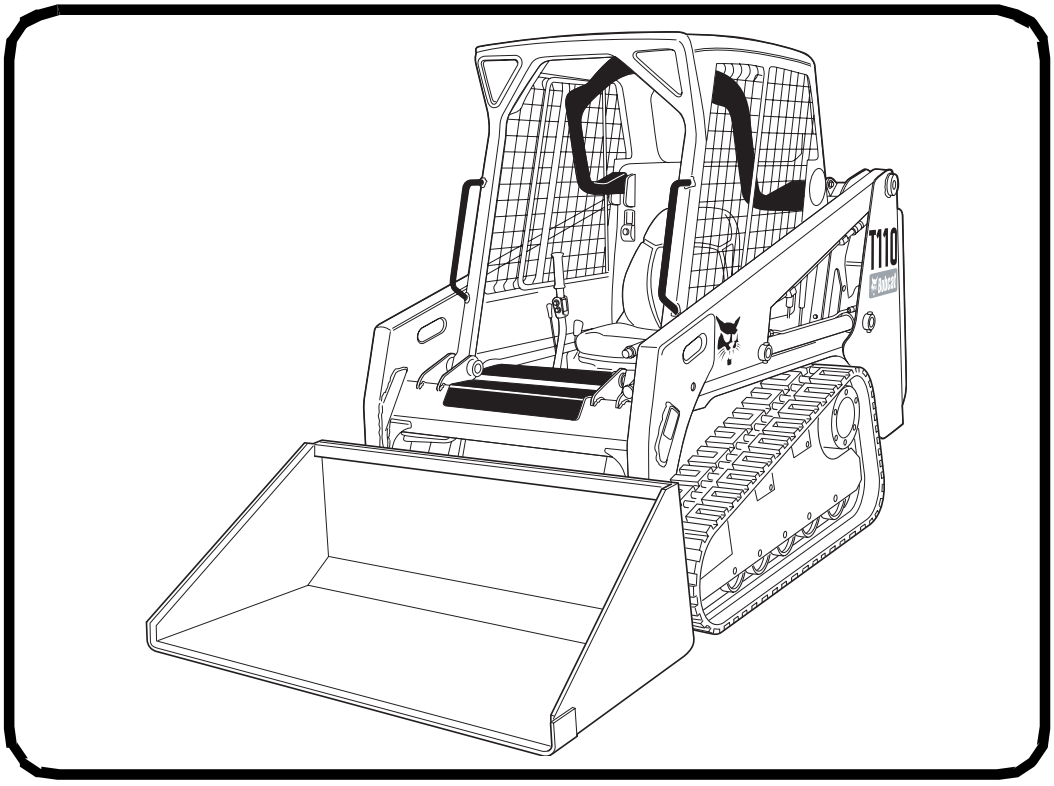
Bobcat®

Service Manual
T110 Compact Track Loader

S/N AE0H11001 & Above
S/N AE0J11001 & Above



EQUIPPED WITH
BOBCAT INTERLOCK
CONTROL SYSTEM (BICS™)

6904979 (7-10)

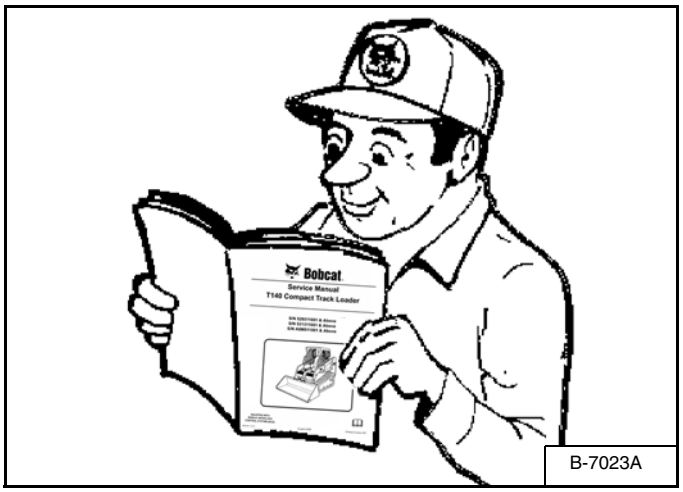
Printed in U.S.A.

FW SSL-1008 SM

LIFTING AND BLOCKING THE LOADER

Procedure

Figure 10-10-1



⚠ WARNING

AVOID INJURY OR DEATH

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0807

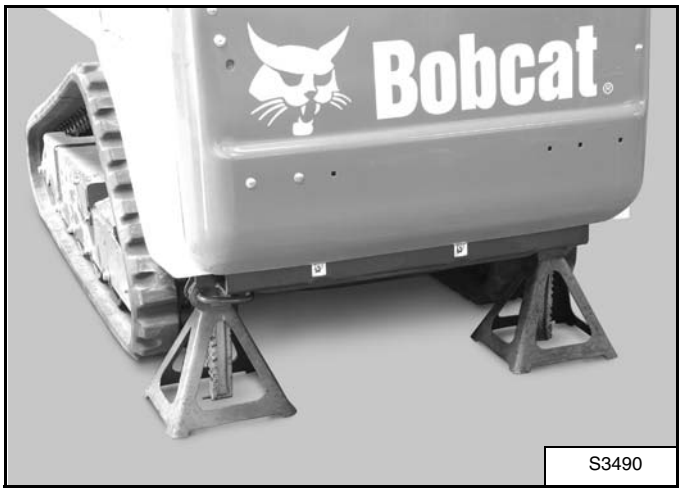
Always park the loader on a level surface.

⚠ WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

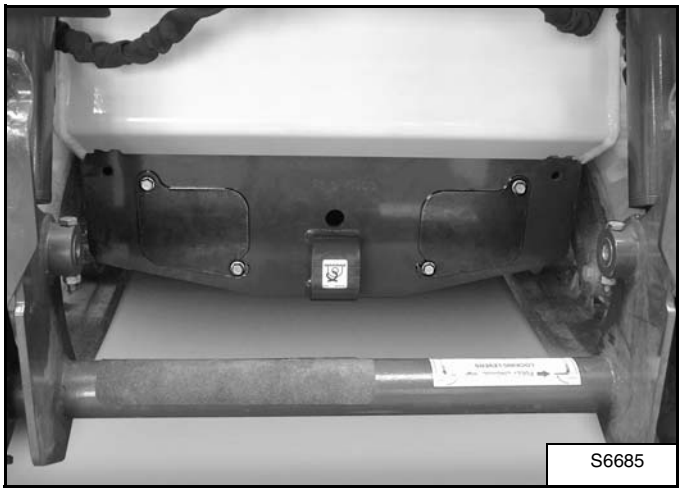
W-2017-0286

Figure 10-10-2



Lift the rear of the loader and install jack stands **[Figure 10-10-2]**.

Figure 10-10-3



Remove the front cover plates **[Figure 10-10-3]**.

TOWING THE LOADER

Procedure

Because of the design of the loader, there is not a recommended towing procedure.

- The loader can be lifted onto a transport vehicle.

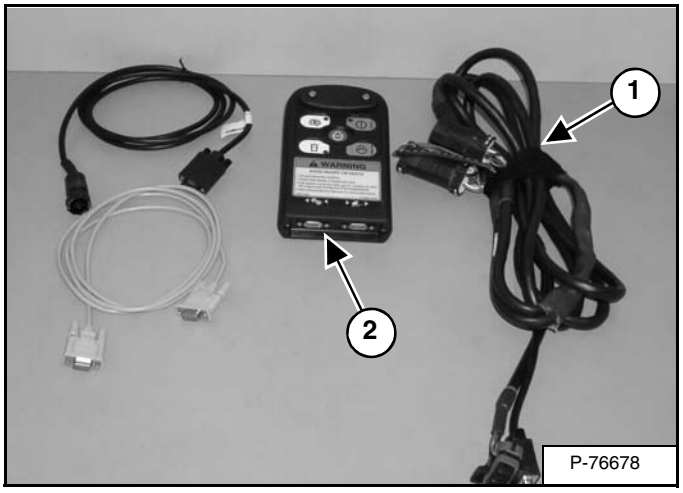
- The loader can be skidded a short distance to move for service (EXAMPLE: Move onto a transport vehicle.) without damage to the hydrostatic system. (The tracks will not turn.) There might be slight wear to the tracks when the loader is skidded.

  The towing chain (or cable) must be rated at 1.5 times the weight of the loader. (See Performance on Page SPEC-10-2.)

REMOTE START TOOL (SERVICE TOOL) KIT - 6689779 (CONT'D)

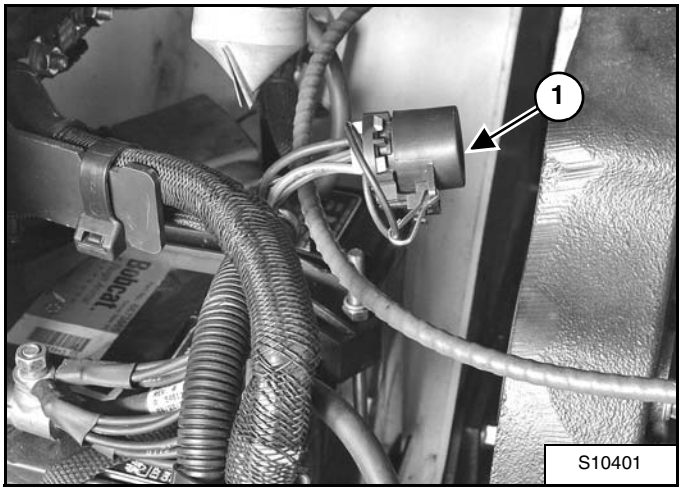
Loader Service Tool Harness - 6689747

Figure 10-61-3



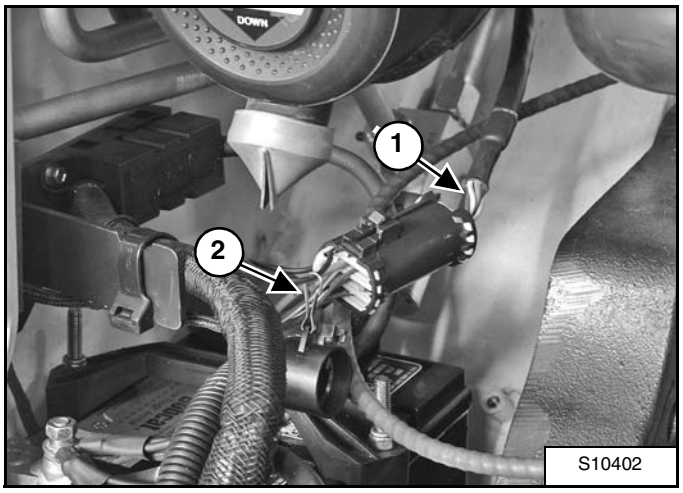
The loader service tool harness (Item 1) is used to connect the remote start tool (service tool) (Item 2) **[Figure 10-61-3]** to the electrical system on the loader.

Figure 10-61-4



Loaders without an attachment control harness, remove the loader harness cap (Item 1) **[Figure 10-61-4]** and connect the Loader Service Tool Harness, from the Remote Start Tool (Service Tool), to the loader harness connector.

Figure 10-61-5



Loaders with an attachment control harness (7 pin or 14 pin), the attachment harness (Item 1) must be disconnected from the loader harness (Item 2) **[Figure 10-61-5]**.

When the remote start procedure is completed, replace the loader connector cap (Item 1) **[Figure 10-61-4]** or reconnect the attachment control harness to the loader harness **[Figure 10-61-5]**.

ENGINE COOLING SYSTEM

Check the cooling system every day to prevent overheating, loss of performance or engine damage.

⚠ WARNING

AVOID INJURY OR DEATH

Wear safety glasses to prevent eye injury when any of the following conditions exist:

- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

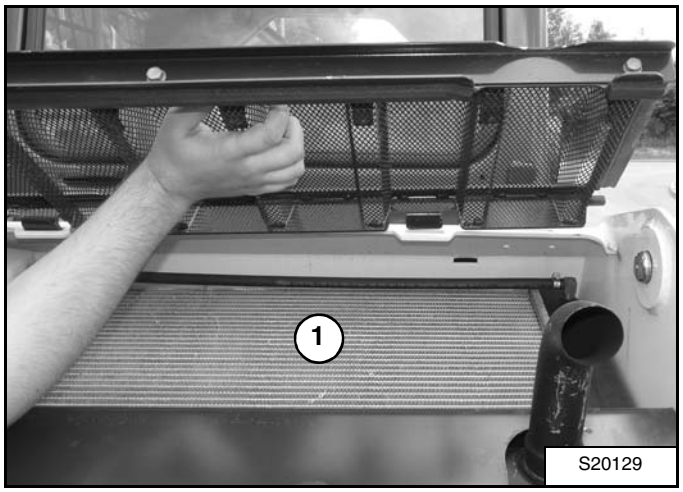
W-2019-0907

Cleaning

Open the rear door. (See the Operation & Maintenance Manual for the correct procedure.)

Remove the rear grill. (See the Operation & Maintenance Manual for the correct procedure.)

Figure 10-90-1



Use low air pressure or water pressure to clean the top of the radiator (Item 1) **[Figure 10-90-1]**.

Check the cooling system for leaks.

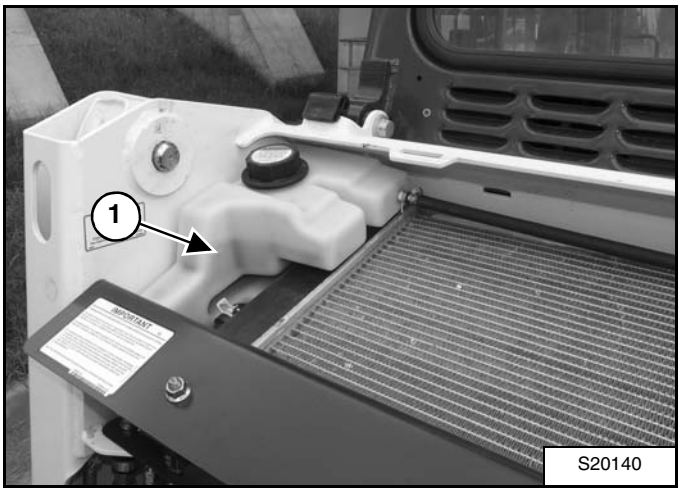
Install the rear grill and close the rear door.

Checking Level

Open the rear door. (See the Operation & Maintenance Manual for the correct procedure.)

Remove the rear grill. (See the Operation & Maintenance Manual for the correct procedure.)

Figure 10-90-2



Check coolant level using the level markers (Item 1) **[Figure 10-90-2]** on the tank. Coolant must be between the top and bottom markers when the engine is cold.

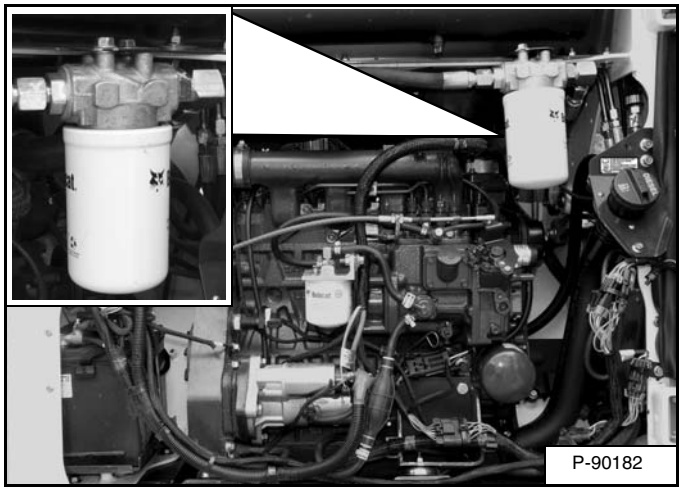
Install the rear grill and close the rear door.

Removing And Replacing Hydraulic / Hydrostatic Filter

For the correct service interval. (See SERVICE SCHEDULE on Page 10-70-1.)

Open the rear door. (See the Operation & Maintenance Manual for the correct procedure.)

Figure 10-120-5



Remove the filter (Inset) **[Figure 10-120-5]**.

Clean the surface of the filter housing where the filter seal contacts the housing.

Put clean oil on the seal of the new filter element. Install and hand tighten the filter element.

⚠ WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

Close the rear door.

Start the engine and operate the loader hydraulic controls.

Stop the engine and check for leaks at the filter.

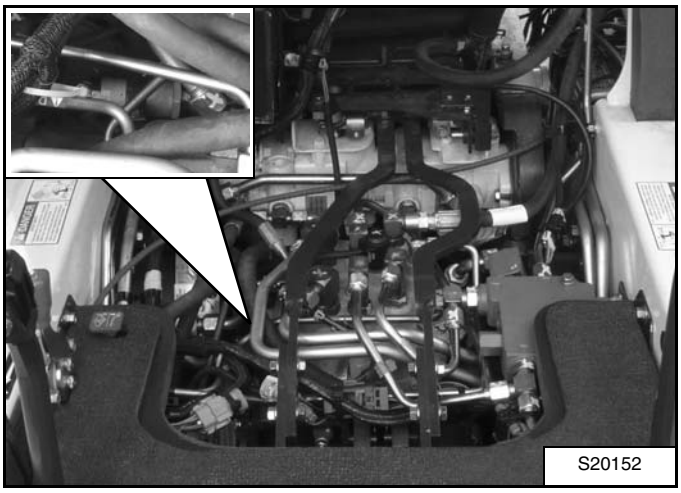
Check the fluid level in the reservoir and add as needed. (See Checking And Adding Fluid on Page 10-120-1.)

Removing And Replacing Case Drain Filters

For the correct service interval (See SERVICE SCHEDULE on Page 10-70-1.)

Raise the operator cab. (See Raising on Page 10-30-1.)

Figure 10-120-6



Disconnect the hoses and fittings at the ends of both case drain filters (Inset) **[Figure 10-120-6]**.

Remove the mounting clamp from the filters.

Install fittings on new filters.

Install new filters, install mounting clamp.

Reconnect and tighten hoses.

⚠ WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

Lower the operator cab. (See Lowering on Page 10-30-2.)

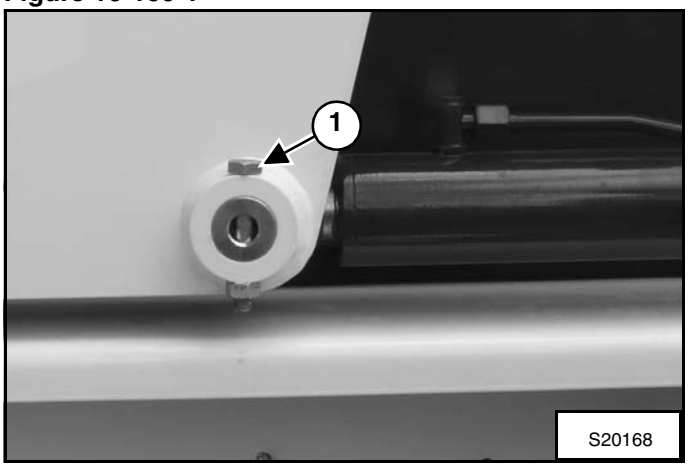
Start the engine and operate the loader hydraulic controls. Stop the engine and check for leaks.

Check the fluid level in the reservoir and add as needed. (See Checking And Adding Fluid on Page 10-120-1.)

PIVOT PINS

Inspection And Maintenance

Figure 10-160-1



All lift arm and cylinder pivots have a large pin held in position with a retainer bolt and lock nut (1) **[Figure 10-160-1]**.

Figure 10-160-2

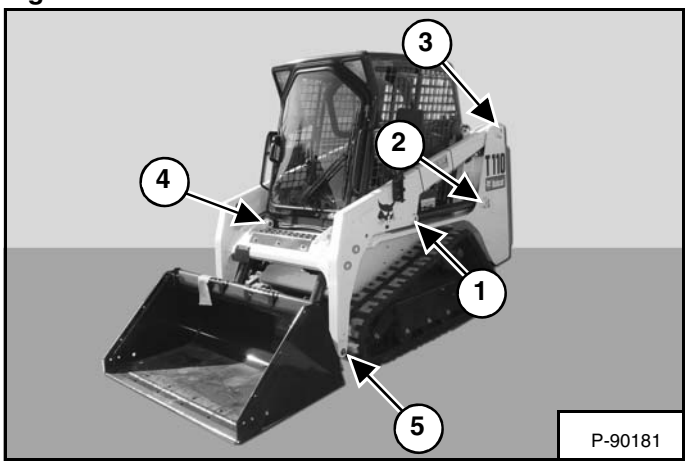
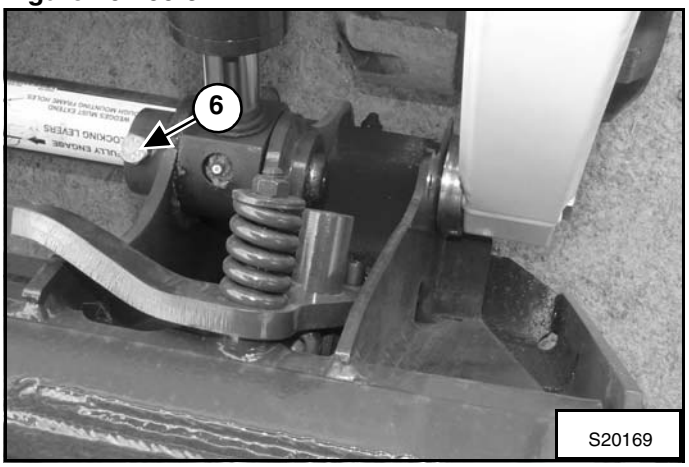


Figure 10-160-3



Check that the lock nuts are tightened to 35 - 40 ft.-lb. (48 - 54 N•m torque (Both Sides) (Items 1 - 6) **[Figure 10-160-2]** and **[Figure 10-160-3]**.

