base.

Step 6: Rotate retaining ring clockwise to tighten bowl with element.

Step 7: Remove secondary filter by turning it counterclockwise.

Step 8: Lubricate filter top with clean diesel fuel and install it. After it contacts filter head, tighten it an additional 1/3 to 3/4 turn.

Step 9: Spin on new filter. Hand tighten, then turn an additional 3/4 turn.

Step 10: Close drain plug.

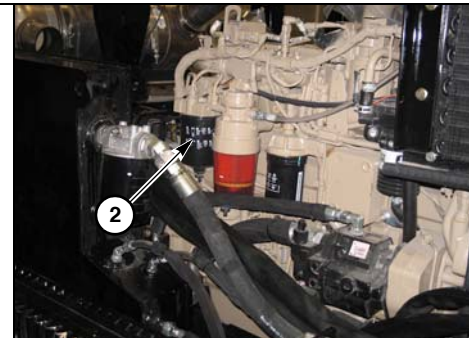
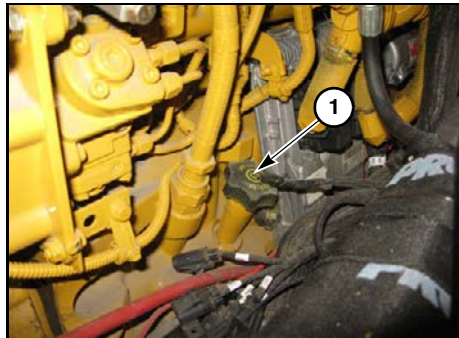
Step 11: Start engine and check for leaks.

Engine Oil and Filter - Change/Replace

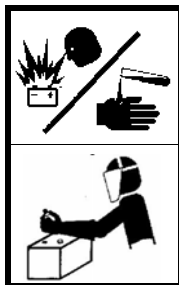
Refer to “Engine Oil and Filter - Initial Change/Replacement,” [page 30-1](#).

Change engine oil and replace engine oil filter after first 100 hours of operation and every 500 hours thereafter.

- (1) **Engine Oil Dipstick/Fill Cap**
- (2) **Engine Oil Filter**



BATTERY TERMINALS - CHECK



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.

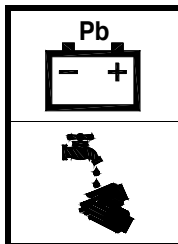
- Work in a well-ventilated area.
- Avoid breathing fumes from battery.
- Avoid contact with skin, eyes, or clothing.
- Keep flame and sparks away, and do not smoke.
- Keep out of reach of children.
- Do not short across battery terminals or allow tools to short from battery terminals to frame.
- Do not jump-start or charge a battery with frozen electrolyte.

In case of acid contact:

External: Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical attention.

Internal: Drink large quantities of water or milk, follow with milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

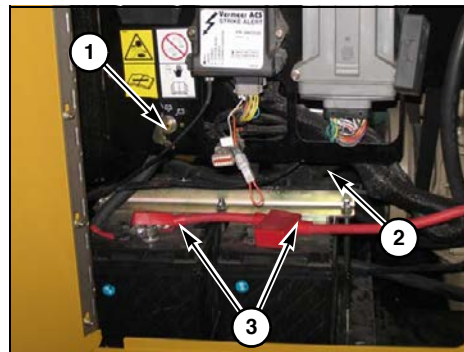
Battery Terminals - Clean



WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

- Step 1:** Raise engine bay hood. Disconnect battery ground using *Battery Disconnect Switch* (1).
- Step 2:** Remove negative (-) cables (2), then positive (+) cables (3).
- Step 3:** Clean terminals and clamps with a stiff wire brush.
- Step 4:** Apply a light coating of petroleum jelly around the base of each terminal.
Keep top of battery clean. If necessary, wash it with a baking soda solution, then rinse with clean water. Do not let any baking soda solution enter battery.
- Step 5:** Install positive cable, then negative cable. Install plastic cap over positive cable clamp.
- Step 6:** Connect battery ground with *Battery Disconnect Switch*.
- Step 7:** Close and lock engine access cover.



HYDRAULIC FLUID FILTERS - REPLACE

Refer to “Hydraulic Fluid Filters - Initial Replacement,” [page 35-1](#).

Look for cracks or pitting in filter head. Replace filter head as needed. Refer to “Hydraulic Fluid Flow Direction,” [page 35-2](#).

DRILLING FLUID PUMP CRANKCASE - INITIAL OIL CHANGE

Change oil after the first 500 hours of use and every 1000 hours thereafter. Refer to “Drilling Fluid Pump Crankcase Oil - Change,” [page 45-4](#).

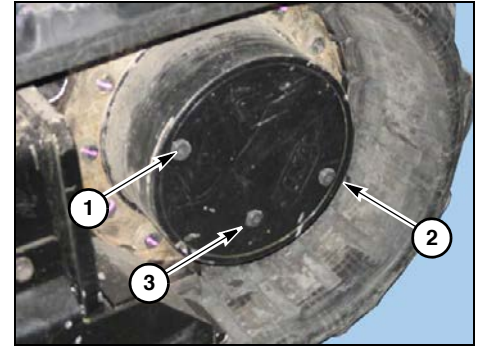
Section 45: Maintenance - 1000 Service Hours

TRACK GEARBOX OIL - CHANGE

- (1) **Fill Plug**
- (2) **Check Plug**
- (3) **Drain Plug**

Refer to “Lubricants,” [page 80-1](#).