Glossary Of Hydraulic / Hydrostatic Symbols

SYMBOL DESCRIPTION

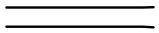
FLOW LINES and CONNECTIONS

WORKING CIRCUITS - Continuous, Solid Line - Working (Main) Line, Return Line (line conducting fluid from working devices to the reservoir) and Feed line (main line conductor).

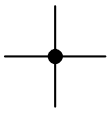
PILOT PRESSURE - Dashed Line - Pilot Line (Line which conducts control fluid).

DRAIN CIRCUITS - Dotted Line - Drain Line (drain or bleed line - line conducting fluid from a component housing to the reservoir.

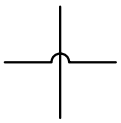
COMPONENTS - Long Chain Line - Enclosure outline for several components assembled in one unit.



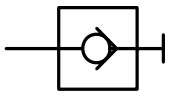
MECHANICAL CONNECTIONS - Double Line (Shaft, Lever, Piston Rod).



CONNECTED JUNCTION OF OIL LINES (Flow Line Connection).



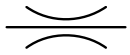
OIL LINES CROSSING (NOT Connected).



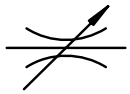
COUPLER - Quick - Acting fitting (uncoupled, closed by non-return valve).

SYMBOL DESCRIPTION

BASIC and MISCELLANEOUS SYMBOLS

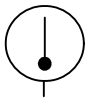


RESTRICTION - Line with Fixed Restriction - Affected by Viscosity (property of resistance to flowing fluid).

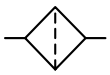


VARIABLE ADJUSTMENT RESTRICTION - Regulated or Variable Restriction.

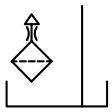
TEMPERATURE CONTROL - (Indication of temperature).



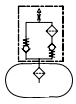
TEMPERATURE INDICATOR - (temperature measurement - thermometer).



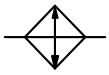
FILTER (strainer or screen) - For fluid conditioning.



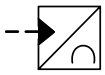
VENTED AND FILTERED RESERVOIR (reservoir open to atmosphere).



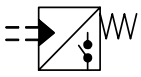
PRESSURIZED, VENTED AND FiLTERED RESERVOIR (Reservoir uses a pressured cap).



OIL COOLER (heat exchanger) - The arrows in the diamond indicate the extraction of heat (heat dissipation).

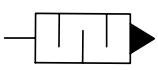


PRESSURE SENSOR - Varies electric signal with pressure.



DIFFERENTIAL PRESSURE SWITCH - Switch activates when pressure difference reaches specified level.

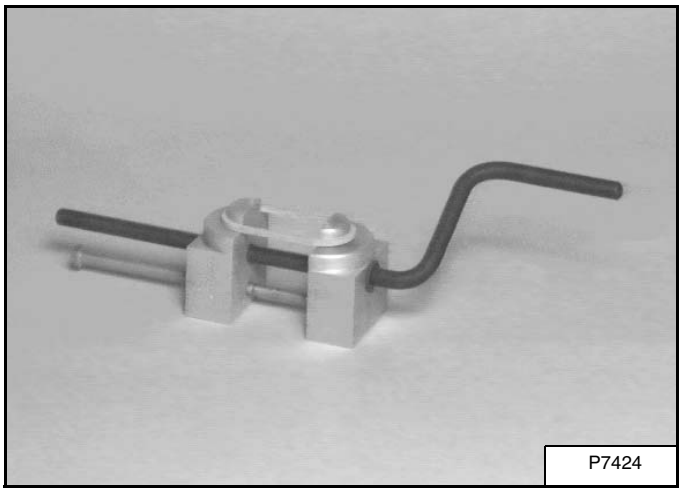
PRESSURE SWITCH - Switch activates when pressure reaches specified level.



MUFFLER - Reduces noise.

Disassembly And Assembly (Cont'd)

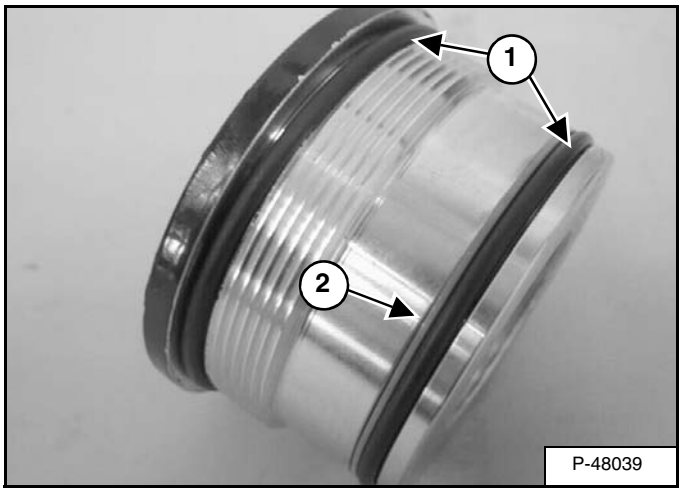
Figure 20-20-9



Assembly: Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-20-9]**. Allow the seal to stretch for 30 seconds before installing it on the piston.

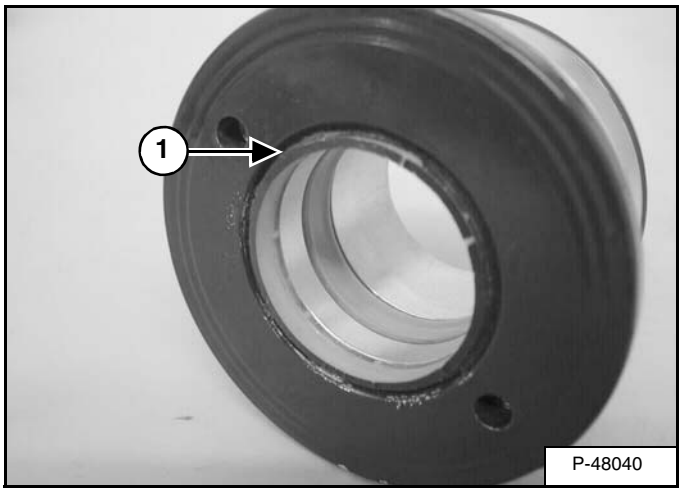
Once the seal is installed on the piston, a piston ring compressor can be used on the piston for 3 minutes to compress the seal into place.

Figure 20-20-10



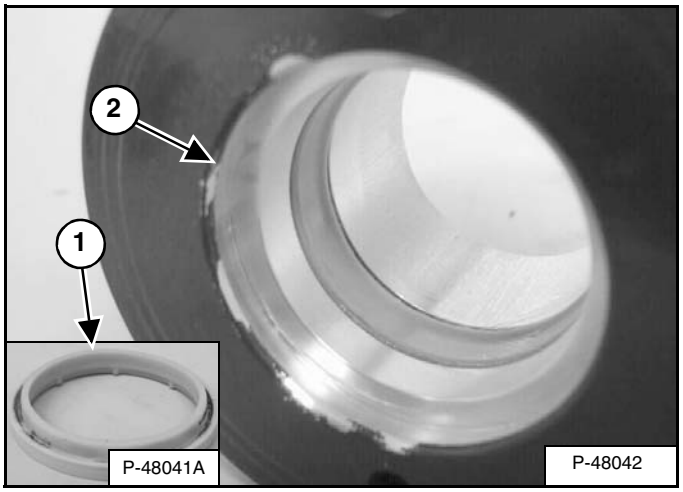
Remove the two O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-20-10]** from the cylinder head.

Figure 20-20-11



Remove the wiper seal (Item 1) **[Figure 20-20-11]** from the cylinder head.

Figure 20-20-12



Assembly: Install the wiper seal, with the wiper side of the seal (Item 1), toward the outside of the head (Item 2) **[Figure 20-20-12]**.

CYLINDER (BOB-TACH) (S/N AE0J11001 & ABOVE)

Testing

WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

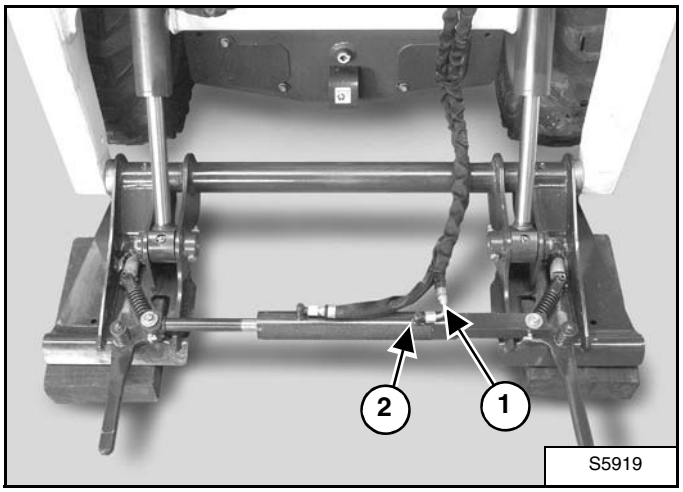
WARNING

AVOID INJURY OR DEATH

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

W-2072-0807

Figure 20-22-1



Tilt the Bob-Tach forward, so it is parallel to the floor **[Figure 20-22-1]**.

Disconnect the hose (Item 1) **[Figure 20-22-1]** from the power Bob-Tach cylinder base end port.

Install a plug in the hose (Item 1) **[Figure 20-22-1]** and tighten.

Engage the parking brake. Lower the seat bar. Start the engine.

Push and hold the BOB-TACH “WEDGES UP” Switch (Front Accessory Panel).

If there is any leakage from the base end cylinder port (Item 2) **[Figure 20-22-1]**, remove the Bob-Tach cylinder for repair.

The verification of the rod end side of the cylinder is similar.

HYDRAULIC CONTROL VALVE

Description

The hydraulic control valve is located inside the main frame, below the operator cab.

The hydraulic control valve is the hydraulic component that uses spools to direct the flow of hydraulic fluid to the lift, tilt and auxiliary functions.

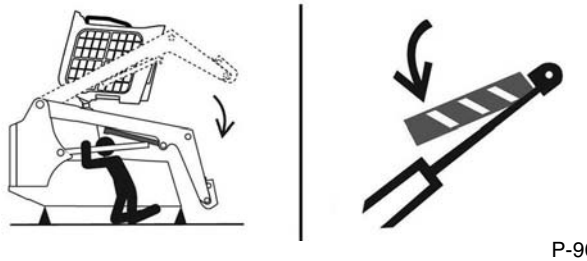
The lift and tilt functions are operated using mechanical linkages to connect the foot pedals to the lift and tilt spools.

The auxiliary functions are operated using mechanical linkages to connect the right steering lever to the auxiliary spool. Move the lever to the right or left to activate the auxiliary hydraulics.

The hydraulic control valve contains a main relief valve which is adjustable.

Removal And Installation

⚠ DANGER



P-90328

AVOID DEATH

- **Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.**
- **Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged.**

D-1009-0409

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-1.)

Clean the area around the control valve.

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

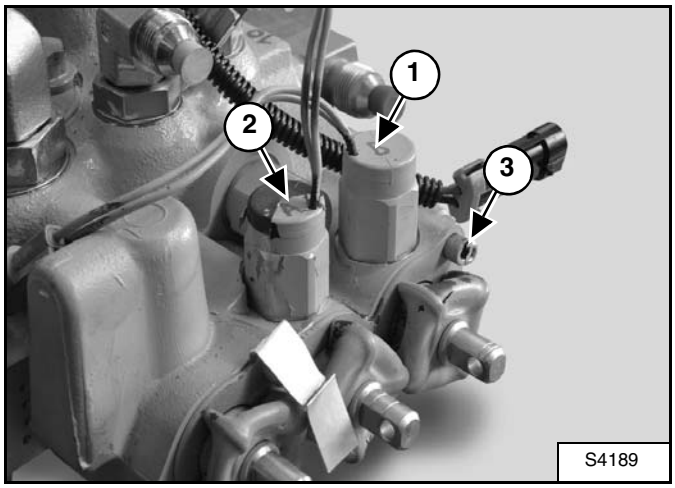
Open the rear door of the loader.

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

NOTE: Before disconnecting the tubelines, first mark the tubelines and the fittings to make sure the tubelines are on the right fitting when reconnecting.

End Cap / Spool Lock Block Removal And Installation

Figure 20-40-28



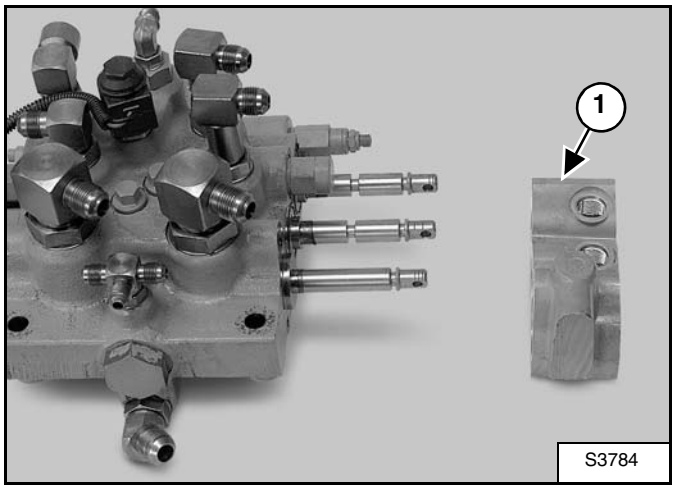
Remove the lift spool lock solenoid (Item 1) and the tilt spool lock solenoid (Item 2) **[Figure 20-40-28]** from the end cap / spool lock block.

Remove the four end cap / spool lock block mount screws (Item 3) **[Figure 20-40-28]**.

Installation: Tighten the screws to 90 - 100 in.-lb. (10 - 11,3 N•m) torque.

Remove the rubber boots and retainer plate from the lift and tilt spools.

Figure 20-40-29



Remove the end cap / spool lock block (Item 1) **[Figure 20-40-29]** from the control valve.

Lift Spool And Detent Removal And Installation

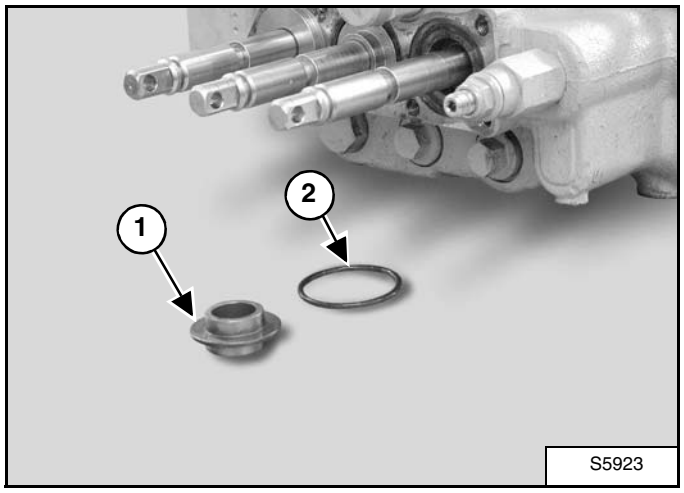
The tool listed will be needed to do the following procedure:

MEL 1278 - Detent Tool

MEL 1285 - Detent Spring Tool

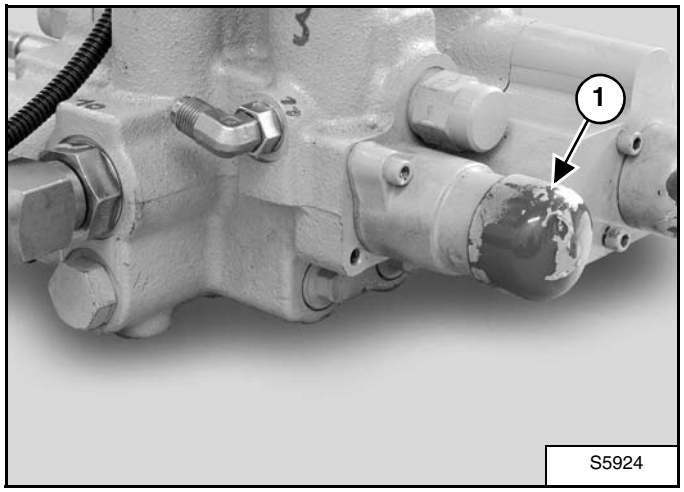
Remove the end cap / spool lock block from the control valve. (See End Cap / Spool Lock Block Removal And Installation on Page 20-40-11.)

Figure 20-40-30



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-30]** from the lift spool.

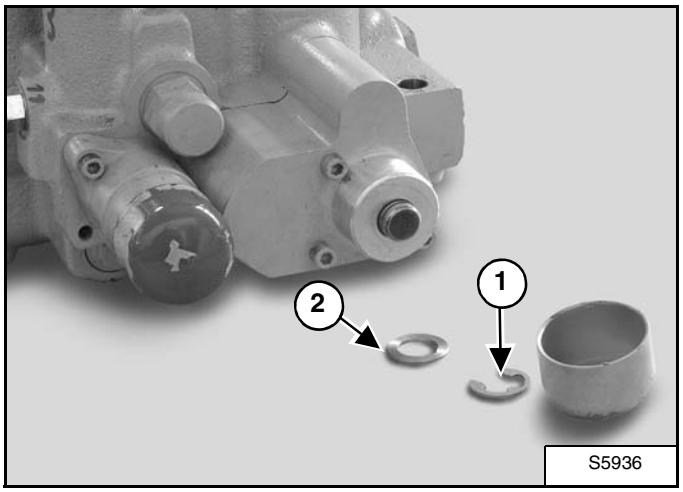
Figure 20-40-31



Remove the end cap (Item 1) **[Figure 20-40-31]**.

Tilt Spool Removal And Installation (Cont'd)

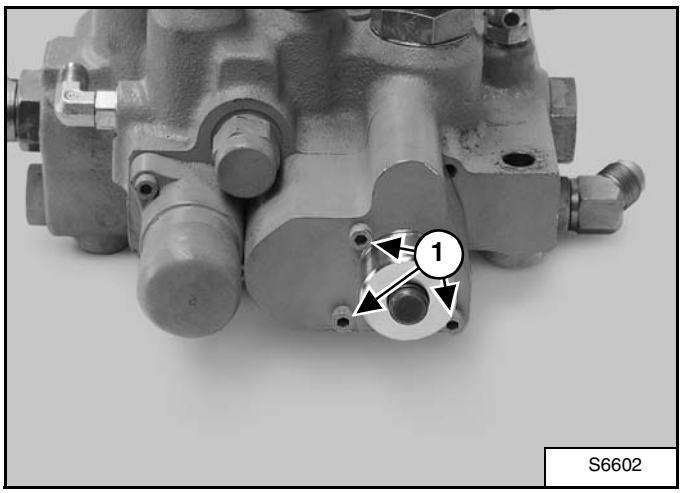
Figure 20-40-68



Use a screwdriver to remove the snap ring (Item 1) **[Figure 20-40-68]**.

Remove the washer (Item 2) **[Figure 20-40-68]**.

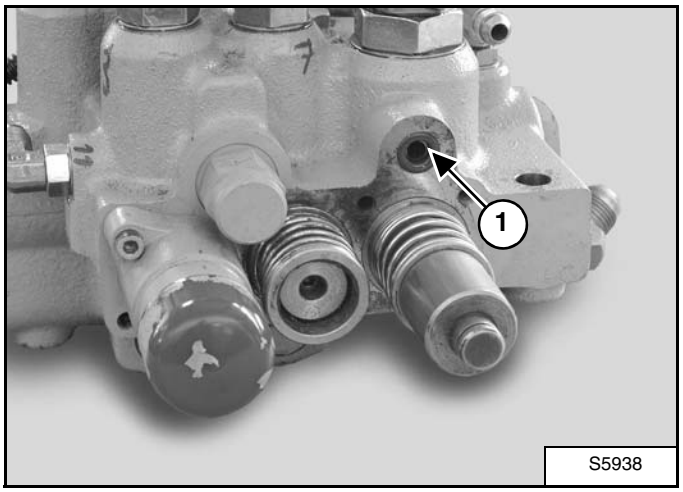
Figure 20-40-69



Remove the three bolts (Item 1) **[Figure 20-40-69]** from the spool centering block and remove the spool centering block.

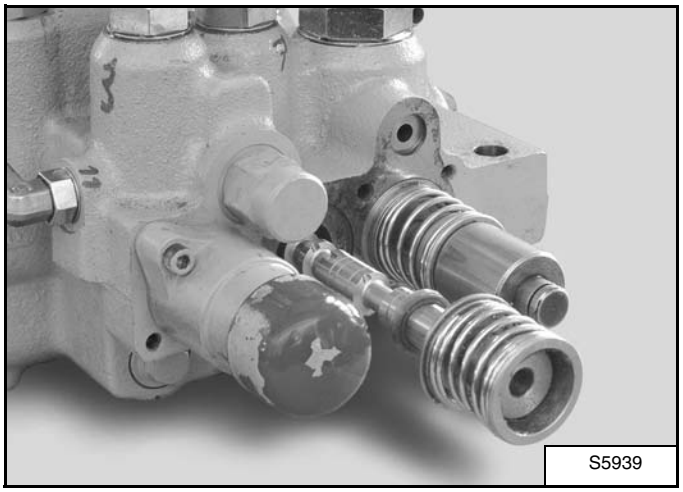
Installation: Tighten the bolts to 90 - 100 in.-lb. (10 - 11,3 N•m) torque.

Figure 20-40-70



Check and replace the O-ring (Item 1) **[Figure 20-40-70]** before replacing the spool centering block.

Figure 20-40-71

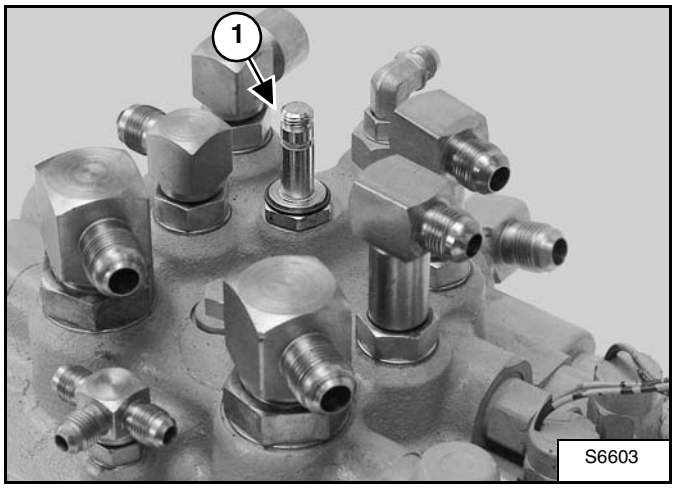


Remove the tilt spool, centering spring, back-up washer and spool seal **[Figure 20-40-71]**.

Installation: Always use a new spool seal.

Solenoid Removal And Installation (Cont'd)

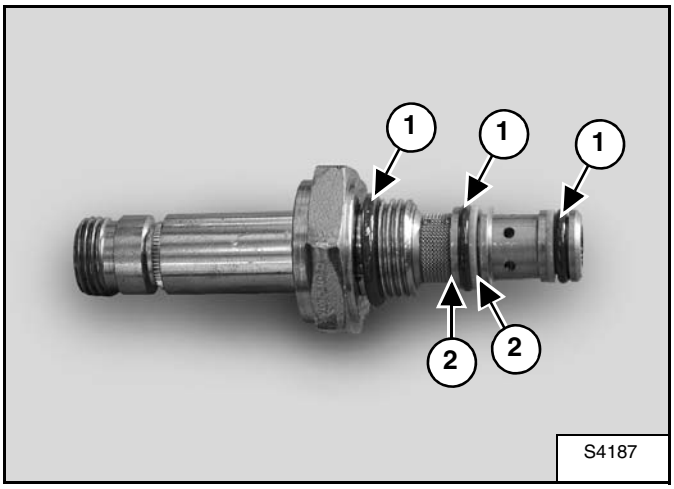
Figure 20-40-107



Remove the solenoid stem (Item 1) **[Figure 20-40-107]**.

Installation: Lubricate the O-rings and tighten the stem to 20 - 24 ft.-lb. (27 - 33 N•m) torque.

Figure 20-40-108



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-108]** from the cartridge.

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear and replace any showing excessive wear.

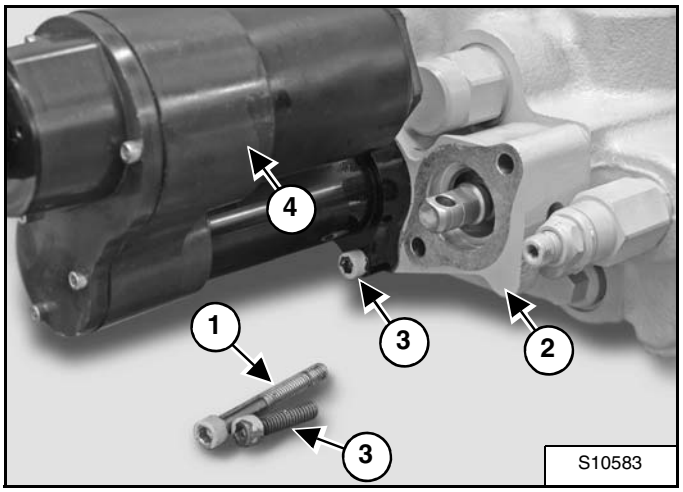
NOTE: The screen (Item 3) [Figure 20-40-108] can be cleaned with solvent. If it is torn or worn it needs to be replaced.

Use only new O-rings and apply oil to all O-rings and back-up rings before installation.

Install new O-rings (Item 1) **[Figure 20-40-106]** and **[Figure 20-40-108]** and new back-up rings (Item 2) **[Figure 20-40-108]** on the solenoid stem.

Actuator Removal And Installation (Cont'd)

Figure 20-41-19

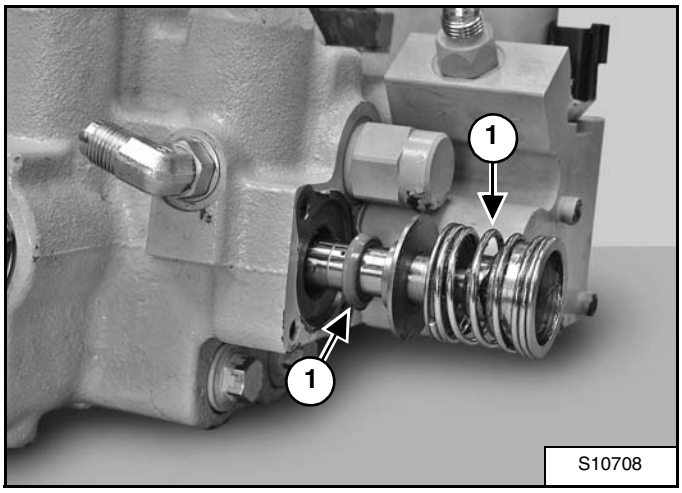


NOTE: The two longer bolts (Item 1) are used to mount the lift actuator and end cap (Item 2) to the control valve.
The two shorter mount bolts (Item 3) are used to mount the tilt actuator (Item 4) [Figure 20-41-19] to the end cap.

Installation: Tighten the mounting bolts (Item 1) **[Figure 20-41-19]** to 90 - 100 in.-lb. (10,2 - 11,3 N•m) torque.

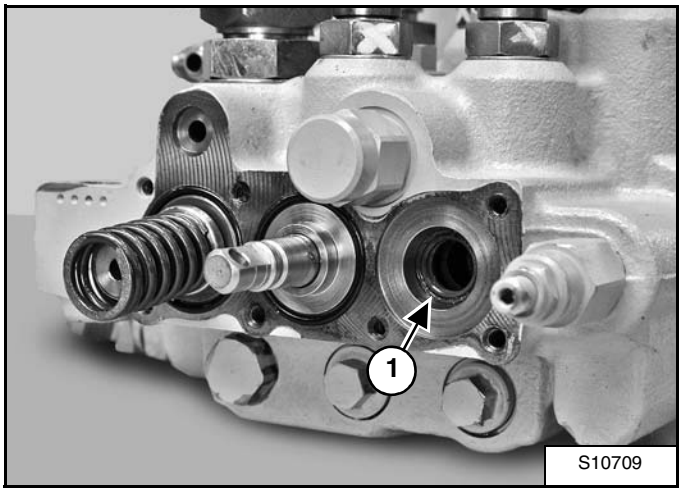
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-41-50



Remove the lift spool assembly (Item 1) and seal (Item 2) **[Figure 20-41-50]** from the control valve.

Figure 20-41-51



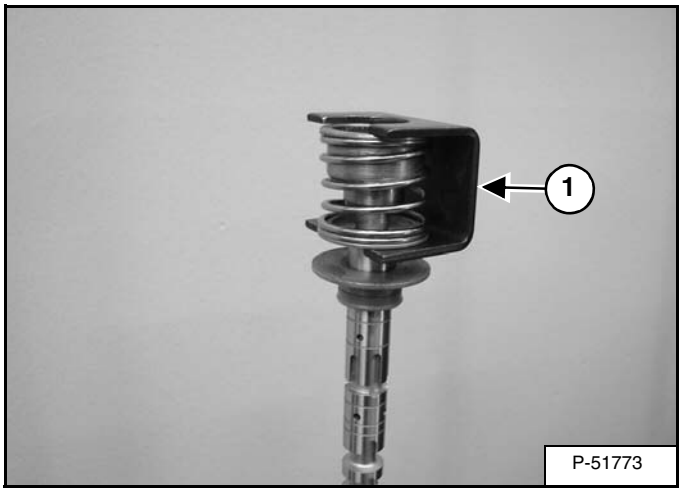
Remove the lift spool seal (Item 1) **[Figure 20-41-51]** from the linkage end of the valve.

Figure 20-41-52

Clamp the linkage end of the spool in a vise **[Figure 20-41-52]**.

NOTE: Protect spool before clamping in vise.

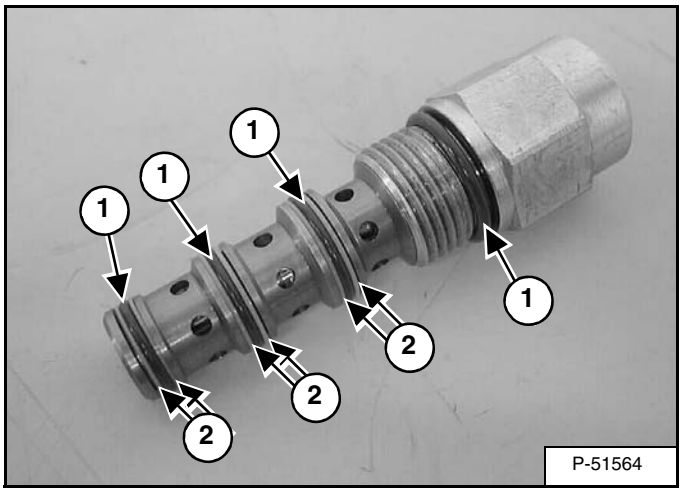
Figure 20-41-53



Install the spring tool (Item 1) **[Figure 20-41-53]** over the centering spring.

Lock Valve Removal And Installation (Cont'd)

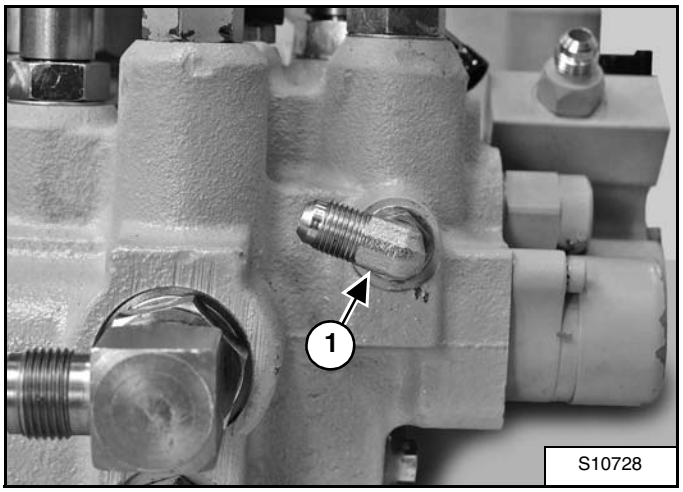
Figure 20-41-86



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-86]** from the tilt lock valve, and replace them.

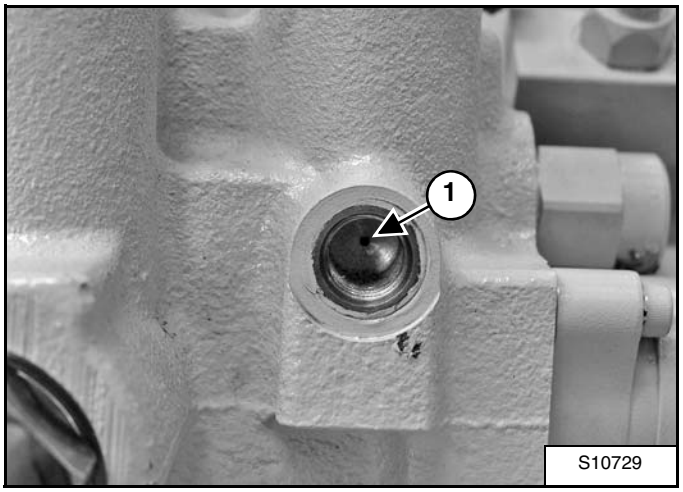
Lift Arm Bypass Orifice Removal And Installation

Figure 20-41-87



Remove the fitting (Item 1) **[Figure 20-41-87]** from the valve.

Figure 20-41-88



Check the lift arm bypass orifice (Item 1) **[Figure 20-41-88]**.

NOTE: This orifice is not removable from the valve casting.

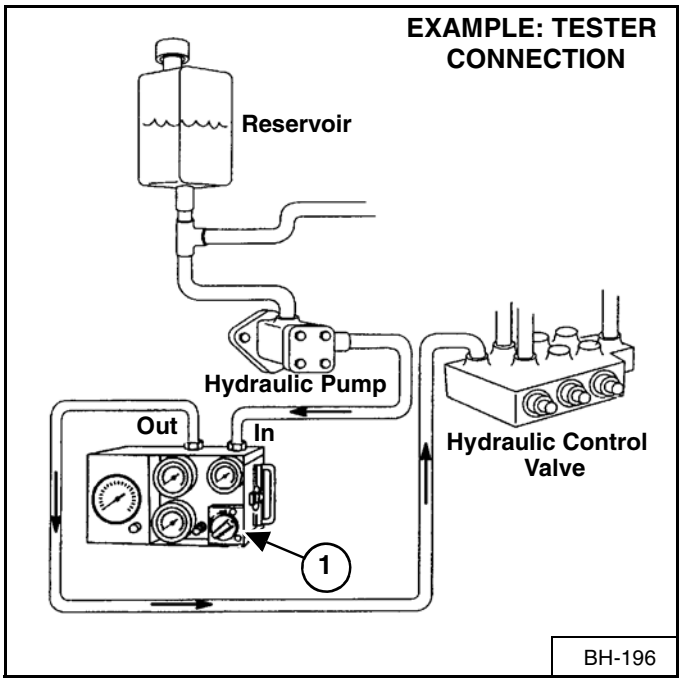
Direct Pump Test (Standard Section) (Cont'd)

IMPORTANT

The hydraulic tester must be in the fully open position before you start the engine.

I-2024-0284

Figure 20-60-4



Sample tester connection shown **[Figure 20-60-4]**.

Start the engine and run at low idle RPM. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to full RPM*.

Warm the fluid to 140° F (60° C) by turning the restrictor control (Item 1) **[Figure 20-60-4]** on the tester to about 1000 PSI (68,95 bar).

DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM*.

Push the maximum / variable flow switch (on the remote start tool) to engage the front auxiliary hydraulics, the light will come ON. Push the button (on the right control lever) for fluid flow to the quick coupler (fluid pressure will go over main relief). Record the highest pressure (PSI) and flow (GPM). The high pressure flow must be at least 80% of free flow.

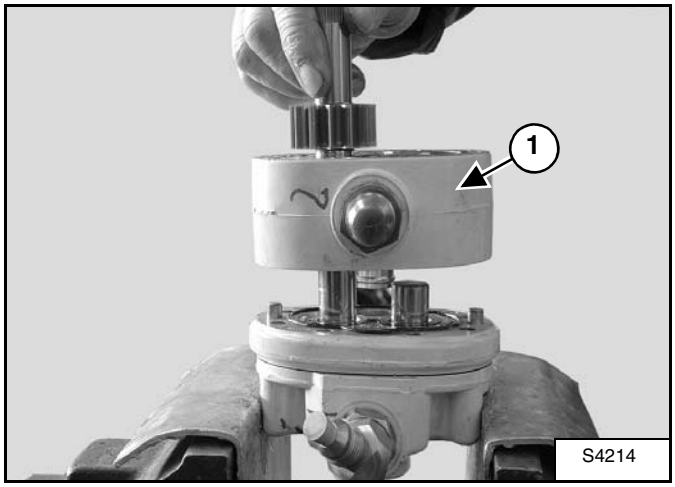
$$\% = \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

A low percentage can indicate a failed pump.

*Refer to (See Hydraulic System on Page SPEC-10-3.) for system relief pressure and full RPM.

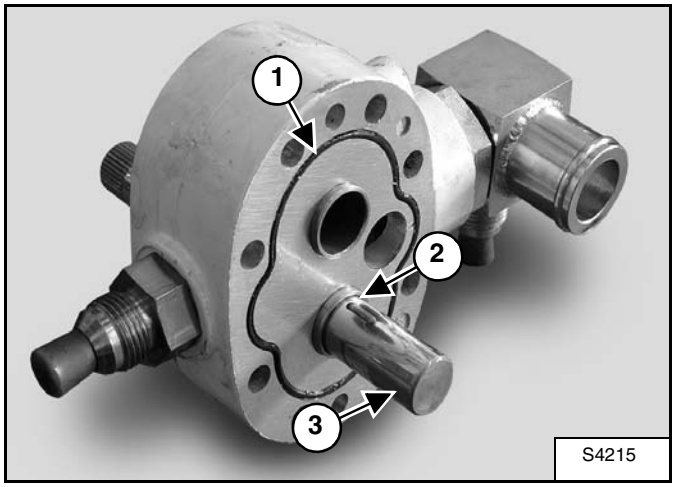
Disassembly And Assembly (Cont'd)

Figure 20-60-27



Remove the pump center section (Item 1) **[Figure 20-60-27]** with drive gear and drive shaft by lifting it up.

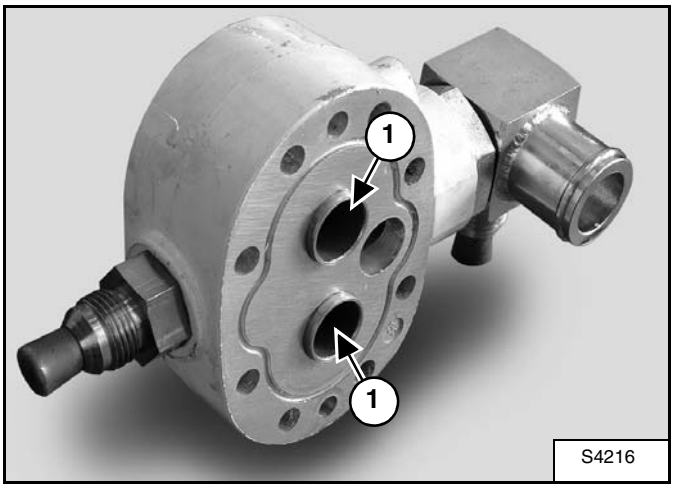
Figure 20-60-28



Remove the section seal (Item 1) **[Figure 20-60-28]** from the pump center section.

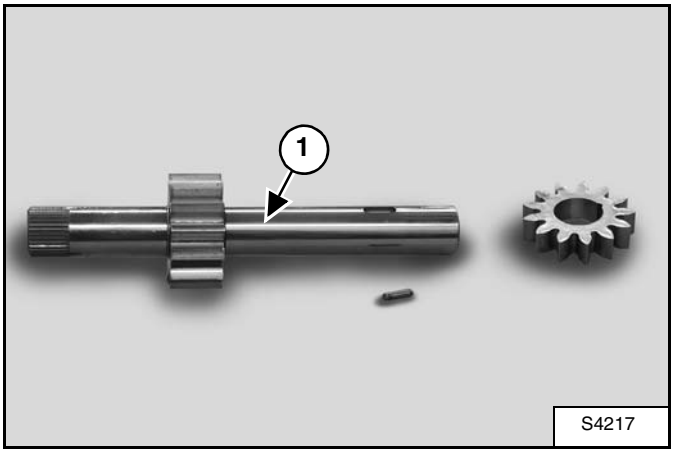
Remove the pin (Item 2) from the drive shaft (Item 3) **[Figure 20-60-28]** and remove the drive shaft by pulling it out of the bushing.

Figure 20-60-29



Remove the bushings (Item 1) **[Figure 20-60-29]** from the pump center section and check for wear. Replace if needed.

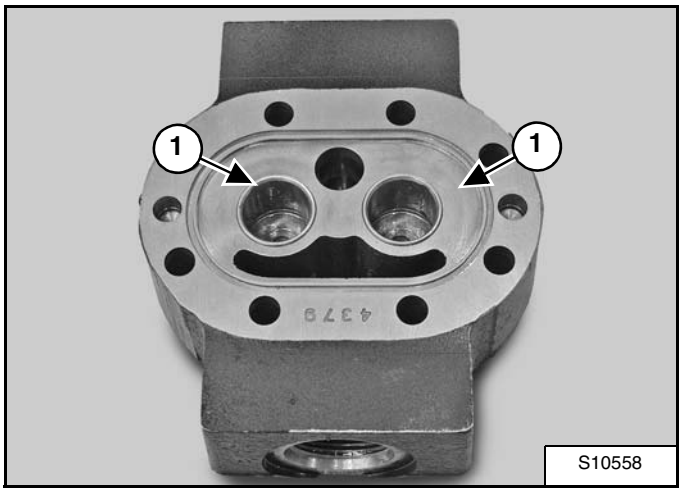
Figure 20-60-30



Inspect the drive gear and drive shaft (Item 1) **[Figure 20-60-30]** for wear. Replace if needed.

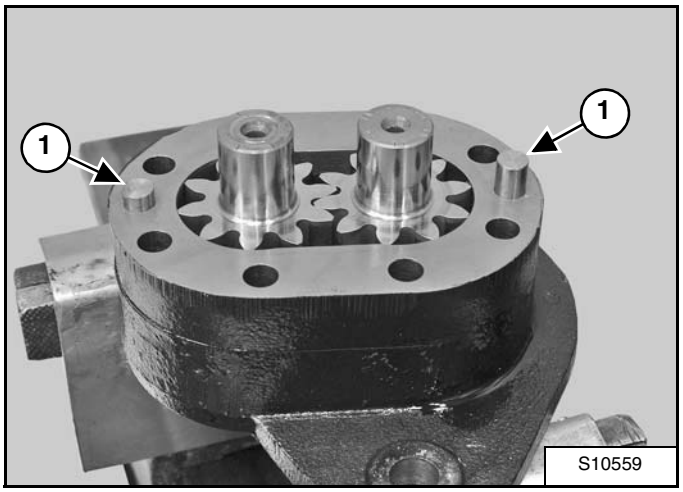
Disassembly And Assembly (Cont'd)

Figure 20-61-12



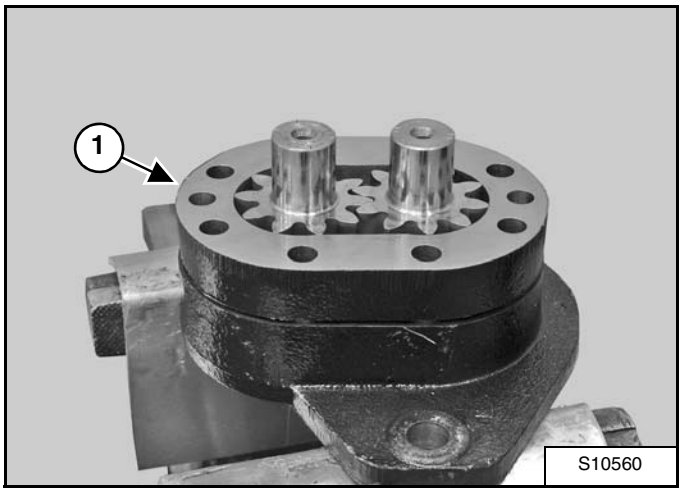
Remove the bushings (Item 1) **[Figure 20-61-12]** from the pump end section and check for wear. Replace if needed.