- Step 1:** Rotate plug (3) to the 6:00 position.
- Step 2:** Remove plug and drain oil.
- Step 3:** Insert plug and tighten.
- Step 4:** Rotate so that plug (1) is at 9:00 and plug (2) is at 3:00.
- Step 5:** Fill until oil is level with check plug (2).
- Step 6:** Replace plugs.

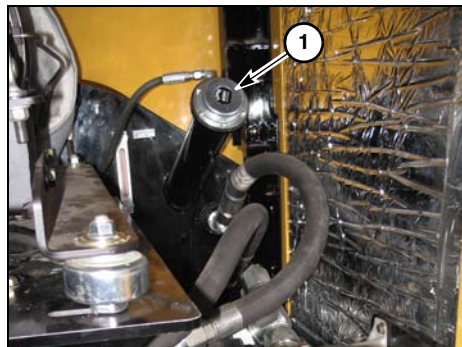


HYDRAULIC FLUID - CHANGE

Hydraulic Fluid - Drain

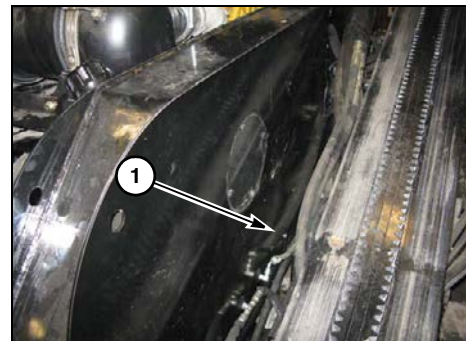
NOTICE: If fluid smells burned, contains air bubbles, or appears contaminated, consult your Vermeer dealer immediately.

- Step 1:** Run engine until hydraulic fluid is warm.
- Step 2:** Follow [Shutdown Procedure](#), page [12-1](#).
- Step 3:** Remove fill cap (1).
- Step 4:** Remove drain plug at bottom front of tank and drain fluid into a suitable container (minimum 55 gal/208 L).
- Step 5:** Clean and inspect drain plug.
Contact your Vermeer dealer if excessive metal particles are found on the magnetic drain plug.
- Step 6:** Install drain plug.
- Step 7:** Replace hydraulic filter. Refer to “Hydraulic Fluid Filters - Initial Replacement,” [page 35-1](#).



Strainer - Clean and Inspect

- Step 1:** Remove access covers (1), one on each side.
- Step 2:** Unscrew strainer and remove it from inside the tank.
- Step 3:** Clean strainer with a petroleum-based paint thinner or other good cleaning solvent. Scrub strainer with a soft-bristled brush.
- Step 4:** Inspect strainer. Consult a Vermeer dealer if you find any of the following:
- lacquers which may have formed as a result of hot spots in the hydraulic system
 - an extremely dirty strainer that will not come clean
 - metallic particles on the screen mesh
 - any evidence of a hydraulic system failure
 - any evidence of holes or other damage that would allow unfiltered oil to circulate in the hydraulic system
- Step 5:** Install strainer, O-ring, and access cover.



Tank - Fill

NOTICE: Clean hydraulic fluid is very important for longer life and good operation of hydraulic components. Take care not to spill dirt or other contaminants into the tank when checking or adding hydraulic fluid. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank.

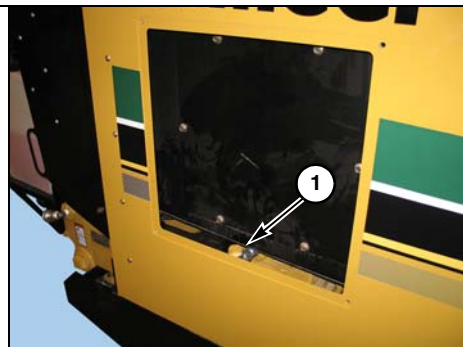
- Step 1:** Fill hydraulic fluid tank. Refer to “Lubricants,” [page 80-1](#).
- Step 2:** Install and tighten fill cap.
- Step 3:** Start engine, press *Hydraulic Enable Button* and cycle all hydraulic cylinders and drill functions to fill all components.
- Step 4:** Check hydraulic fluid level. The fluid level must be within the upper half of sight gauge.

DRILLING FLUID PUMP CRANKCASE OIL - CHANGE

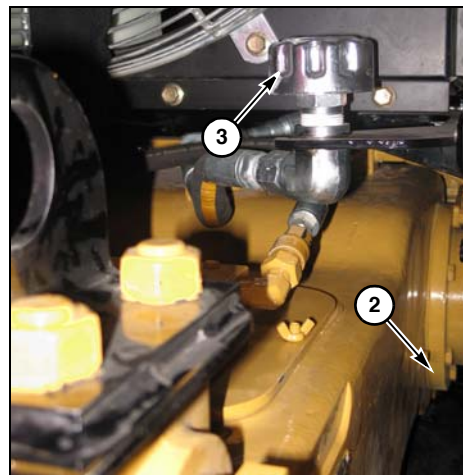
Drain tank, and fill to petcock level.
Refer to "Lubricants," [page 80-1](#).

Access to pump petcock: Remove four bolts and panel (A).

If oil appears milky, water is seeping past the plunger stem seals. Contact your Vermeer dealer.