Figure 20-61-13



Remove the guiding pins (Item 1) **[Figure 20-61-13]** from the pump center section.

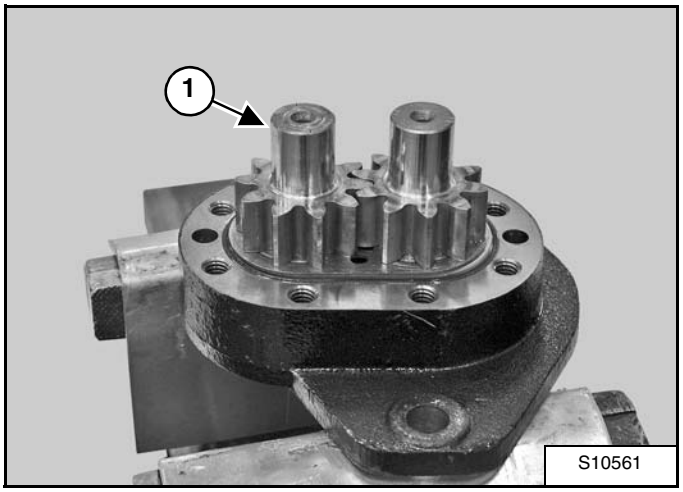
Figure 20-61-14



Remove the pump center section (Item 1) **[Figure 20-61-14]**.

Installation: Align the marks made during disassembly.

Figure 20-61-15



Remove the idler gear (Item 1) **[Figure 20-61-15]** from the pump lower section.

Inspect the idler gear. Replace if needed.

NOTE: The drive gear and idler gear are not serviced separately. These parts are matched sets which are run in at the factory. If any part is damaged, the entire section must be replaced.

OIL COOLER

Description

The oil cooler is used to cool the loaders hydraulic and hydrostatic oil. Oil passages are coiled into a heat exchanger. The cooling fan forces air around the passages cooling the oil.

The oil cooler is located underneath the rear grill.

Removal And Installation

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

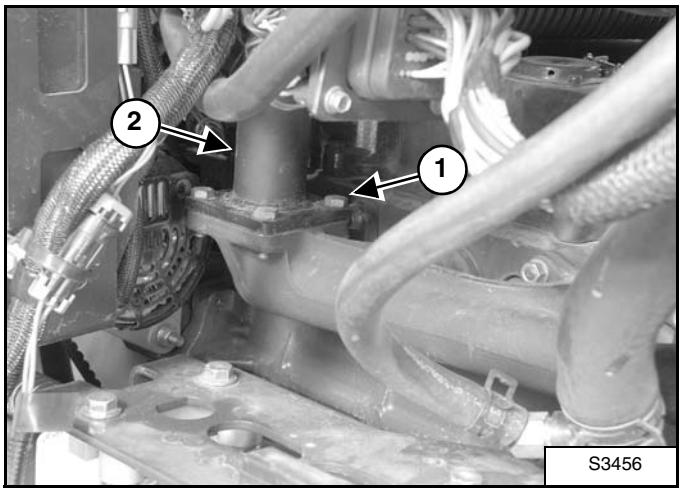
I-2003-0888

Open the rear door of the loader.

Remove the rear grill. (See Removal And Installation on Page 20-90-1.)

Remove the oil filter. (See Housing Removal And Installation on Page 20-70-1.)

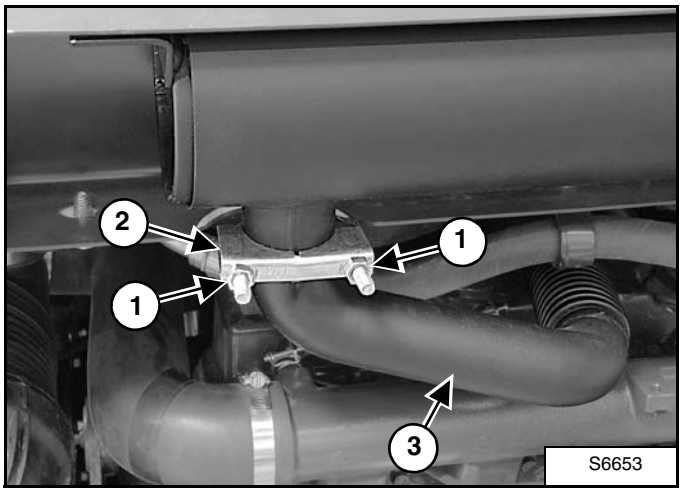
Figure 20-90-1



Remove the four bolts (Item 1) from the exhaust pipe (Item 2) **[Figure 20-90-1]**.

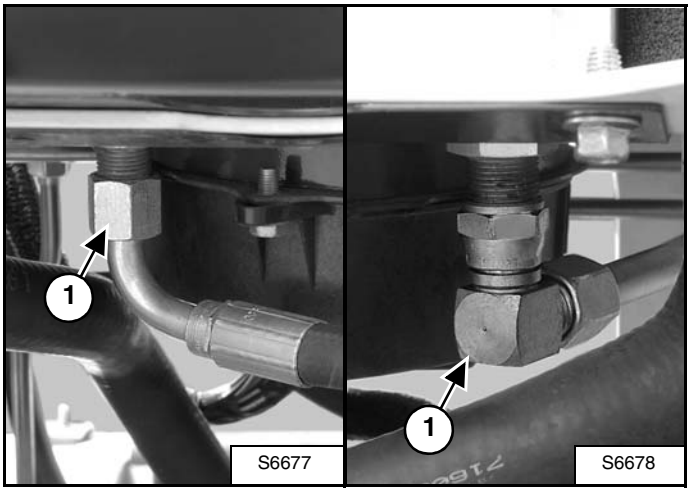
Installation: Make sure the gasket is fit in between the flanges when installing.

Figure 20-90-2



Remove the two nuts (Item 1) and the clamp (Item 2) from the exhaust pipe and remove the pipe (Item 3) **[Figure 20-90-2]**.

Figure 20-90-3



Disconnect the two hydraulic tubelines (Item 1) **[Figure 20-90-3]** from the oil cooler.

Remove the fans from the oil cooler frame. (See Fan Removal And Installation on Page 70-50-2.)

BOB-TACH (POWER) BLOCK (S/N AE0J11001 & ABOVE)

Description

The Power Bob-Tach block is an option that allows the operator to hydraulically control the Bob-Tach levers for mounting and dismounting the attachments.

The Power Bob-Tach block is operated by a switch on the front console.

The Power Bob-Tach block is mounted on the front right side of the machine.

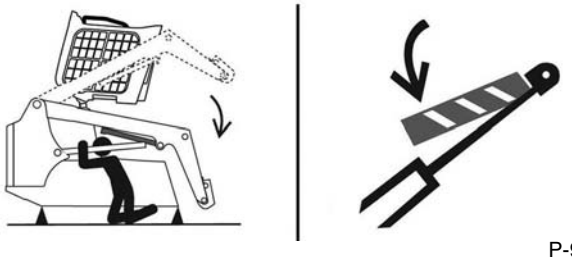
Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

⚠ DANGER



P-90328

AVOID DEATH

- **Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.**
- **Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged.**

D-1009-0409

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

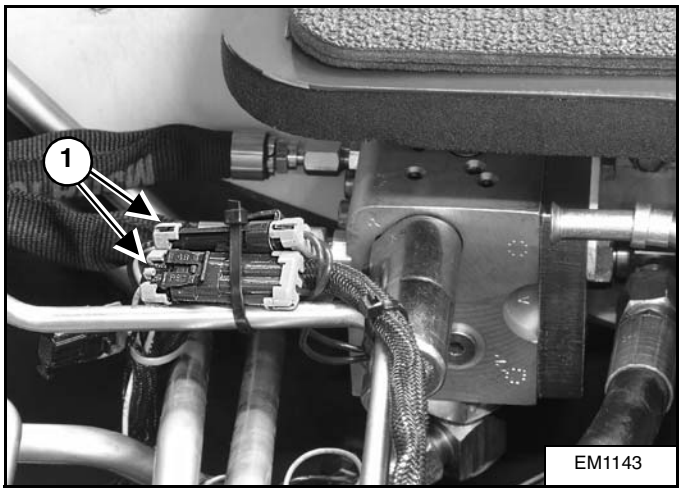
Raise the operator cab. (See Raising on Page 10-30-1.)

Drain the hydraulic reservoir.

Remove the steering linkages.

Remove the bucket position valve. (See Removal And Installation on Page 20-100-2.)

Figure 20-120-1

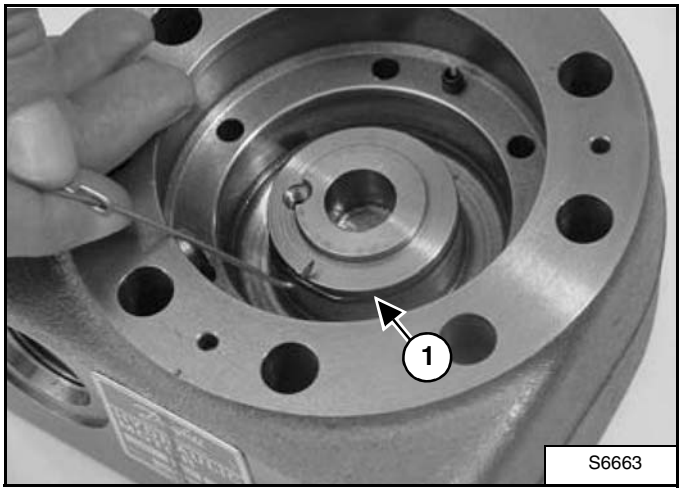


Disconnect the Power Bob-Tach harness from the solenoid connectors (Item 1) **[Figure 20-120-1]**.

HYDROSTATIC SYSTEM

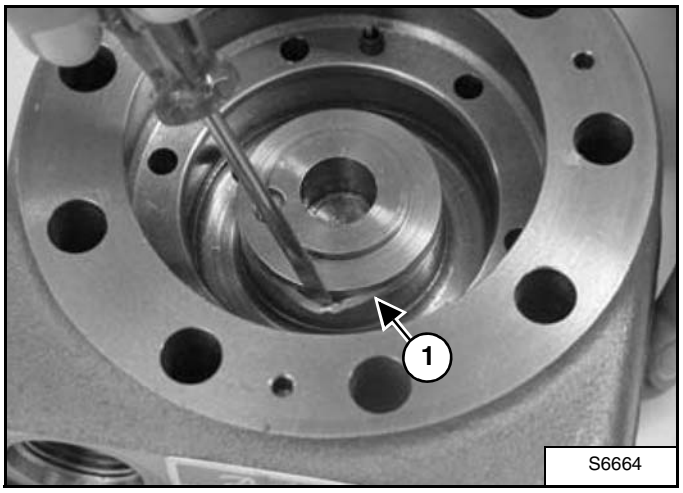
Disassembly And Assembly (Cont'd)

Figure 30-20-15



Remove the O-ring (Item 1) **[Figure 30-20-15]** from the end cover.

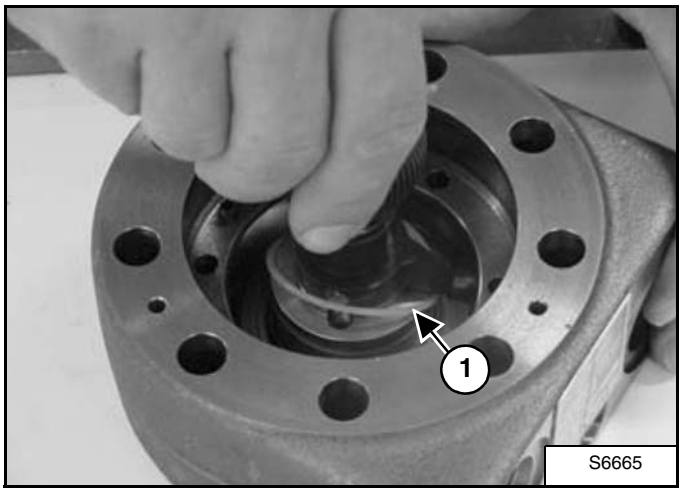
Figure 30-20-16



Remove the backup ring (Item 1) **[Figure 30-20-16]**.

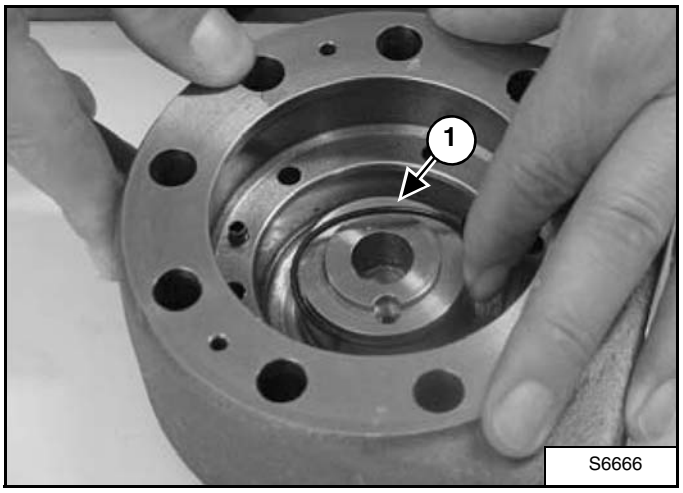
NOTE: Removing the backup ring cannot be done without damaging it.

Figure 30-20-17



Installation: Use tool to position the backup ring (Item 1) **[Figure 30-20-17]**. Make sure that the excavation for the O-ring faces the housing. The backup ring is located on the top.

Figure 30-20-18



Mount the O-ring (Item 1) **[Figure 30-20-18]** beneath the backup ring.

HYDROSTATIC PUMP

Description

The hydrostatic pump is composed of two hydrostatic piston pumps connected together. The pumps provide bi-directional flow to two separate hydrostatic drive motors. The pump flow and direction are controlled by two hand levers, one for each pump.

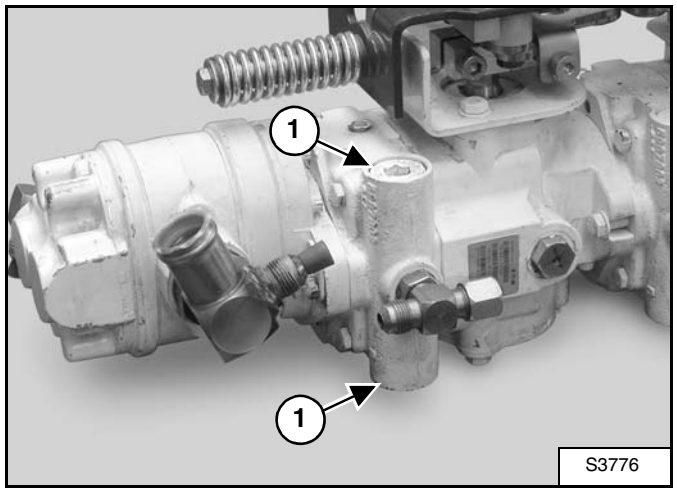
The hydrostatic pump contains replenishing valves. The function of these valves is to give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling. Another function of the replenishing valve is to keep high pressure fluid out of the low pressure side of the hydrostatic circuit.

The hydrostatic pump contains the charge pressure relief. The charge pressure relief is adjustable with shims.

The hydrostatic pump is located in the center of the mainframe mounted to the engine flywheel housing.

Replenishing / High Pressure Relief Valve Removal And Installation

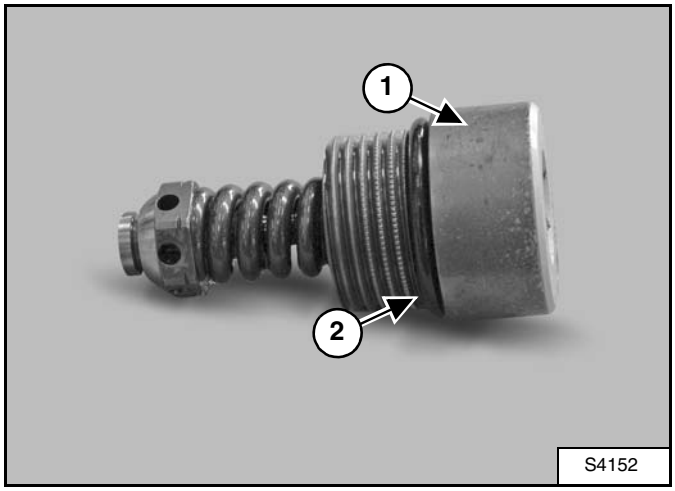
Figure 30-40-1



There are four replenishing / high pressure relief valves (Item 1) **[Figure 30-40-1]** in the hydrostatic pump assembly. Two are located at the top of the pumps and two are located at the bottom of the pumps.

NOTE: The two top valves are for the reverse drive loop and the two bottom valves are for the forward drive loop.

Figure 30-40-2



Remove the replenishing / high pressure relief valve (Item 1) **[Figure 30-40-2]** from the pump.

Assembly: Tighten the plug to 30 - 50 ft.-lb. (41 - 68 N•m) torque.

Check for damage and replace as needed.

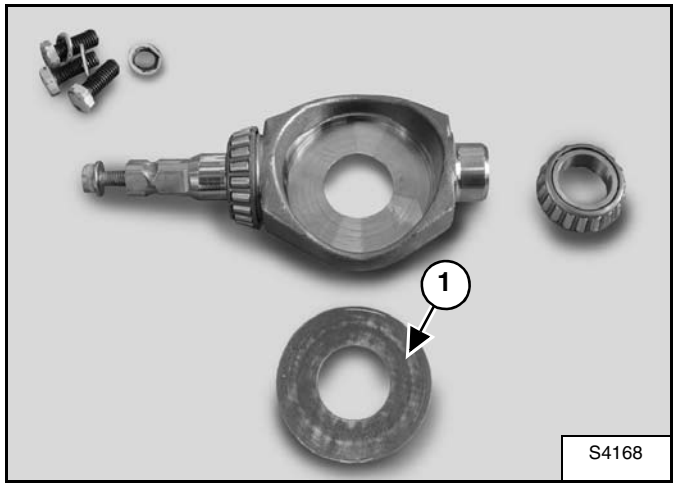
Check O-ring (Item 2) **[Figure 30-40-2]** for damage and replace as needed.

If the replenishing / high pressure relief valve must be replaced, it must be replaced as a complete unit.

The pressure setting for a new replenishing / high pressure relief valve is 4250 PSI (293 bar).

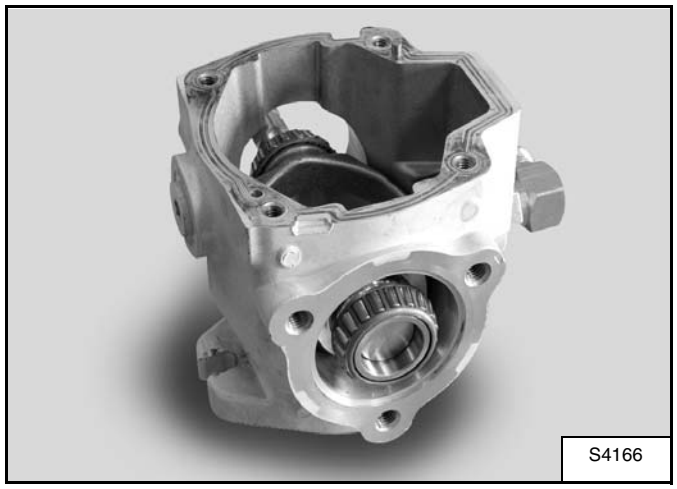
Assembly

Figure 30-40-30



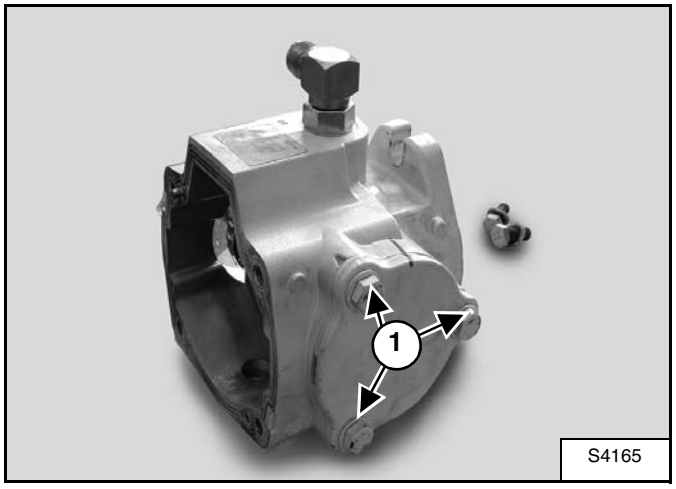
Install the wear plate (Item 1) **[Figure 30-40-30]** onto the swash plate.