- (1) Check/Fill Port
- (2) Drain Plug
- (3) Breather



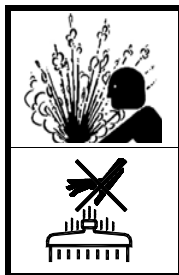
Section 50: Maintenance - 3000 Service Hours

ENGINE MAINTENANCE

- Engine Valve Clearance - Check/Adjust
- Flush and Refill Cooling System
- Bleed Air from Cooling System
- Thermostats - Test

Refer to the Engine Operation Manual supplied with the machine for instructions.

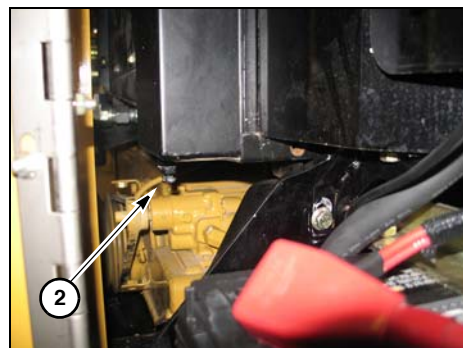
COOLING SYSTEM - DRAIN AND CLEAN



WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

- Step 1:** Follow [Shutdown Procedure](#), page [12-1](#).
- Step 2:** Open engine access cover.
- Step 3:** Remove overfill bottle cap (1).
- Step 4:** Drain old coolant from the system by opening petcock (2) on the radiator. The system holds approximately 4.4 gal (17 L).
- Step 5:** Close petcocks.
- Step 6:** Fill radiator with clean water. Check for signs of rust and add a cooling system cleaner to the water if necessary.
- Step 7:** Install overfill bottle cap. Run engine long enough to ensure thermostat has opened, allowing engine and radiator to receive fresh water.
- Step 8:** Shut off engine. Allow system to cool, then remove overfill bottle cap and open petcocks to drain water.



Cooling System - Refill

- Step 1: Close petcocks.
- Step 2: Prepare a 50/50 mixture of 4.4 gal (17 L) of coolant and distilled or deionized water. Refer to “Cooling Medium,” [page 80-2](#).
- Step 3: Add most but not all of mixture to radiator. Do not fill it completely.
- Step 4: Operate engine until mixture has circulated through system.
- Step 5: Install overfill bottle cap.
- Step 6: Recheck radiator after engine has cooled overnight. As air works out of the system, you may need to add more water/antifreeze mixture to keep the radiator full. Continue checking before starting each day until radiator remains full.

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Section 55: Maintenance - 4500 Hours

DIESEL PARTICULATE FILTER (DPF) - FORCED REGENERATION

The DPF is self-cleaning and generally requires no operator action. Automatic regeneration is the standard mode.

However, if the *Diesel Particulate Filter Light* (1) is yellow, a forced regeneration may be required.

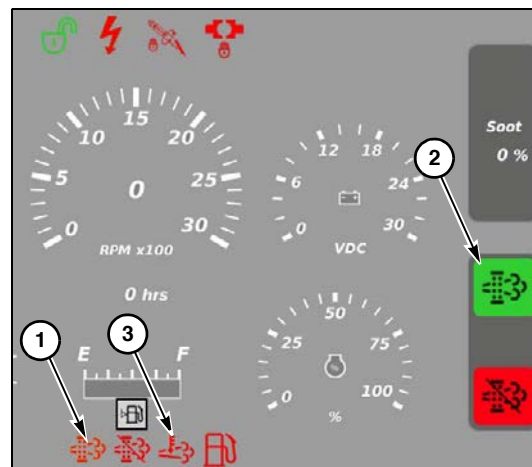
Perform forced regeneration at 4500 hours regardless of whether warning light is on.

Refer to the Engine Operation Manual for complete information.

NOTICE: Failure to follow procedures specified in the Engine Operation Manual may violate U.S. federal, state and local hazardous waste laws, and may damage the DPF resulting in potential denial of the Diesel Exhaust Filter emissions warranty. If this results in premature failure of exhaust system components, an engine service technician will be required to perform a service regeneration.

- Step 1:** Park machine in a location so exhaust is not directed at any surface or material that could be flammable.
- Step 2:** Press *Request DPF Regeneration Switch* (2). The *High Exhaust System Temperature (HEST) Light* (3) will turn red, engine RPM will increase, and a change to the sound of the turbocharger will occur.
- Step 3:** Monitor machine and surrounding area for unsafe conditions. If necessary, shut off machine.

When DPF is regenerated, the engine will return to normal idle speed and *HEST Light* will shut off. Exhaust temperatures will remain elevated for 3–5 minutes.