Figure 30-40-31



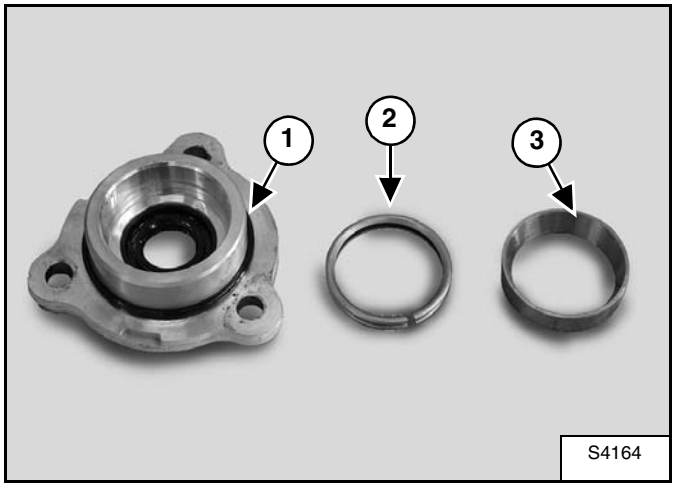
Install the swash plate and the upper tapered roller bearing into the pump housing **[Figure 30-40-31]**.

Figure 30-40-32



Install the lower cover on the pump housing and tighten the bolts (Item 1) **[Figure 30-40-32]** to 29 ft.-lb. (39,3 N•m) torque.

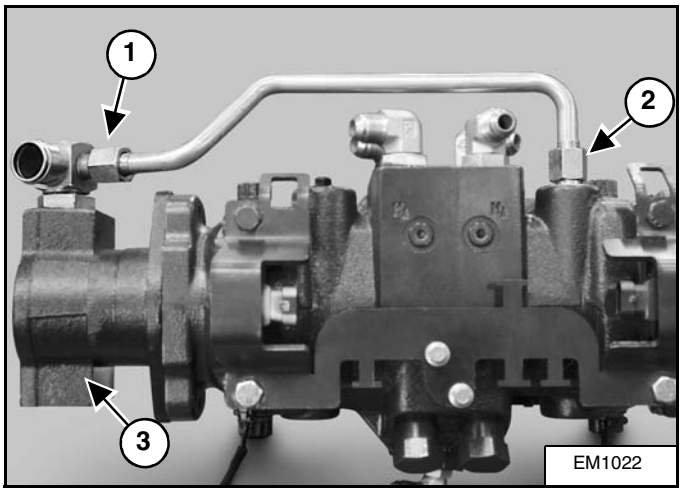
Figure 30-40-33



Install the O-ring (Item 1), the crush ring (Item 2) and the bearing race (Item 3) **[Figure 30-40-33]** on the cover.

Removal And Installation (Cont'd)

Figure 30-41-11

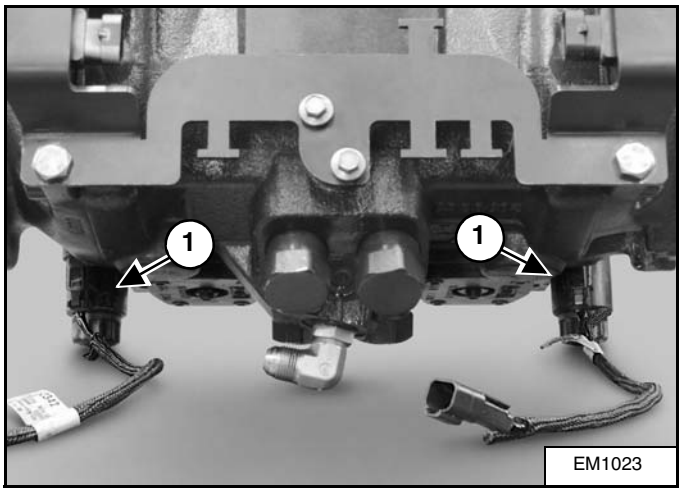


Disconnect the tubeline (Item 1) **[Figure 30-41-11]** from the hydraulic pump.

Disconnect and remove the tubeline (Item 2) **[Figure 30-41-11]** from the hydrostatic pump.

Remove the hydraulic pump (Item 3) **[Figure 30-41-11]** from the hydrostatic pump by sliding it off.

Figure 30-41-12



Mark and unplug the two connectors (Item 1) **[Figure 30-41-12]** from the hydraulic controllers.

Hydrostatic Pump Startup

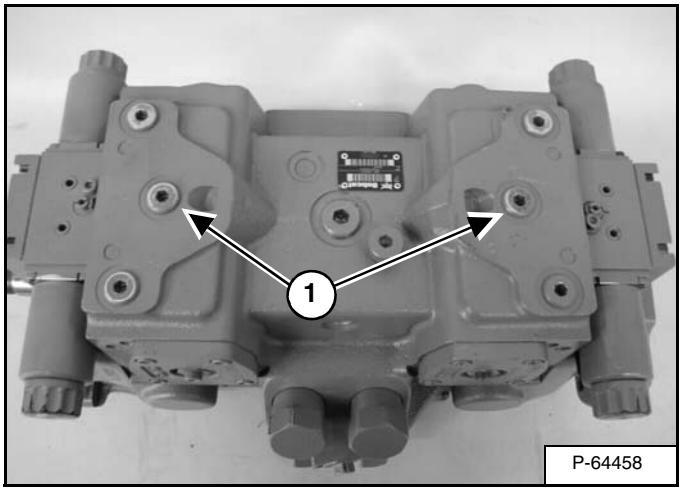
Before putting a hydrostatic pump back into operation, the hydrostatic pump should be filled with hydrostatic fluid. This should be performed when installing a new hydrostatic pump or a pump that has been disassembled.

Starting a hydrostatic pump dry can cause premature wear or permanent pump damage.

Under normal operation, the charge pump will keep the hydrostatic pumps filled.

Filling the hydrostatic pump is best done by removing a plug at the top of the hydrostatic pump. A clean funnel should be used to avoid washing contaminants into the hydrostatic pump. The goal is to fill the hydrostatic pump as much as possible before startup.

Figure 30-41-13



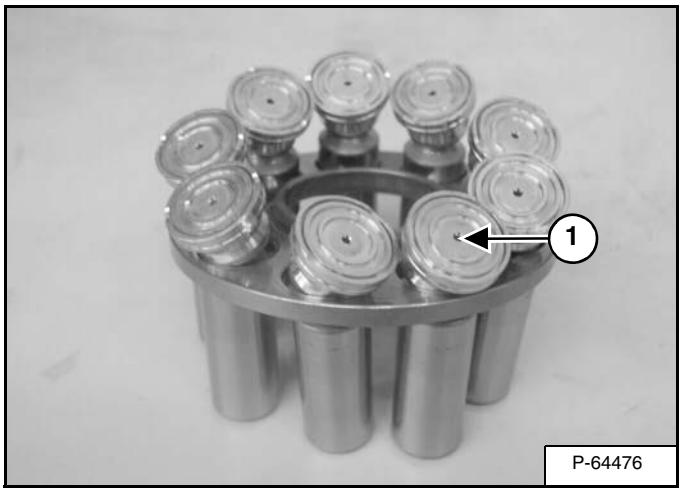
Remove the air bleed plugs (Item 1) **[Figure 30-41-13]**.

BEFORE STARTUP: Fill one of the air bleed ports with new hydraulic oil until the hydraulic oil flows out of the other air bleed port. This will remove trapped air in the hydrostatic pumps before startup.

Assembly: Tighten plugs to 18 ft.-lb. (25 N•m) torque.

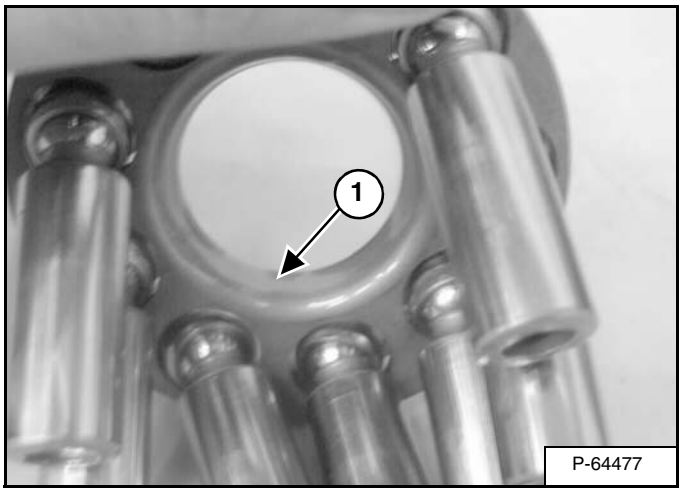
Disassembly And Assembly (Cont'd)

Figure 30-41-40



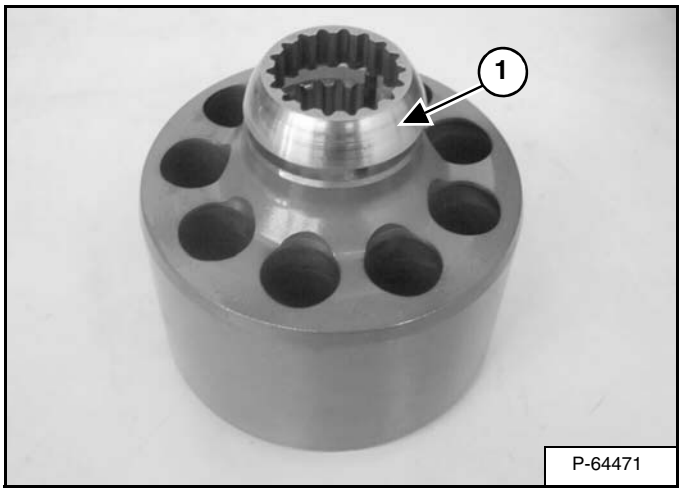
Inspect the pistons, look for scoring and scratches. Ensure the holes (Item 1) **[Figure 30-41-40]** in the slippers, are not plugged.

Figure 30-41-41



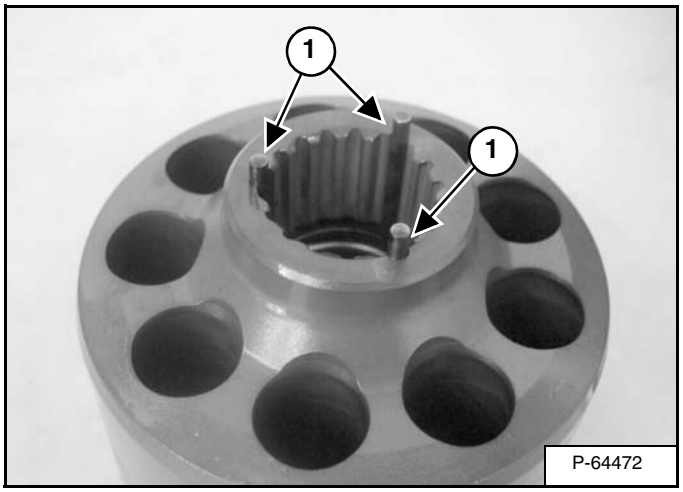
Inspect the mating surface of the spherical washer for scoring or scratches (Item 1) **[Figure 30-41-41]**.

Figure 30-41-42



Remove the spherical washer (Item 1) **[Figure 30-41-42]**.

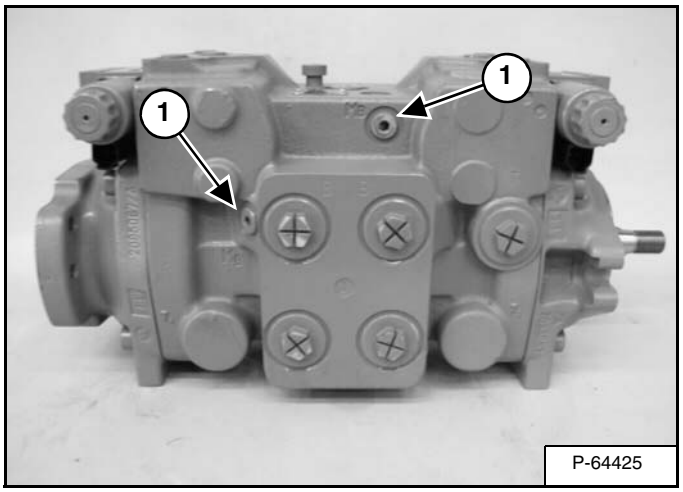
Figure 30-41-43



Inspect the pins (Item 1) **[Figure 30-41-43]**. They should be all the same length. Do not remove.

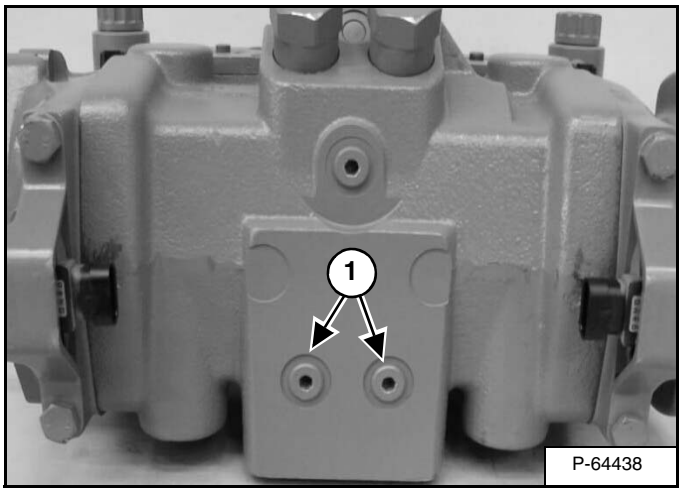
Mechanical Neutral Adjustment (Cont'd)

Figure 30-41-77



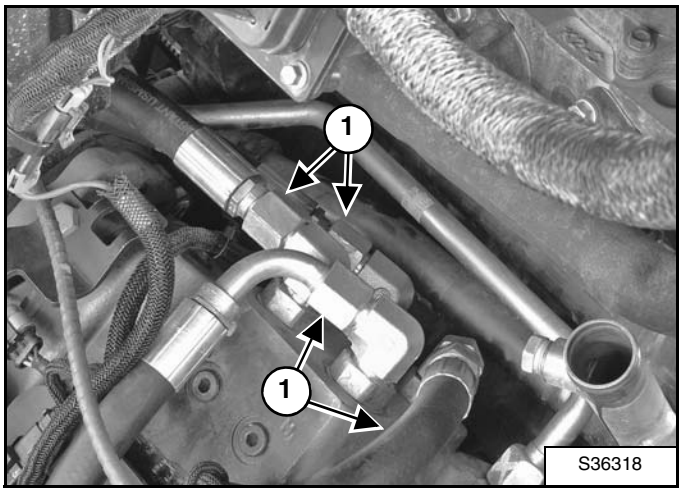
Remove the plugs (Item 1) **[Figure 30-41-77]** from the MB ports on the front side of the pump, and install 7500 PSI (517 bar) pressure gauges.

Figure 30-41-78



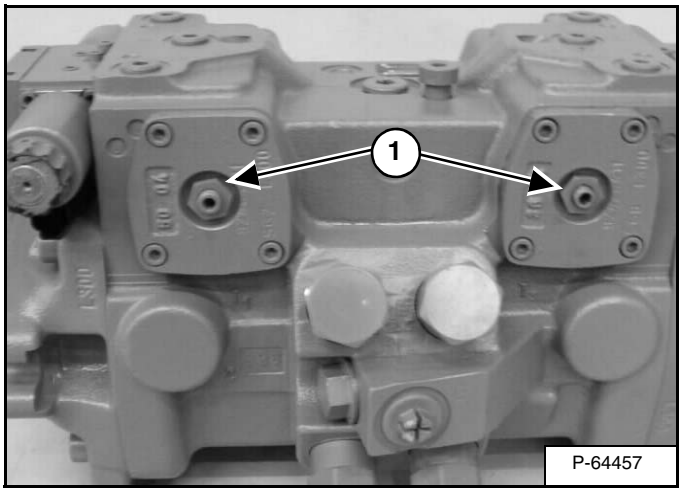
Remove the plugs (Item 1) **[Figure 30-41-78]** from the MA ports on the bottom of the pump, and install 7500 PSI (517 bar) pressure gauges.

Figure 30-41-79



Remove drive hoses from the A and B ports (Item 1) **[Figure 30-41-79]**. Plug the ports with metal caps. The caps must be able to handle at least 7500 PSI (517 bar). Plugging the A and B ports eliminates leakage at the drive motors from causing errors in the pump mechanical neutral setting.

Figure 30-41-80



Loosen the pump neutral adjustment lock nut (Item 1) **[Figure 30-41-80]**.

Start the loader using the remote start tool and run at an idle.

⚠ WARNING

Stay clear of the loader wheels. They will turn whenever the pump is not centered.

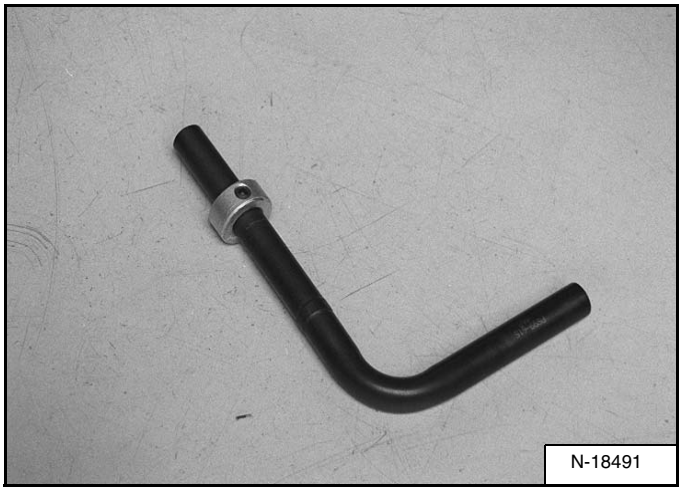
W-2276-1297

DRIVE SYSTEM

Adjusting Tension

Increase Track Tension

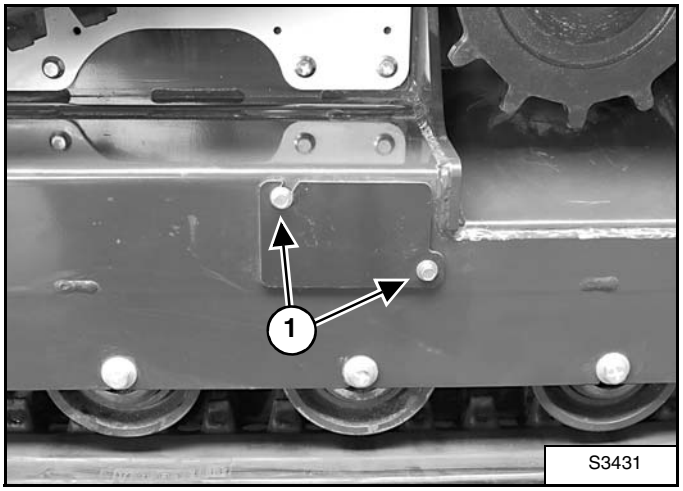
Figure 40-20-4



The tool listed will be needed to do the following procedure:

MEL1560- Bleed Tool **[Figure 40-20-4]**.

Figure 40-20-5



Loosen the two mount bolts (Item 1) **[Figure 40-20-5]** from the covers.

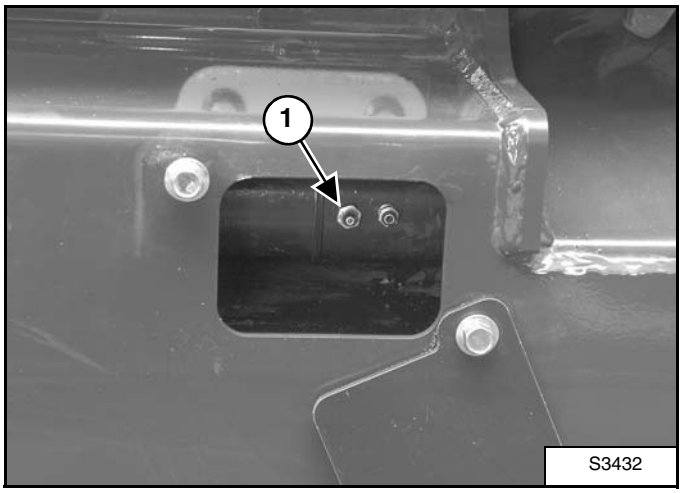
WARNING

HIGH PRESSURE GREASE CAN CAUSE SERIOUS INJURY

- **Do not loosen grease fitting.**
- **Do not loosen bleed fitting more than 1 - 1/2 turns.**

W-2781-0109

Figure 40-20-6



Add grease to the adjustment fitting (Item 1) **[Figure 40-20-6] (the fitting which is located closest to the front of the loader)** until the track adjustment is correct **[Figure 40-20-2 on Page 2]** and **[Figure 40-20-3 on Page 2]**.

NOTE: Do not remove adjustment fitting (Item 1) [Figure 40-20-6] unless pressure is released. (See Adjusting Tension on Page 40-20-3.)

NOTE: If replacement is necessary, always replace adjustment fitting (Item 1) [Figure 40-20-6] with genuine Bobcat Parts. It is a special fitting designed for high pressure.

TRACK MAINTENANCE

Track Damage Identification

Cutting Of Steel Cords

Figure 40-30-1

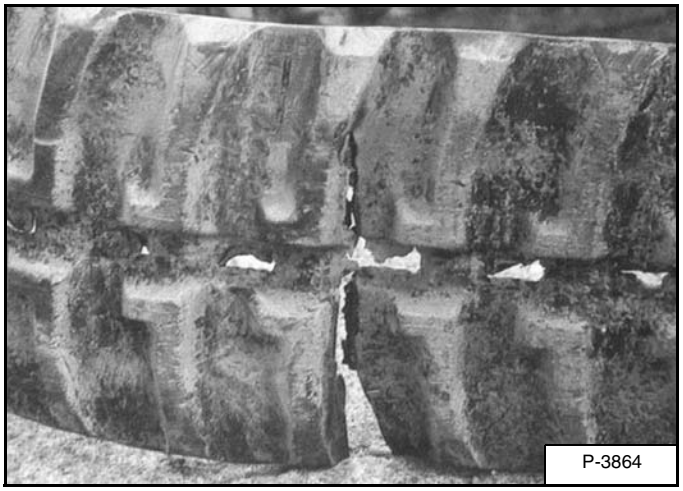
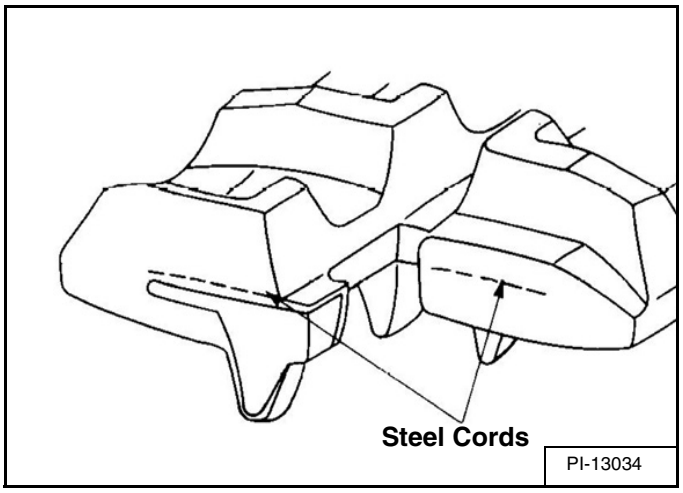


Figure 40-30-2



The following pages show photos and illustrations of track damage and the probable cause of the damage. It is intended to be used for identifying the reason for track damage and how to avoid future track damage.

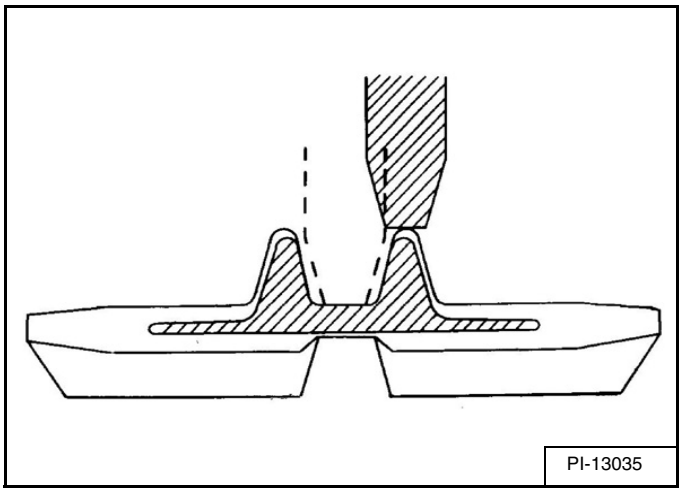
Damage:

Embedded steel cords are cut off **[Figure 40-30-1]** and **[Figure 40-30-2]**.

Replacement:

Replacement is required **[Figure 40-30-1]** and **[Figure 40-30-2]**.

Figure 40-30-3



Causes of the damage:

When applied to rubber tracks under the following circumstances, tension in excess of the breaking strength of the embedded steel cords causes steel cords to be cut:

When the rubber track is detracking, the idler or sprocket rides on the projections of the embedded metal **[Figure 40-30-3]**.

When the rubber track is detracked, projections of rubber tracks get stuck between the frame of the undercarriage.

The rubber track is clogged with stones or foreign obstacles.

Furthermore, when moisture invades through a cut on the lug side rubber surface, the embedded steel cords will corrode. The deterioration of the design strength can lead to the breaking off of the steel cords.

Prevention:

The following preventions should be taken to minimize the risk of this damage:

Periodical checking on site of the recommended track tension. (See Checking Tension on Page 40-20-2.)

Avoiding quick turns on bumpy and rocky fields.

Drive carefully to avoid having stones and other articles clog the rubber tracks.

Driving over sharp objects should be avoided. If this is impossible, do not make turns while driving over sharp objects.

Track Damage Identification (Cont'd)

Cuts On The Edges Of Track Roller Side

Figure 40-30-22

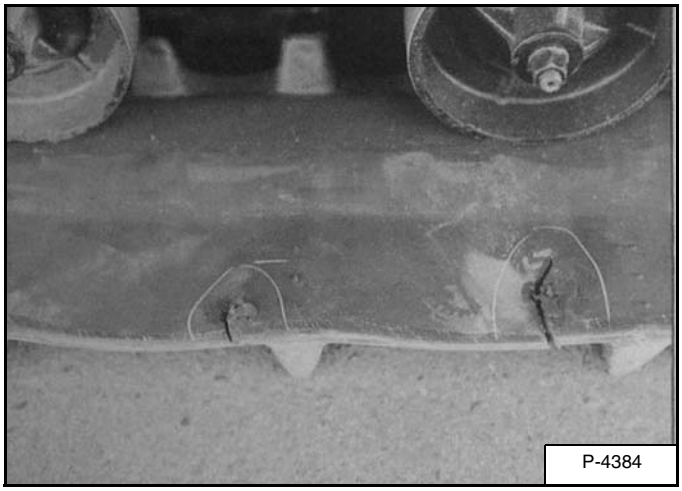
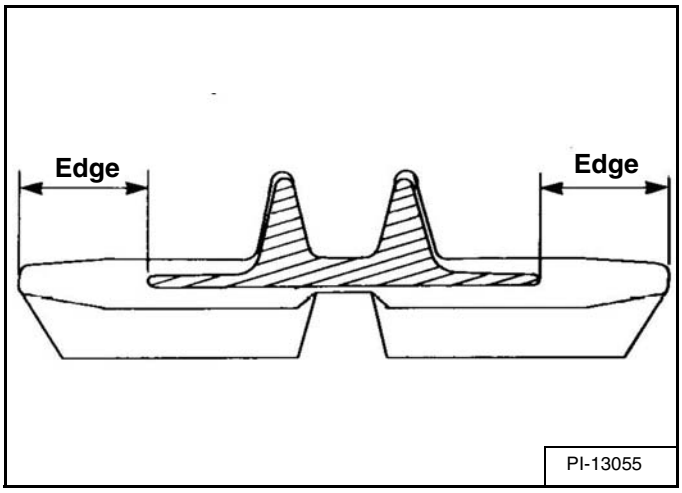


Figure 40-30-23



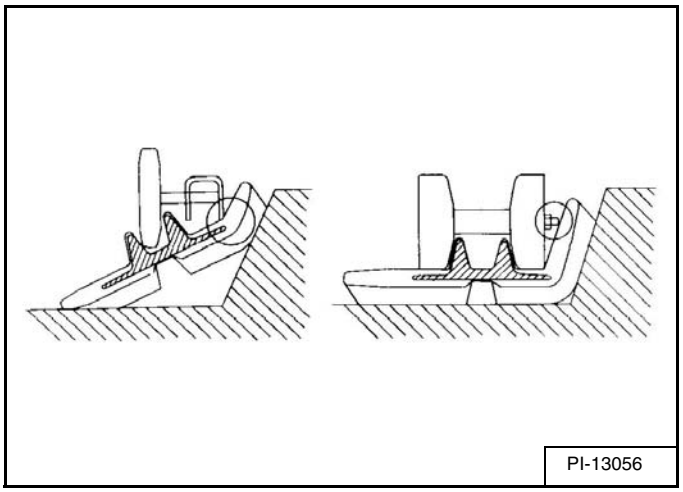
Damage:

Both edges of a rubber track have no special reinforcements. It sometimes occurs during operation that they are cut or torn off **[Figure 40-30-22]** & **[Figure 40-30-23]**.

Replacement:

In such case, the rubber track does not have to be replaced.

Figure 40-30-24



Causes of the damage:

This damage is caused by objects on the field or by interference with the machine frame.

In case of damage by objects on the operating ground:

The edges of rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause extensive stress on the edges resulting in the damage. Especially, when a machine drives over concrete ridges, this type of damage easily occurs **[Figure 40-30-24]**.

Gas Cylinder Removal And Installation

⚠ WARNING

Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

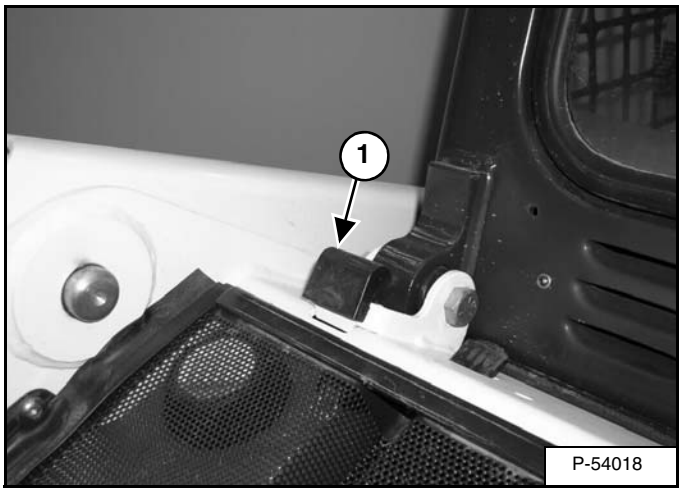
W-2113-0288

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

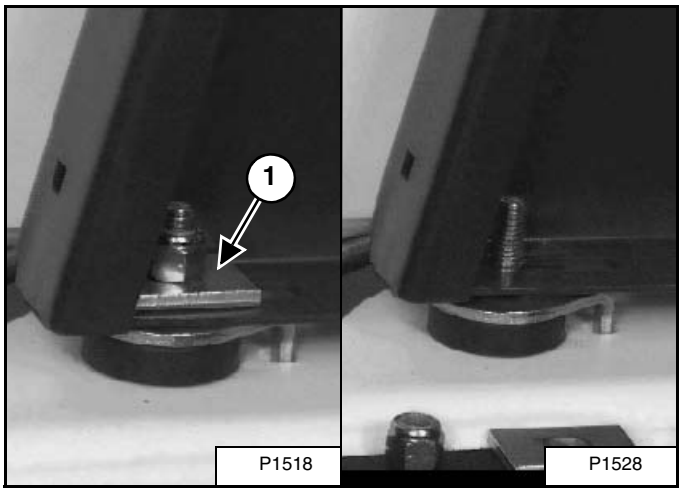
W-2059-0598

Figure 50-20-1



Remove the operator cab stop (Item 1) (both sides) **[Figure 50-20-1]**.

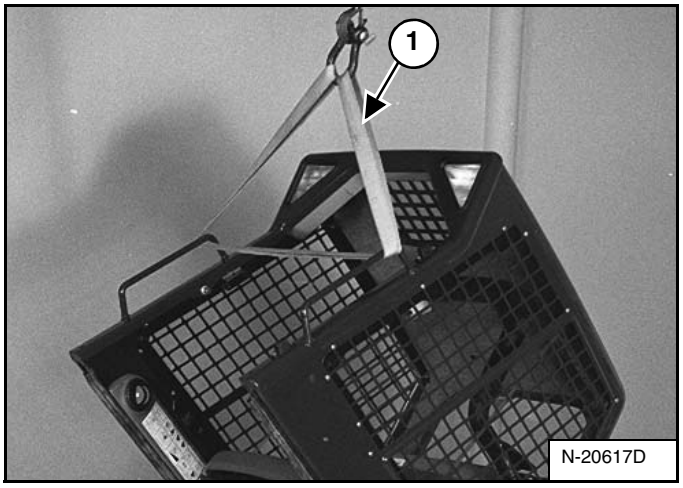
Figure 50-20-2



Remove the cab nut and holddown plate (Item 1) **[Figure 50-20-2]** (both sides).

Installation: Tighten the nut to 40 - 50 ft.-lb. (54 - 68 N•m) torque.

Figure 50-20-3

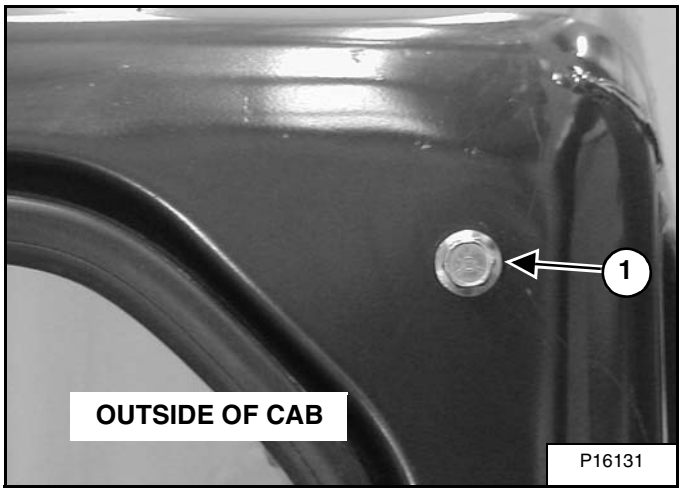


Install a strap (Item 1) **[Figure 50-20-3]** to the cab handles to prevent the cab from falling forward.

Raise the operator cab. (See Raising on Page 10-30-1.), to release the tension on the gas cylinder.

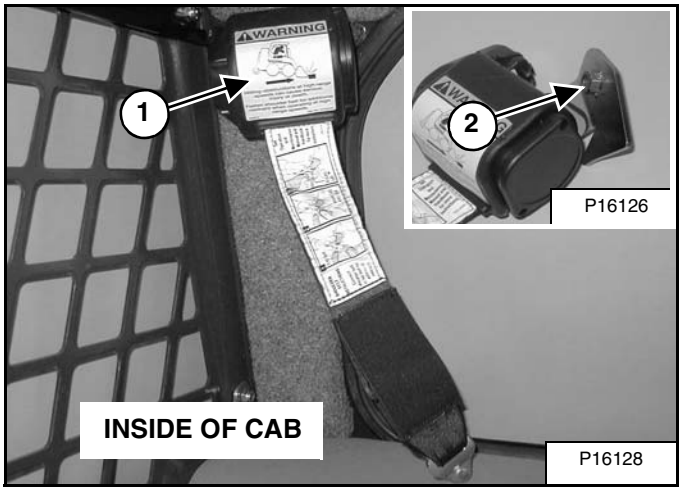
3-Point Seat Belt Removal And Installation (Cont'd)

Figure 50-30-14



Remove the mounting bolt (Item 1) **[Figure 50-30-14]**.

Figure 50-30-15



Remove the shoulder harness retractor (Item 1) **[Figure 50-30-15]**.

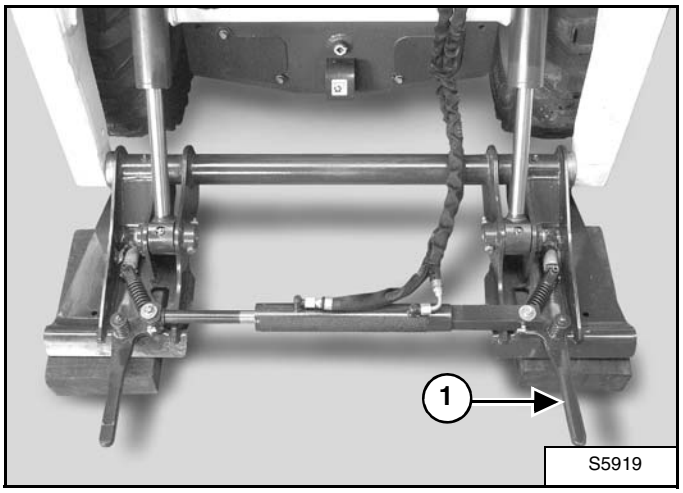
Installation: Line up the bolt (Item 1) **[Figure 50-30-14]** with the mounting bracket (Item 2) **[Figure 50-30-15]** on the inside of the cab.

BOB-TACH (POWER) (S/N AE0J11001 & ABOVE) (CONT'D)

Lever And Wedge Disassembly And Assembly

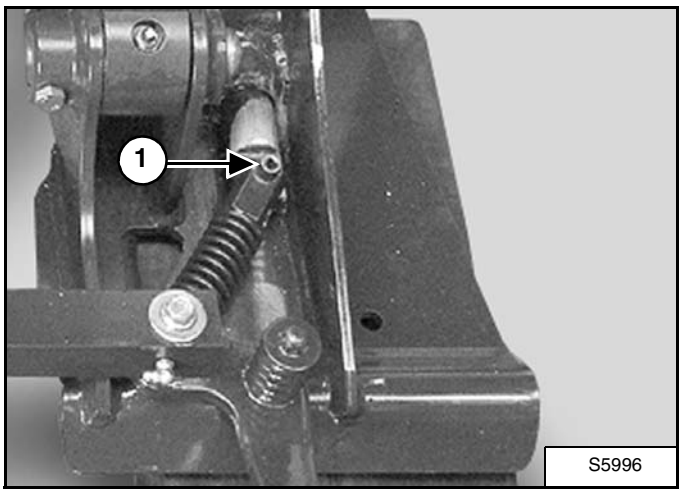
Remove the Power Bob-Tach cylinder. (See Removal And Installation on Page 50-41-1.)

Figure 50-41-5



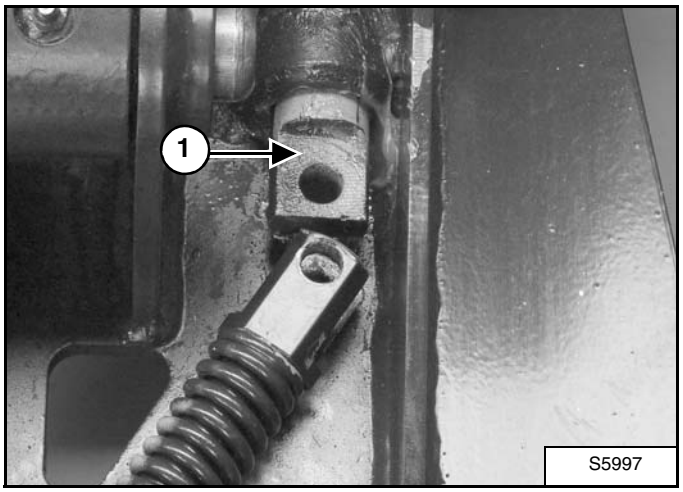
Use the following procedure to remove and install the Bob-Tach lever (Item 1) **[Figure 50-41-5]** spring and wedge.

Figure 50-41-6



Use a punch and hammer, remove the roll pin (Item 1) **[Figure 50-41-6]** from the Bob-Tach Wedge and spring clevis.

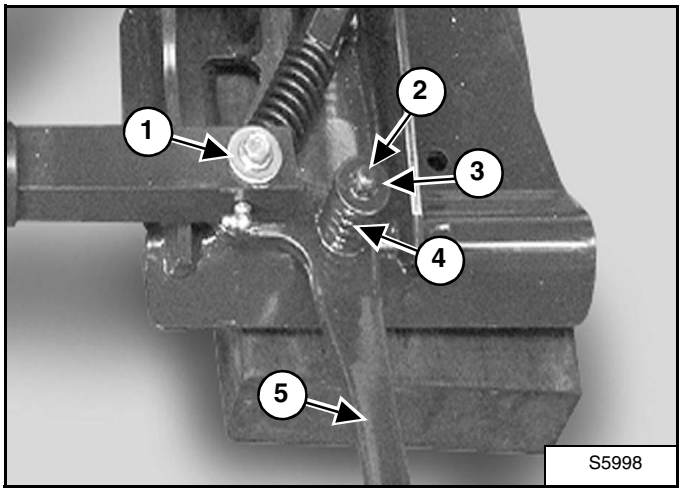
Figure 50-41-7



Remove the wedge (Item 1) **[Figure 50-41-7]**.

Always replace bent or broken wedges.

Figure 50-41-8



Remove the washer and bolt (Item 1) **[Figure 50-41-8]**.

Installation: Tighten the bolts to 25 - 28 ft.-lb. (34 - 38 N•m) torque.

Remove the cylinder off the lever pivots. Position the rod end to the left with the grease fitting holes to the bottom **[Figure 50-41-8]**.

Remove the lever mounting nut (Item 2), washer (Item 3), spring (Item 4) and lever (Item 5) **[Figure 50-41-8]**.

Installation: Tighten the nut to 25 - 28 ft.-lb. (34 - 38 N•m) torque.

REAR GRILL

Removal And Installation

Open the rear door.