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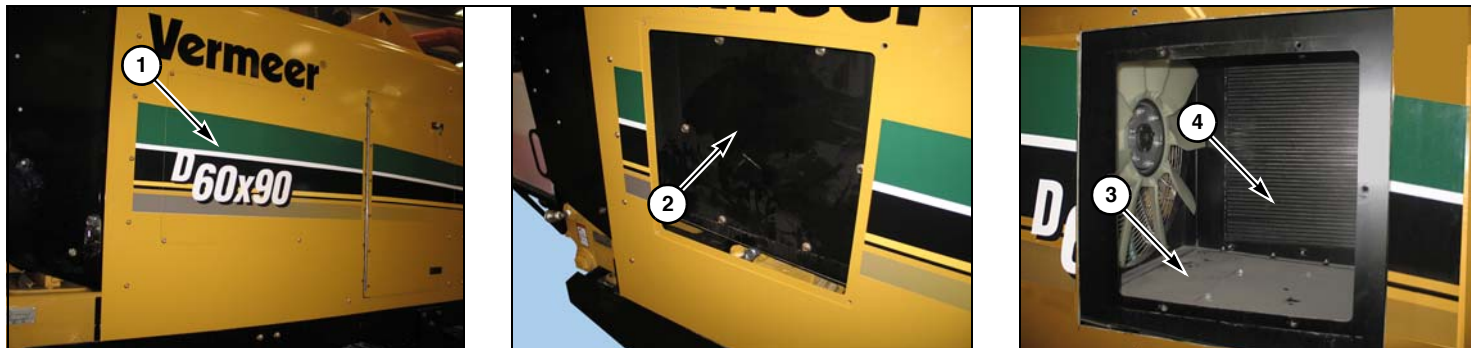
Section 60: Maintenance As Required

ENGINE MAINTENANCE

Refer to the Engine Operation Manual for complete information.

- Alternator Belt - Replace

Engine Cooling Compartment - Clean Out



Remove bolts and shield covering cooling compartment (1). Remove bolts and second shield (2). Clean out compartment (3). Clean fins (4).

Replace shields and bolts.

Engine Compartment - Clean

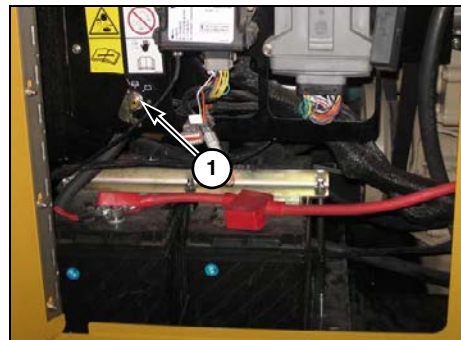
Inspect and clean engine compartment frequently to prevent engine compartment fires. Always clean up spilled fuels and lubricants, including any debris that is fuel or oil contaminated. Use appropriate methods to dispose of contaminated materials.

BATTERY - REPLACE



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.



WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

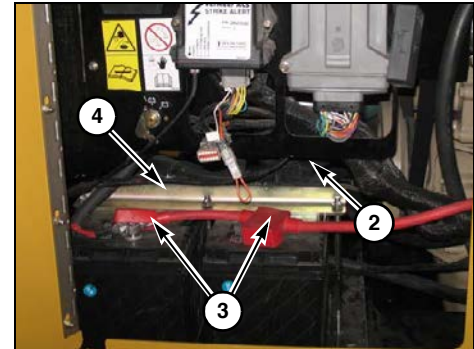
Wash hands after handling.

Step 1: Shut off engine.

Step 2: Access battery by opening engine compartment.

Step 3: Turn *Battery Disconnect Switch* (1) counterclockwise to disconnect position.

- Step 4:** Remove negative (-) cables **(2)**. Then remove red positive (+) cables **(3)**.
- Step 5:** Loosen bolts and remove hold-down bracket **(4)**.
- Step 6:** Remove battery.
- Step 7:** Apply a light coating of petroleum jelly around the base of each terminal of the new, fully charged battery.
- Step 8:** Install new battery and hold-down bracket.
- Step 9:** Install positive (+) cable and red cover **(3)**; then install negative (-) cable and black cover **(2)**.
- Step 10:** Turn key clockwise to connect battery.



FUSES

Behind Seat in Cab

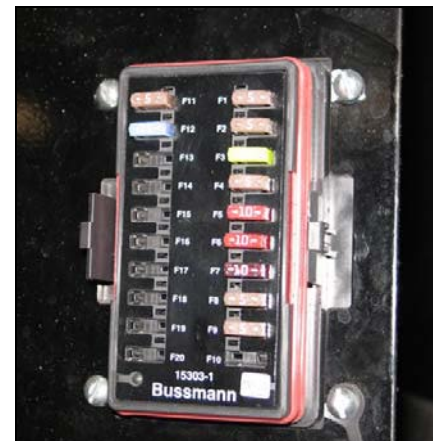
Fuses protect electrical circuits and are located on lower right side of operator's seat platform. When replacing them, use fuses with the correct rating to prevent damaging electrical system.

Location	Function	Location	Function
F11-15A	Auxiliary port 3	F1-5A	Joysticks, seat switch
F12-10A	Auxiliary port 2	F2-5A	PV750 display
		F3-5A	Left and right keypads
		F4-7.5A	Cab controller
		F5-15A	Left and right stakedown switches, rack lift
		F6-15A	DCIM module, remote lockout
		F7-25A	Washer pump, wiper motor
		F8-15A	HVAC relay, HVAC on switch and HVAC actuator
		F9-10A	Washwand switch, carriage light, Strike Alert test
		F10-25A	HVAC fan switch, cab door prox switch



On Engine

Location	Function	Location	Function
F11-5A	Qualcomm	F1-5A	Qualcomm
F12-7.5A	Ignition	F2-5A	Strike Alert
		F3-15A	Pump
		F4-15A	Pressure Sensor/Fuel
		F5-10A	Rack
		F6-10A	Vises
		F7-10A	Carriage
		F8-5A	Mud Inlet Pressure, Rod Lift Prox, Station Prox, Rod Box Prox, Rod Arm Prox
		F9-5A	Radio Remote
		F10-5A	



AIR CLEANER ELEMENT - REPLACE

The air cleaner element must be replaced when the air cleaner restriction indicator **(2)** reaches the red area. Refer to “Air Cleaner Restriction Indicator - Check,” [page 20-6](#).