Figure 50-60-1

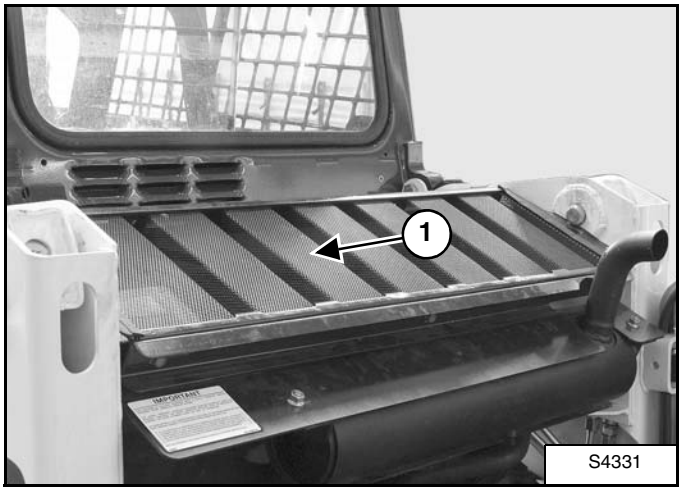
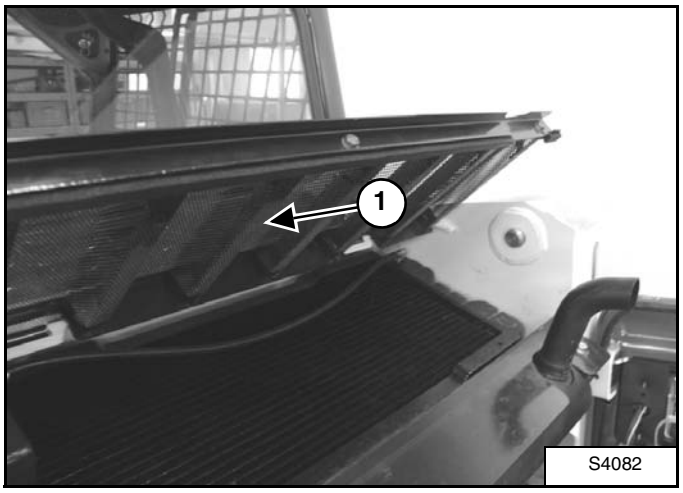


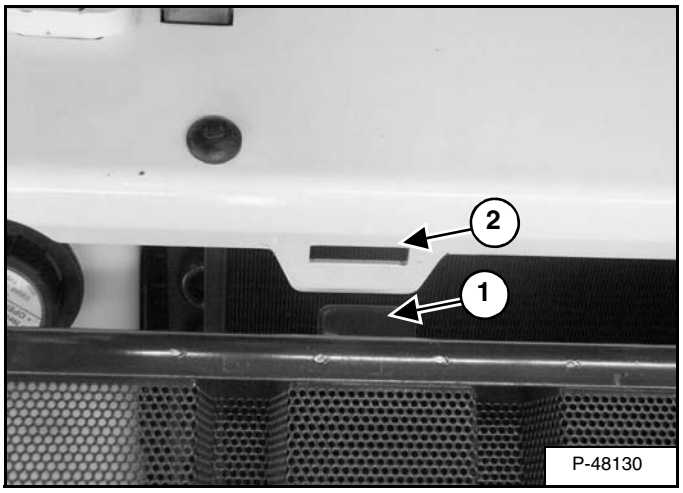
Figure 50-60-2



Lift up on the rear grill (Item 1) **[Figure 50-60-1]** and **[Figure 50-60-2]**.

Lift the grill away from the loader.

Figure 50-60-3



Installation: Line up the tab (Item 1) on the grill with the slot (Item 2) **[Figure 50-60-3]** on the loader mainframe. Insert the tab fully and then push down.

Reverse the removal procedure to install the grill.

CONTROL PEDALS AND LINKAGES

Description

The control pedals and linkages are connected to the control valve. The control pedals will mechanically move the lift and tilt spools on the control valve.

The control pedals and linkages are located on the lower mainframe at the operator's feet.

Pedal Removal And Installation

⚠ WARNING

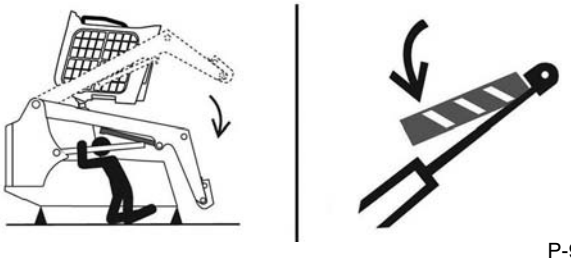
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-1.)

⚠ DANGER



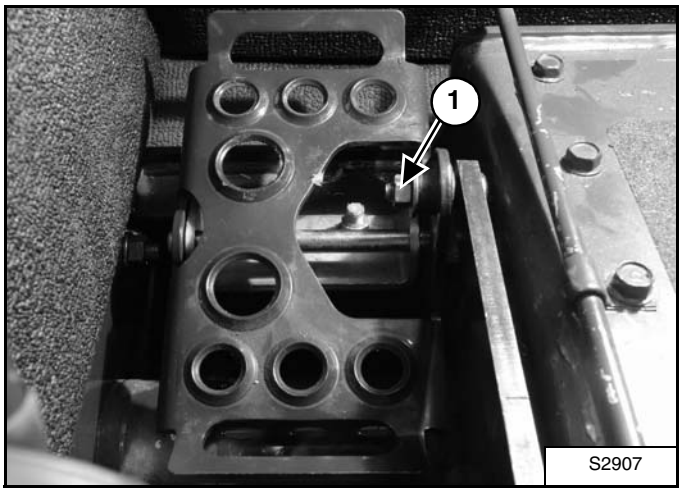
P-90328

AVOID DEATH

- **Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.**
- **Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged.**

D-1009-0409

Figure 50-90-1

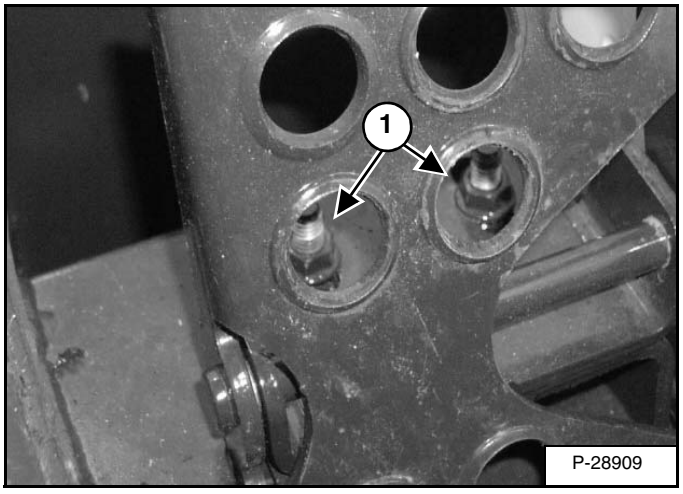


Remove the bolt (Item 1) **[Figure 50-90-1]** and nut from the pedal linkage.

Installation: Tighten the bolt and nut to 25 - 28 ft.-lb. (34 - 38 N•m) torque.

Check the rubber bushing in the pedal for wear and replace as needed.

Figure 50-90-2



Remove the two mounting bolts (Item 1) **[Figure 50-90-2]** from the pedal mounting bracket.

Remove the pedal assembly from the loader.

Linkage Removal And Installation

WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

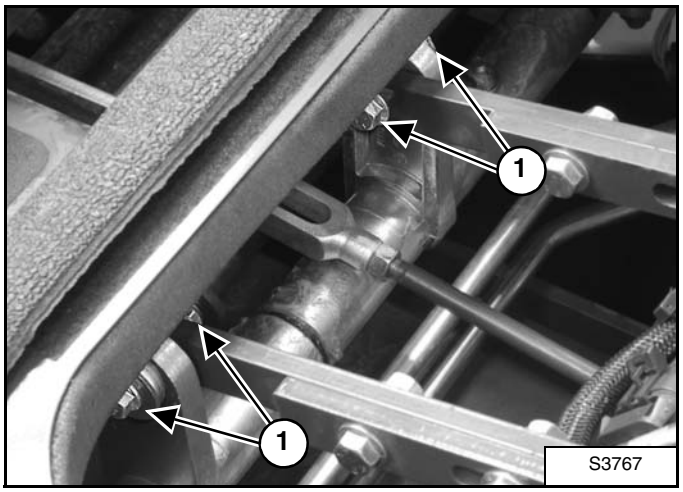
W-2017-0286

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-1.)

Figure 50-100-15



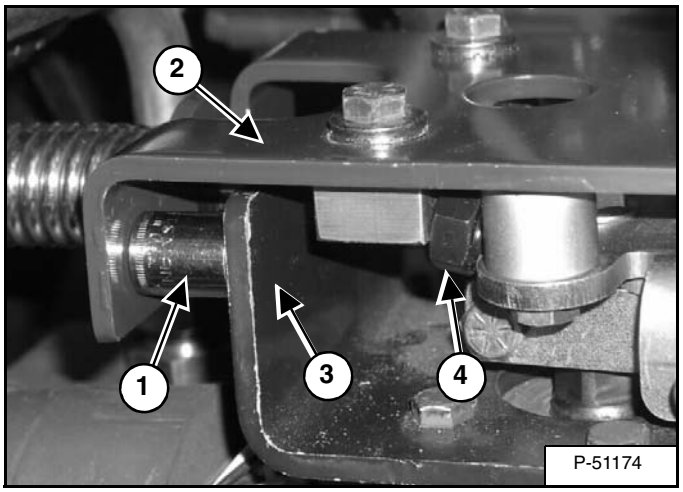
Remove the shocks. (See Shock Removal And Installation on Page 50-100-6.)

Remove the steering linkage mounting bolt and nut (Item 1) **[Figure 50-100-15]**. Do this for both steering linkages.

Installation: Tighten the steering linkage mounting bolts to 35 - 40 ft.-lb. (47,5 - 54,2 N•m) torque.

Linkage Travel (Adjusting) (Cont'd)

Figure 50-100-41

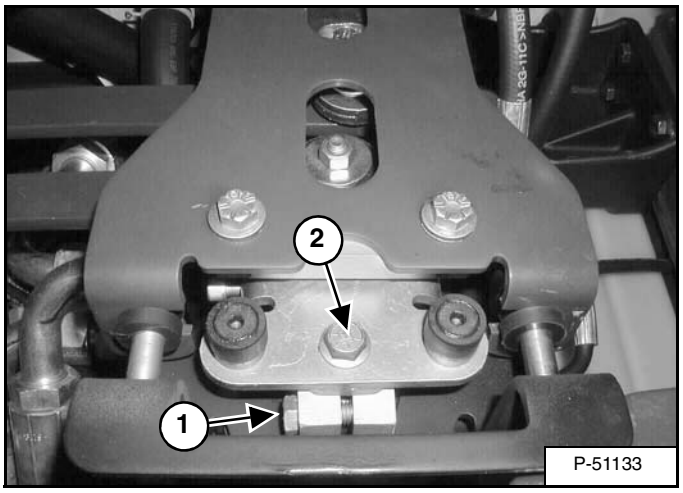


Move the right side steering lever forward and install a 1 1/8 in. (28,57 mm) thick spacer (Item 1) between the center plate (Item 2) and the mounting plate (Item 3) **[Figure 50-100-41]**.

This will allow the pintle arms to move freely while adjusting the steering linkage for full forward travel speed.

Remove the 3/8 in. (10 mm) thick spacer (Item 4) **[Figure 50-100-41]**.

Figure 50-100-42

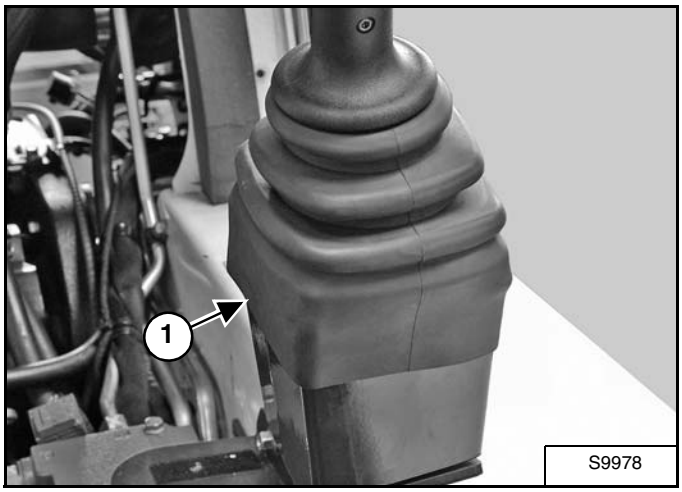


Before adjusting the linkage, check that the base pintle arm mounting bolt (Item 1) and both of the upper pintle mount bolts (Item 2) **[Figure 50-100-42]** and tighten to 35 - 40 ft.-lb. (48 - 54 N•m) torque. There should be no play between the pintle arm and the square pump shaft.

Also check that the cam mounting nuts or bolts (Item 4) **[Figure 50-100-40]** are tight, 35 - 40 ft.-lb. (48 - 54 N•m) torque.

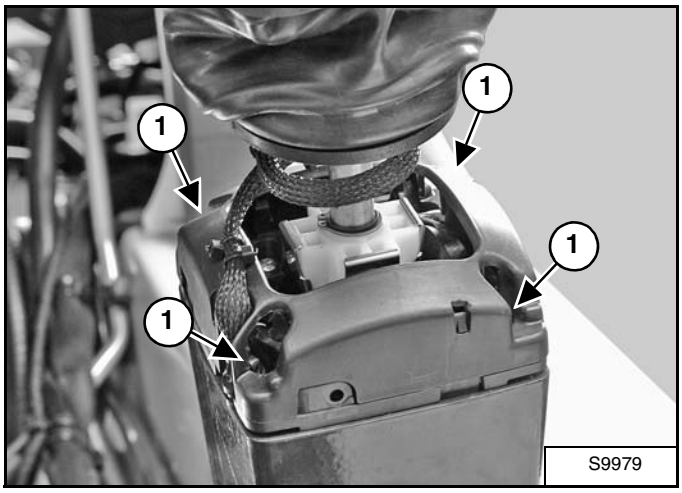
Joystick Removal And Installation

Figure 50-111-5



Lift the rubber boot (Item 1) **[Figure 50-111-5]**.

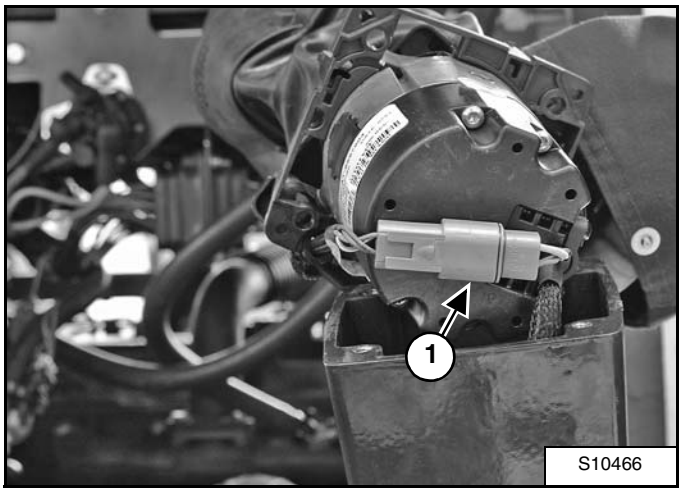
Figure 50-111-6



Remove the four screws (Item 1) **[Figure 50-111-6]** to lift the joystick control from the base.

Installation: Tighten screws (Item 1) **[Figure 50-111-6]** to 35 - 40 in.-lb. (4,0 - 4,5 N•m) torque.

Figure 50-111-7

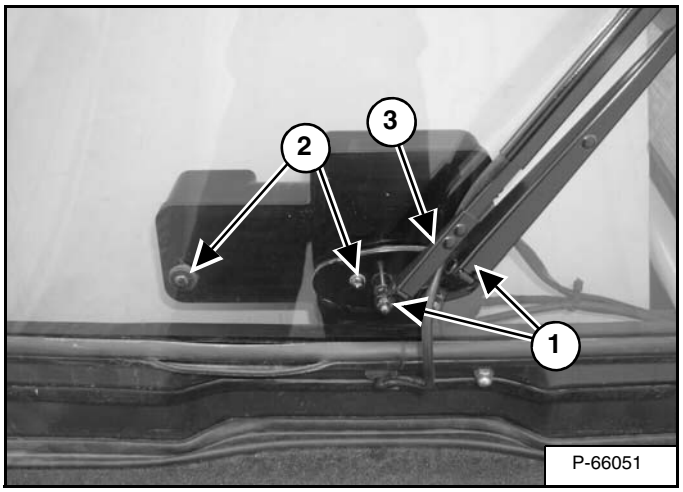


Disconnect the joystick connector (Item 1) **[Figure 50-111-7]** from the harness connector.

WINDOW (CAB DOOR)

Removal (Standard Window)

Figure 50-123-1

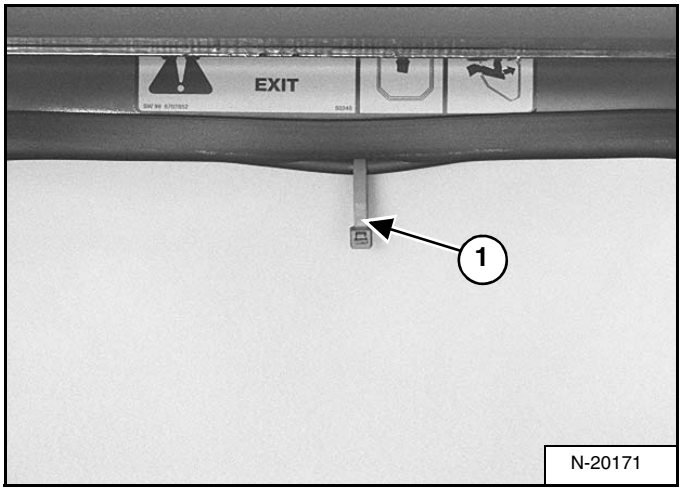


Remove the wiper arm assembly (Item 1) **[Figure 50-123-1]**.

Remove the two screws (Item 2) and the nut (Item 3) **[Figure 50-123-1]**.

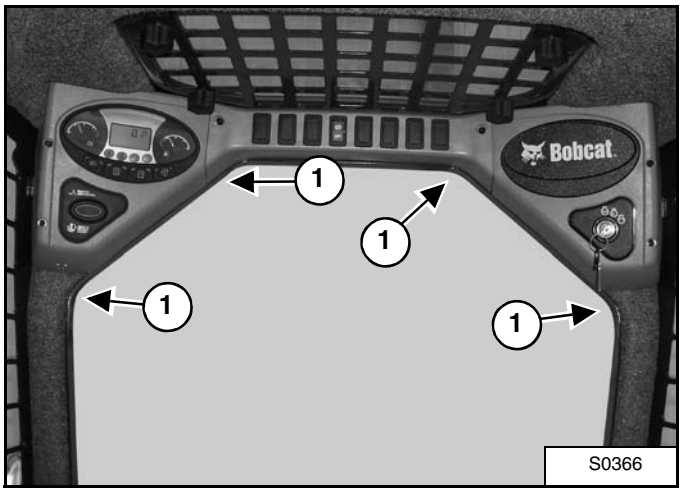
Secure the wiper motor inside the cab.

Figure 50-123-2



Pull the plastic loop (Item 1) **[Figure 50-123-2]** at the top of the window to remove the rubber cord.

Figure 50-123-3



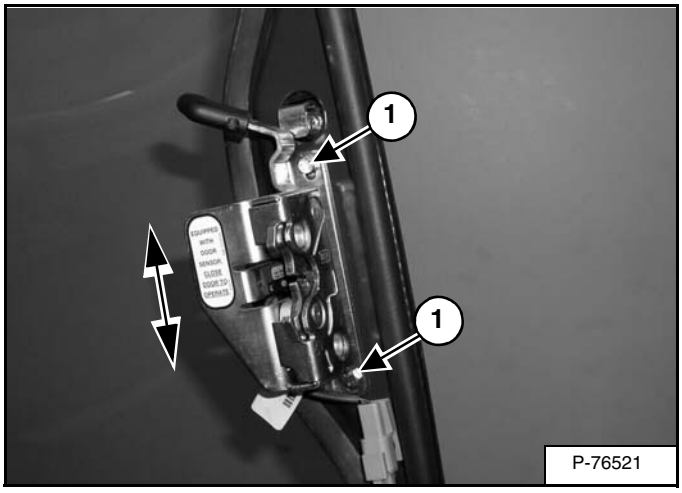
Push the window out at any corner of the window (Item 1) **[Figure 50-123-3]**.

NOTE: The window can fall when pushing on the corners. Have a second technician assist you during the removal of the window.

CAB DOOR (SPECIAL APPLICATIONS KIT DOOR) (CONT'D)

Adjusting

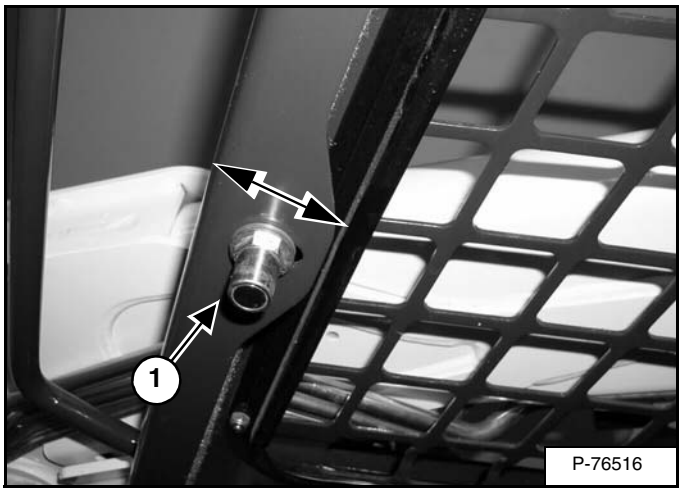
Figure 50-131-6



Loosen the two bolts (Item 1) **[Figure 50-131-6]** and adjust the latch as needed.

NOTE: For the initial adjustment, position the latch towards the bottom of the door.

Figure 50-131-7



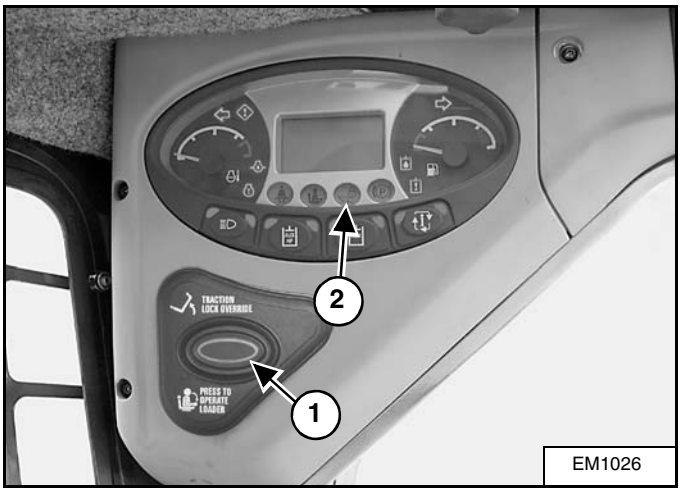
Loosen the striker and adjust as needed (Item 1) **[Figure 50-131-7]**.