Step 1: Open access door on top of hood **(1)**.

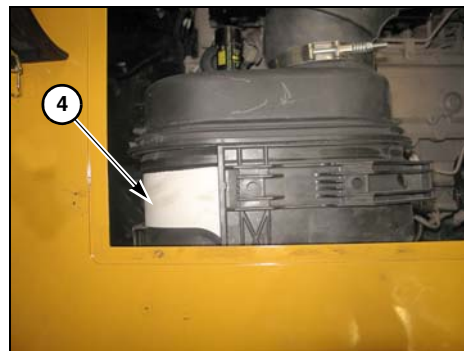
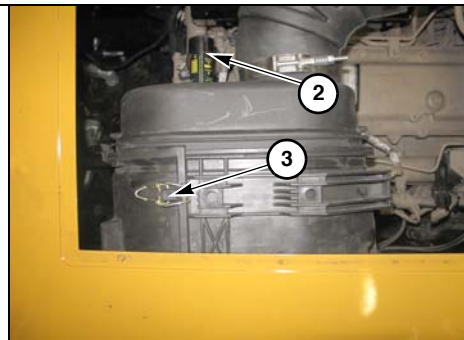
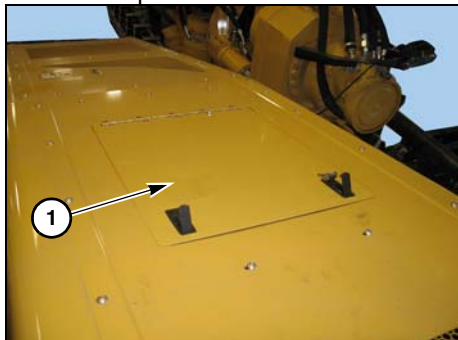
Step 2: Release four clip fasteners **(3)** and remove cover.

Step 3: Remove dirty element **(4)**.

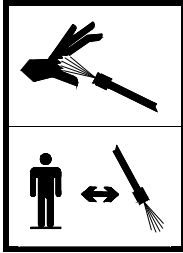
Step 4: Check replacement air cleaner element for damage.

Step 5: Install air cleaner element. Ensure gasket is installed against closed end of air cleaner assembly and is seated properly.

Step 6: Install end of air cleaner assembly; ensure all fasteners and/or clamps are tight.



RACK AND PINION - CLEAN

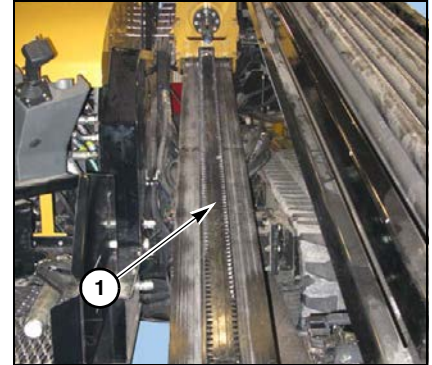


WARNING: High pressure water can penetrate skin. Serious injury is possible.

Keep nozzles away from body.

Power wash drill thrust rack and pinion gears (1) each time the machine is washed down or as needed to ensure gears remain free of foreign materials.

NOTICE: Do not apply grease on rack and pinion gears. Dust, dirt and other foreign matter will adhere to the grease and can cause premature failure of rack and pinion gears.



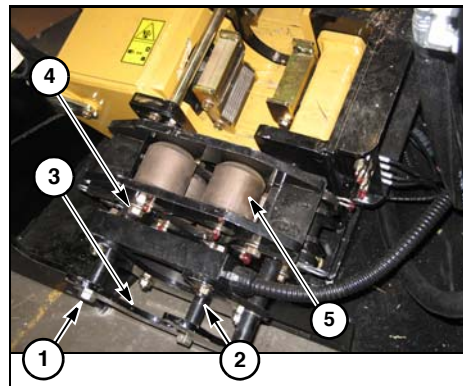
ROD GUIDE ROLLERS - REPLACE

Replace rollers (5) if there is excessive play in the bearing, or if rollers do not turn freely.

Step 1: Remove bolts (1), tubes (2), and rod wiper holder (3).

Step 2: Remove bolts (4), washers, and rollers (5).

Step 3: Assemble in reverse order. Torque bolts (1) to 35 ft-lb (47 Nm). Torque bolts (4) to 305 ft-lb (414 Nm).

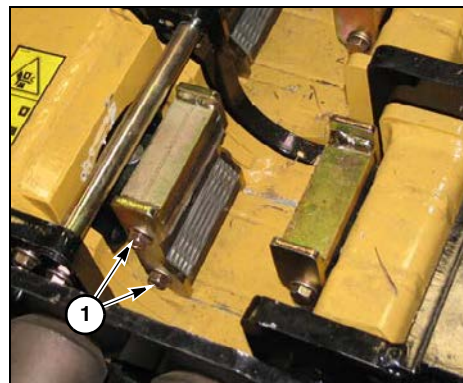


WISE DIE GRIPS - REPLACE

Step 1: Open vises and shut off engine.

Step 2: On each grip, remove bolts (1) to remove grip.

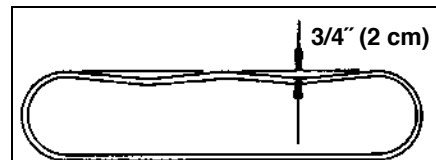
Step 3: Install new grip and bolts.



TRACK TENSION - ADJUST

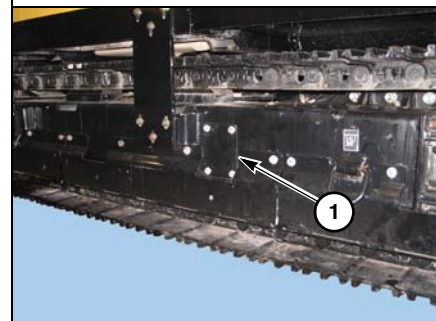
Track tension is set with a grease cylinder which compresses a spring against the idler roller.

With clean tracks, the proper tension is 3/4" (2 cm) of slack when measured as shown.

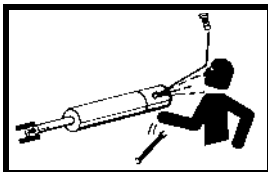


Track Tension - Increase

- Step 1:** Remove access cover (1).
- Step 2:** Attach grease gun to the fitting on fitting (2). Add grease to grease cylinder until track is properly tensioned.
- Step 3:** Install access cover.

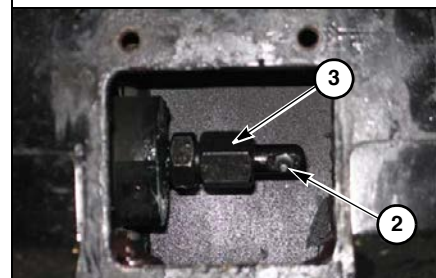


Track Tension - Decrease



WARNING: The track tensioning system is under high pressure and may result in personal injury if not released according to the instructions given below.

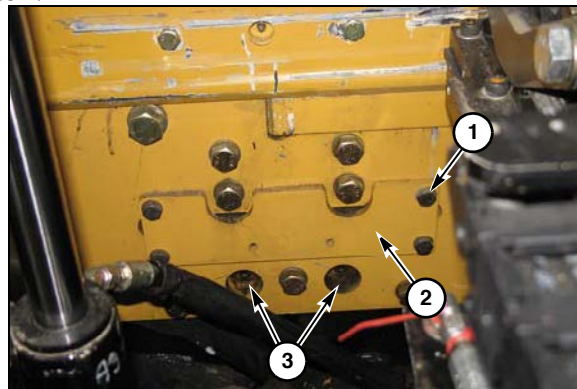
- Step 1:** Remove access cover.
- Step 2:** Loosen fitting swivel (3) slowly, then remove. Allow grease to come out until track tension is correct. Install and tighten swivel and clean up expelled grease.
- Step 3:** Install access cover.



GEARBOX GUIDES - REPLACE

The gearbox has four sets of slides, two at the front and two at the rear. Front is shown, and has four bolts on slide cover. Rear cover has six bolts.

- Step 1:** Remove bolts (1) and slide cover (2).
- Step 2:** Remove guide located behind cover. Install new guide.
- Step 3:** Install cover and bolts.
- Step 4:** Install jam nuts onto setscrews. Place setscrews into holes and adjust using the following procedure.

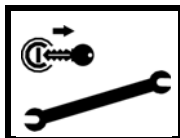


Gearbox Guides - Adjust

- Step 1:** Position gearbox at widest point on rack.
- Step 2:** Loosen jam nuts and turn setscrews (3) to adjust guide (on back of carriage plate) either in toward or away from rack.
 - Clockwise tighten (push guide against rack)
 - Counterclockwise loosen (pull guide away from rack)
- Step 3:** Ensure each set of guides opposite each other are equal distance from the rack.
- Step 4:** After adjusting, slowly move gearbox up and down rack to ensure no binding between gearbox and rack. If gearbox drags on rack, loosen screws (3) 1/4 turn and test again.
- Step 5:** Repeat test until operation is smooth.

STORAGE

Preparing for Storage



WARNING: Use [Shutdown Procedure](#) when preparing the machine for storage. [Refer to page 12-1.](#)

- Store machine inside or under cover.
- Clean off foreign material and wash the machine. Repaint bare metal to inhibit rust.
- Repair or replace worn or broken parts or damaged decals.
- Refer to the Engine Operation Manual for engine storage instructions.
- Disconnect battery cables. If necessary, remove battery. Refer to “Battery - Replace,” [page 60-2](#). Store where the temperature will not drop below freezing. Check fluid level and charge fully; recheck every 30 days and charge if necessary.
- Remove Remote Lockout system batteries from remote transmitter and charging compartment. Unplug docking station.

Removing from Storage

- Remove all protective coverings.
- Drain any water and sediment from fuel tank that may have built up during storage. Fill fuel tank.
- Check battery fluid level. Charge batteries and install in machine if removed, or reconnect cables.
- Plug in Remote Lockout system docking station. Charge batteries fully. Install charged battery in remote transmitter.
- Refer to the Engine Operation Manual for restoring engine to operation.

Section 70: Troubleshooting

ENGINE SYSTEM

An Engine Operation Manual is supplied with each machine. Refer to this manual for troubleshooting procedures.

ELECTRICAL SYSTEM

Problem	Cause	Solution
Low battery output	Low water level	Add water.
	Loose alternator belt	Tighten belt.
	Defective alternator	Replace alternator.
	Corroded or loose battery cable	Clean and tighten battery cables.
	Defective battery cell	Replace battery.
	Cracked battery case or broken terminal	Replace battery.
Battery uses too much water.	Dirty or wet battery top, causing discharge	Clean battery top.
	Cracked battery case	Replace battery.
	Overcharged battery	See your Vermeer dealer.
Low battery charge	Alternator not charging	See your Vermeer dealer.
	Corroded or loose battery cable	Clean and tighten battery cables.
	Poor wiring connections in battery charging circuit	Check wiring connections.
	Defective battery cell	Replace battery.
	Faulty regulator	Replace regulator.
	Excessive engine idling	Reduce engine idle.
	Continuous drain on battery – dirty battery top or electrical components shorted or grounded	Clean battery top.

HYDRAULIC SYSTEM

Problem	Cause	Solution
No hydraulic power	Operator not in seat when using drill functions	Sit in the operator's seat.
	No hydraulic fluid	Fill with fluid.
	Battery voltage too low to shift the solenoid	Check battery, alternator and charging circuit.
	Damaged or worn hydraulic pump	See your Vermeer dealer.
	Relief valve damaged	See your Vermeer dealer.
	Remote Lockout system activated	Place Remote Lockout system in RUN mode.
Slow hydraulic power	Low hydraulic fluid level	Add hydraulic fluid.
	Plugged hydraulic filter	Replace filter.
	Plugged hydraulic strainer	Clean strainer.
	Worn pump	See your Vermeer dealer.
	Improper pressure relief setting	See your Vermeer dealer.
	Hydraulic fluid cold	Warm up machine and operate hydraulic system.
Noisy hydraulic pump	Cold hydraulic fluid	Warm up machine at reduced engine speed.
Hydraulic power loss	Low hydraulic fluid	Add hydraulic fluid.
	Plugged hydraulic filter	Replace filter.
	Plugged hydraulic strainer	Clean strainer.
	Wrong viscosity of hydraulic oil	Change hydraulic fluid to correct viscosity.
	Worn pump or motor	See your Vermeer dealer.
	Improper pressure relief setting	See your Vermeer dealer.
	Poor engine performance	Check engine.
	Operator not in the seat	Sit in the operator's seat.
Oil foams.	Low hydraulic fluid	Add hydraulic fluid.
	Water in hydraulic fluid	Change fluid.
	Air leak between tank and pump	Repair leak.

DRILLING FLUID SYSTEM

Problem	Cause	Solution
No hydraulic power	No hydraulic fluid	Fill with fluid.
	Damaged or worn hydraulic pump	See your Vermeer dealer.
	Relief valve damaged	See your Vermeer dealer.
Slow hydraulic power	Low hydraulic fluid level	Add hydraulic fluid.
	Plugged hydraulic filter	Replace filter.
	Plugged hydraulic strainer	Clean strainer.
	Worn pump	See your Vermeer dealer.
	Improper pressure relief setting	See your Vermeer dealer.
	Cold hydraulic fluid	Warm up machine and operate hydraulic system.
Noisy hydraulic pump	Cold hydraulic fluid	Warm up machine at reduced engine speed.

STRIKE ALERT

Indicator	Indication	Significance
Two-Tone Horn	On	Electrical strike occurred or <i>Test Button</i> pressed
	Silent	No voltage detected above threshold.
Green Light	Off	Test in progress, light burned out, or wiring harness problem
	Flashing 	Voltage Stake is not in the ground.
	Double Flashing 	Current Sensor failed.
	Triple Flashing 	Voltage Stake wiring problem
	On	Power-up check or Test passed. System is ready.
Control	Function	
Alarm Cancel Button	Turns alarm off (only when voltage and current are not present)	
Test Button	Tests sensors, controller, and alarm	

The alarm will sound when the *Test Button* is pressed.

- A successful test is indicated when the green light remains steady ON after the test button is released. If there is a flashing green light after releasing the test button, the Strike Alert system is not functioning correctly.
- Confirm the voltage stake is fully inserted into the ground. The soil at the stake may need to be moistened to improve conductivity of the earth. Retest the system. If the test fails to pass, contact your Vermeer dealer.
- The Strike Alert system automatically runs a system check whenever the machine is powered up (ignition key turned from OFF to RUN). The alarm does not sound during the power-up system check.

REMOTE LOCKOUT SYSTEM

Problem	Cause	Solution
Remote Lockout system not responding	Operator not in seat when system is turned on	Sit in seat and select RUN or LOCKOUT mode.
	Cold weather operation causing greater hydraulic oil viscosity, preventing pressure switches from confirming lockout	To achieve lockout confirmation, move throttle to its lowest setting.
	Lockout not confirmed due to machine in Transport mode	To achieve lockout confirmation, change from Transport mode to Drill mode.
	Out of range	Move into range.
	Low battery	Replace battery.

The Remote Lockout system controls thrust, rotation, and fluid functions together. If one function is working and the others are not, then the Remote Lockout system is not the source of the problem. The Remote Lockout system cannot disable one function independent of the others. Contact your Vermeer dealer for troubleshooting assistance.

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Section 80: Specifications

LUBRICANTS

Lubricant/Recommendation	Capacity	Specifications / Notes
Engine Oil	Refer to engine specifications	API service category CJ-4 or ACEA E6. DO NOT use engine oil containing more than 1.0% sulfated ash, 0.12% phosphorus, or 0.4% sulfur. Refer to the Engine Operation Manual for engine service requirements.
Hydraulic Fluid <i>Vermeer HyPower 68 or</i> <i>Vermeer HyPower 100</i>	70 gal (265 L) tank	ISO 64: as low as -22°F (-30°C) ISO 68: -4° to 104°F (-20° to 40°C) ISO 100: 14° to 122°F (-10° to 50°C) Use caution not to get dirt or other contaminants into the system(s). Filter all fluid through a 5-micron filter before adding to tank. NOTICE: Use of any oils other than those recommended without written factory approval will jeopardize warranty.
All-Purpose Gear Lube	Maintain check plug level.	Oils must conform to API GL5 or MIL-L-2105D specifications. -20° to 100°F (-30° to 40°C): 80W-90 20° to 120°F (-10° to 50°C): 85W-140
General Lubricating Oil <i>Vermeer Ultra Gold 10W30</i>	As required	SAE10W30
Grease <i>Vermeer Ultra LC Grease</i>	As required	Lithium complex, extreme pressure NLGI Grade 2 To minimize condensation in bearings, grease machine after it is shut down for the day. Fittings and grease applicator nozzle must be clean before applying grease. Replace all missing fittings.

Lubricant/Recommendation	Capacity	Specifications / Notes
Drilling Fluid Pump Crankcase <i>Vermeer Ultra Gold</i>	4.5 qt (4.3 L)	Aplex: SAE- 40W non-detergent (Classification MM or better) Kerr: 40W non-detergent: Below 30°F (-1°C) 50W non-detergent: 30° to 50°F (-1 to 10°C) 90W non-detergent: Above 50°F (10°C)
Drill Rod Thread Compound	As required	BioStick thread lubricant (P/N 296337339)
Pneumatic Drill Head Oil <i>Hammerhead Summer Oil</i> <i>Hammerhead Anti-Rust Oil</i>	As required	SAE-10W/ISO22 zinc and paraffin additives SAE-20W/ISO68 anti-rust in a paraffin base

Engine	
Model	John Deere 6068HF
Maximum power	185 hp (138 kW) at 2400 loaded rpm
Tier rating	Tier 4 Interim/Stage IIIB
Fuel capacity	66 gal (250 L) ultra low sulfur diesel, less than 15 ppm or .0015% (15 mg/kg)
Oil capacity	28.5 qt (27 L) without filter
Maximum engine inclination	25° all directions continuous, 35° intermittent
Cooling Medium	Use a 50/50 mixture of Extended Life (ELC) Nitrite-Free (NF) coolant and distilled or deionized water to -34° (-37°C) protection. Never add pure antifreeze to the system; always dilute to a 50/50 mixture. Never use Supplemental Cooling Additives (SCAs) with ELC coolant. Refer to the Engine Operation Manual.
Engine coolant capacity	13 qt (12 L)
Electrical system	12-volt
Alternator	120-amp

MACHINE SPECIFICATIONS

Battery	
Required	2
BCI group size	31 P MHD
Cold Cranking Amps (CCA)	950 cold cranking amps, 30 seconds, 0°F (-18°C)
Reserve capacity	360 min, 25 amp output at 80°F (27°C)
Height	8-3/4" (22 cm)
Width	7-1/4" (18 cm)
Hydraulic Systems Pressure Settings	
Rotation pump flow	60 gpm (227 L/min)
Rotation pressure	6000 psi (413 bar)
Charge pressure	350 psi (24 bar)
Ground drive pressure	3500 psi (241 bar)
General, Basic Machine Dimensions	
Weight empty	26000 lb (11790 kg) non-cab, 15-ft drill rod
Weight w/ rod box	33000 lb (14970 kg) non-cab, 15-ft drill rod
Overall length	25 ft 9" (7.85 m) 15-ft drill rod
Overall width	88" (224 cm)
Overall height	104" (264 cm) at stakedowns with rack level
Drilling Fluid System Hydraulic Pressure Settings	
Pump flow	45 gpm (170 L/min)
System pressure	5600 psi (386 bar)
Remote Lockout Frequency	2.4 GHz

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Revision History

Revision	Date	Page(s)	Description
tm1_00	04/11	All	Temporary Maintenance Manual released
m1_00	08/11	All	First edition maintenance manual released.
m1_01	09/11	Section 30	Rod lifter control
m1_02	04/12	Sections 20, 30, 60	Accumulator safety, backup alarm, engine cooling compartment cleanout
m1_03	10/12	Sections 20, 25, 30, 45, 55	Updates.
m1_04	08/15	Sections 10, 20, 35, 50, 55, 80	Updated software, updated safety messages, updated coolant



WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

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.

When operated in California, any off-road diesel vehicle may be subject to the California Air Resources Board In-Use Off-Road Diesel Vehicle Regulation. It therefore could be subject to retrofit or accelerated turnover requirements to reduce emissions of air pollutants. For more information, please visit the California Air Resources Board website at <http://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm>.