NOTE: For the initial adjustment, position the striker towards the front of the machine.

After adjusting the striker and latch recheck the alignment of the door sensor. (See Aligning on Page 50-130-2.)

Checking Operation

Figure 50-131-8

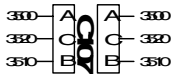
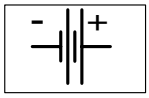
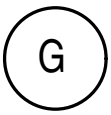
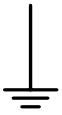


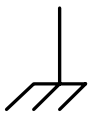
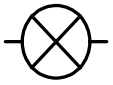
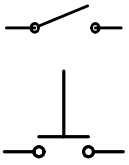
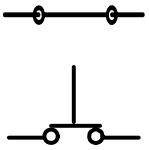
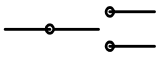
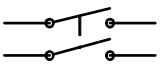
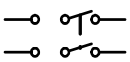
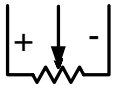
Sit in operator's seat. Turn key ON. (Standard Key Panel), press RUN / ENTER button (Deluxe Instrumentation Panel), lower seat bar and close the door. Press the PRESS TO OPERATE LOADER button (Item 1) **[Figure 50-131-8]**.

Open the door. The LIFT & TILT VALVE light (Item 2) **[Figure 50-131-8]** will flash, an audible tone will sound, and the message [door] will appear in the display.

Close the door and the LIFT & TILT VALVE light (Item 2) **[Figure 50-131-8]** will go out and the display will return to machine hours.

Glossary Of Electrical Symbols

SYMBOL	DESCRIPTION
	CONNECTIONS
	CONNECTOR - Harness - Used for connecting two harnesses together or a harness to a component. The connector can vary from a single pin to any number of pins (Example: three pin connectors shown). The connector pins can be numbered alphabetical (shown) or numerical (1, 2, 3 etc.). The harness wires numbers are called out next to the connector (Example: 3500).
	The connector number is called out next to the connector (Example: C107). These connector numbers are used for schematic identification only and do not appear on the harness or connector.
	COMPONENTS
	BATTERY - Used for supplying and storing electrical power for the machine.
+	POSITIVE ELECTRICAL CIRCUIT - Indicates positive battery circuit.
-	NEGATIVE ELECTRICAL CIRCUIT - Indicates battery ground circuit.
	ALTERNATOR - Used to create the electrical current to supply voltage to the battery and components.
	STARTER - Uses battery current to start the machine engine.
	GROUND - Used to represent an external ground connection.

SYMBOL	DESCRIPTION
	COMPONENTS
	GROUND - Frame - Used to represent an component that is internally grounded.
	LIGHT -
	SWITCH - Single Pole - Single Throw (ON-OFF) Normally Open
	SWITCH - Single Pole - Single Throw (ON-OFF) Normally Closed.
	SWITCH - Single Pole - Double Throw (ON-OFF-ON) - This switch can be in any of three positions. (Some switches are spring activated to return them to a certain position when released.)
	SWITCH - Double Pole - Single Throw (ON-OFF) Open and Closed positions will be specified depending on switch application.)
	SWITCH - Double Pole - Double Throw (ON-OFF) Open and Closed positions will be specified depending on switch application.
	POTENTIOMETER - Variable resistance - Provides variable resistance.

BATTERY

Removal And Installation

WARNING

AVOID INJURY OR DEATH

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

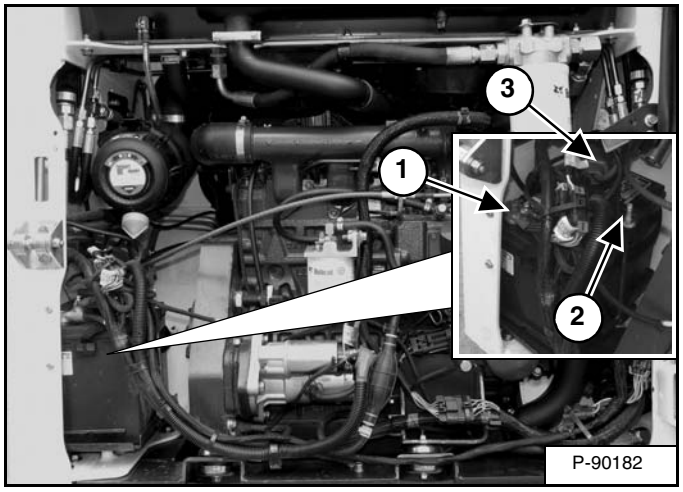
In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-0807

Open the rear door. (See the Operation & Maintenance Manual for the correct procedure.)

Figure 60-20-1



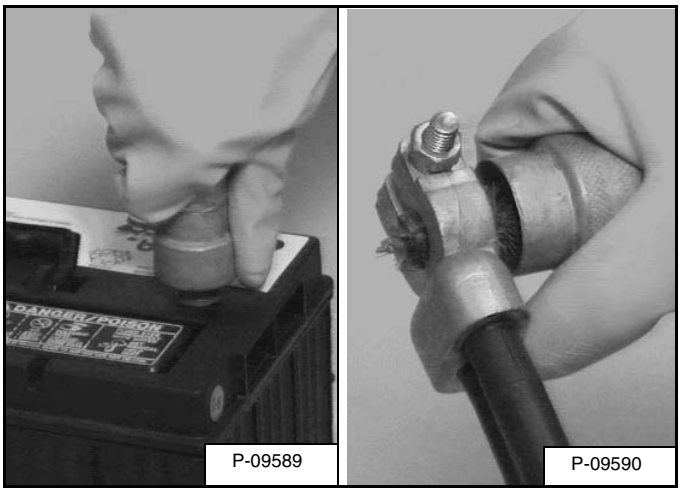
Disconnect the negative (-) cable (Item 1) **[Figure 60-20-1]**.

Remove the battery hold down clamp (Item 2) **[Figure 60-20-1]**.

Disconnect the positive (+) cable (Item 3) **[Figure 60-20-1]** from the battery.

Remove the battery from the loader.

Figure 60-20-2



Always clean the battery terminals and cable ends when installing a new or used battery **[Figure 60-20-2]**.

When installing the battery in the loader, do not touch any metal parts with the battery terminals.

Connect the negative (-) cable last to prevent sparks.

Connect and tighten the battery cables.

Install and tighten the battery hold down.

Close the rear door.

WARNING

AVOID INJURY OR DEATH

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at machine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

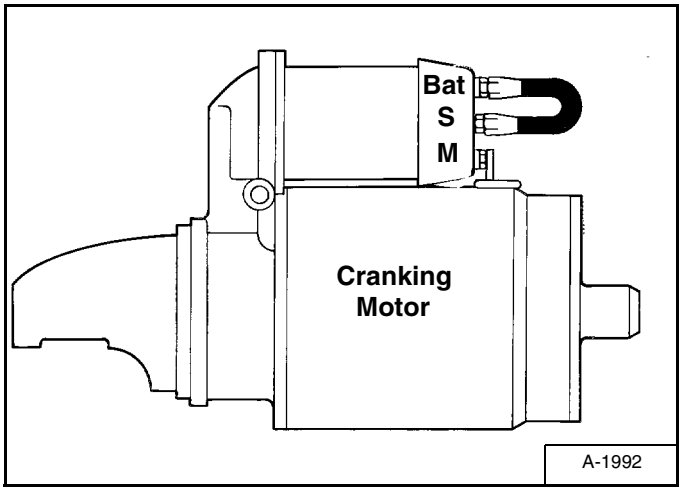
Battery gas can explode and cause serious injury.

W-2066-0705

STARTER

Testing

Figure 60-40-1



The key switch must be in the OFF position.

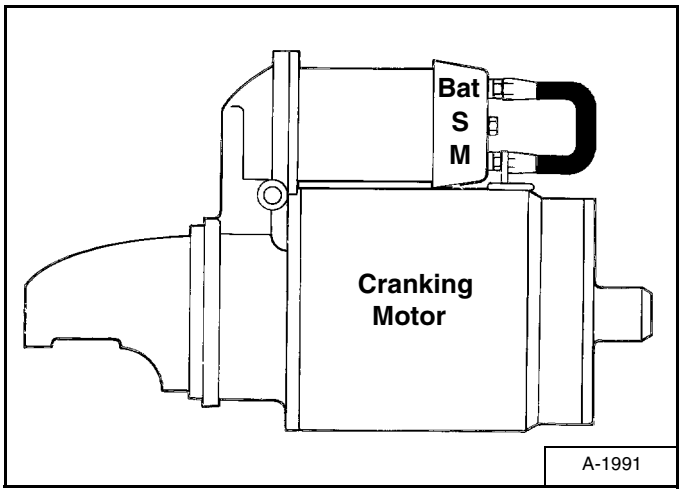
The battery must be fully charged.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between L&S-terminal and BAT-terminal **[Figure 60-40-1]**.

If the starter turns but the engine does not turn, the starter drive has a defect.

Figure 60-40-2

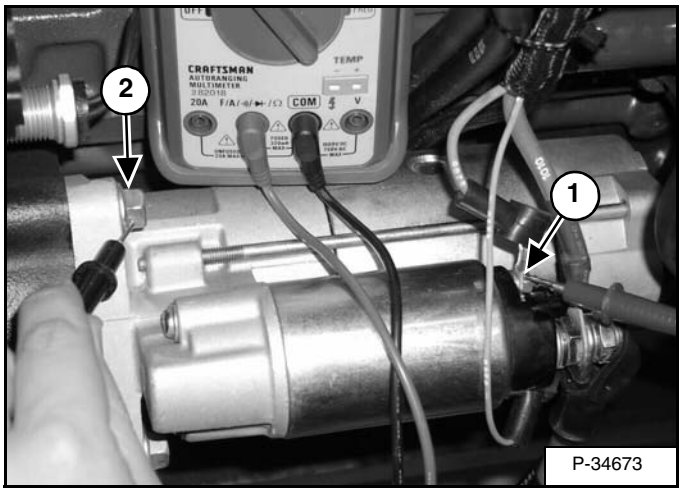


Connect a jumper wire **(of at least four gauge in size)** between the M terminal and the BAT terminal **[Figure 60-40-2]**.

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

Figure 60-40-3

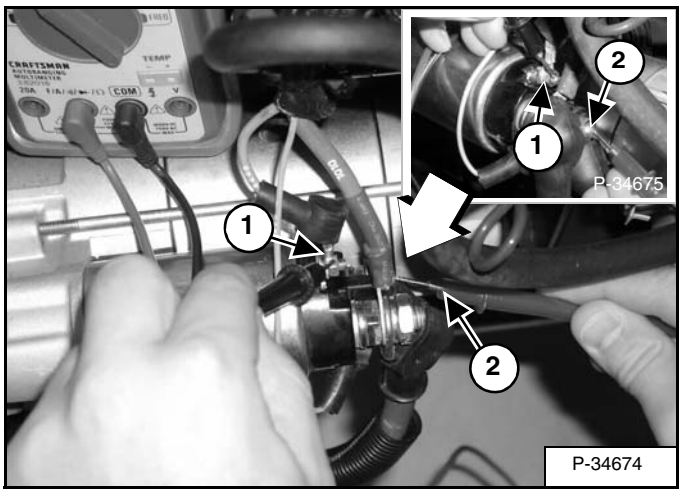


Disconnect the negative cable from the battery. (See Removal And Installation on Page 60-20-1.)

Disconnect the S-terminal on the starter (Item 1) **[Figure 60-40-3]**.

Hold-In Test: Use circuit tester, attach one probe to the L&S-terminal (Item 1) and one probe to the mounting bolt (Item 2) **[Figure 60-40-3]** on the magnetic switch (solenoid). If there is no continuity replace the magnetic switch (solenoid).

Figure 60-40-4



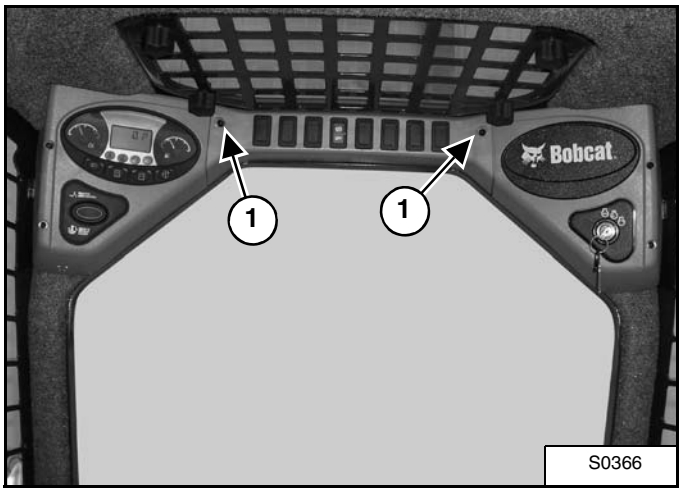
Disconnect the negative (-) cable from the battery. (See Removal And Installation on Page 60-20-1.)

Disconnect the L&S-terminal on the starter (Item 1) **[Figure 60-40-4]**.

Pull-In Test: Use circuit tester, touch one probe to the L&S-terminal (Item 1) and one probe to the starter motor terminal (Item 2) **[Figure 60-40-4]**. If there is no continuity replace the magnetic switch (solenoid).

Front Panel Removal And Installation

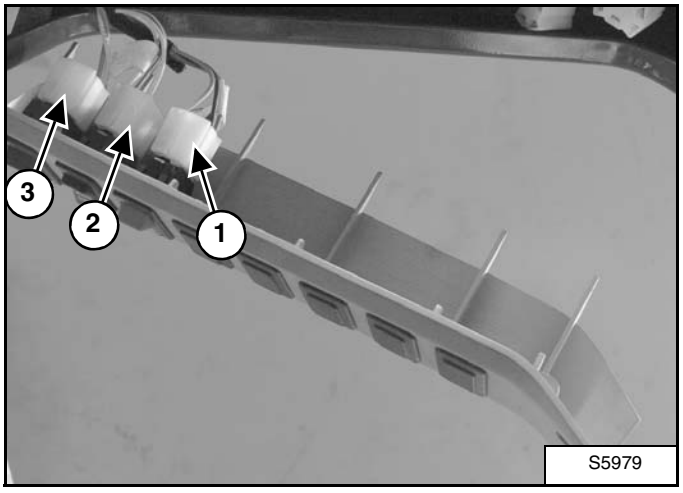
Figure 60-50-8



Remove the two mounting bolts (Item 1) **[Figure 60-50-8]**.

Installation: Be careful to not overtighten the front accessory panel mounting bolts to prevent damage to the plastic panel.

Figure 60-50-9



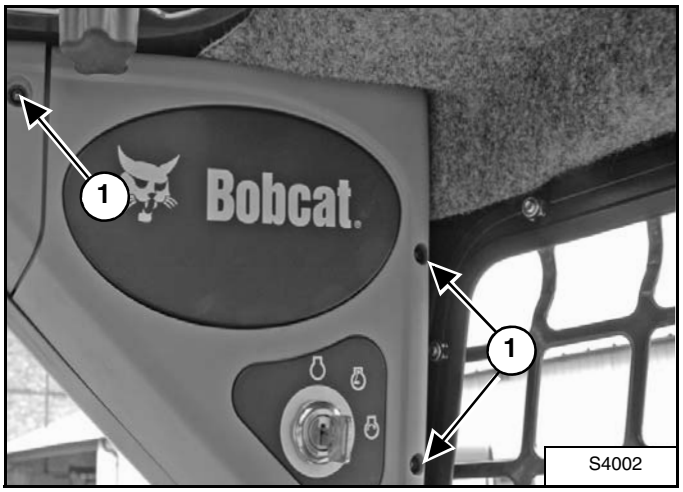
Pull the front accessory panel down and disconnect the wire harness connector(s) (Items 1, 2, and 3) **[Figure 60-50-9]** from the switches.

Remove the panel.

Reverse the procedure to install the front accessory panel.

Removal And Installation (Left And Right)

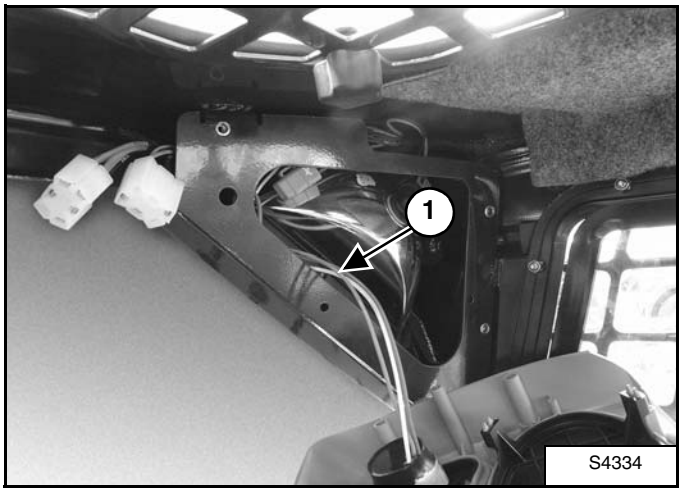
Figure 60-50-10



Remove the three mounting bolts (Item 1) **[Figure 60-50-10]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels.

Figure 60-50-11



Pull the right instrument panel down and disconnect the key switch wiring harness connector (Item 1) **[Figure 60-50-11]** from the panel.

Remove the panel from the loader cab.

Removal And Installation

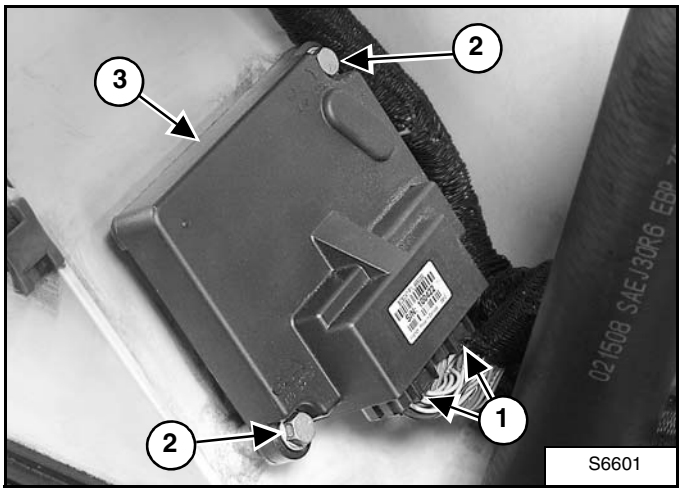
⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Open the rear door.

Figure 60-70-1



Remove the connectors (Item 1) **[Figure 60-70-1]**.

NOTE: The connectors are keyed and will only plug in one direction.

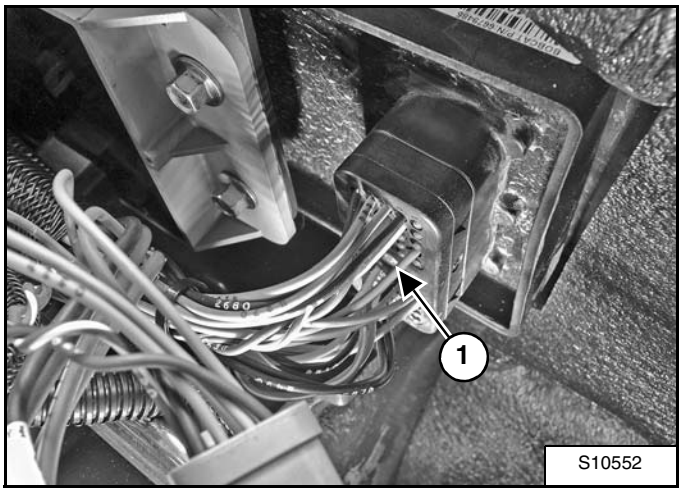
Remove the mounting bolts (Item 2) **[Figure 60-70-1]** from the Bobcat controller.

Installation: Tighten the bolts to 12 - 14 ft.-lb. (16,3 - 19 N•m) torque.

Remove the Bobcat controller (Item 3) **[Figure 60-70-1]**.

Removal And Installation (Cont'd)

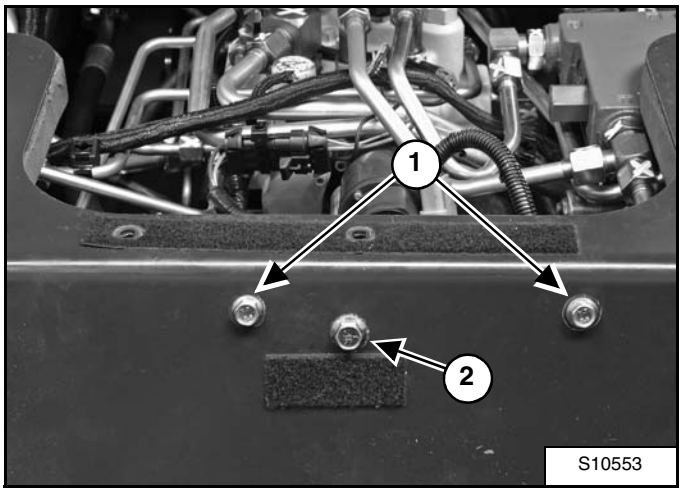
Figure 60-72-4



Remove the screw (Item 1) **[Figure 60-72-4]** and remove the wire harness from the controller.

Installation: Tighten the connector screw to 30 - 35 in.-lb. (3,39 - 3,96 N•m) torque. DO NOT OVERTIGHTEN!

Figure 60-72-5



Remove the two mounting bolts (Item 1) **[Figure 60-72-5]**.

Installation: Tighten the bolts to 12 - 14 ft.-lb. (16,3 - 19 N•m) torque.

Set the Bobcat ACS controller and bracket aside to provide clearance for easy removal of Bobcat drive controller.

Remove the mounting bolt (Item 2) **[Figure 60-72-5]**.

Installation: Tighten the bolt to 12 - 14 ft.-lb. (16,3 - 19 N•m) torque.

Remove the Bobcat drive controller from the machine.

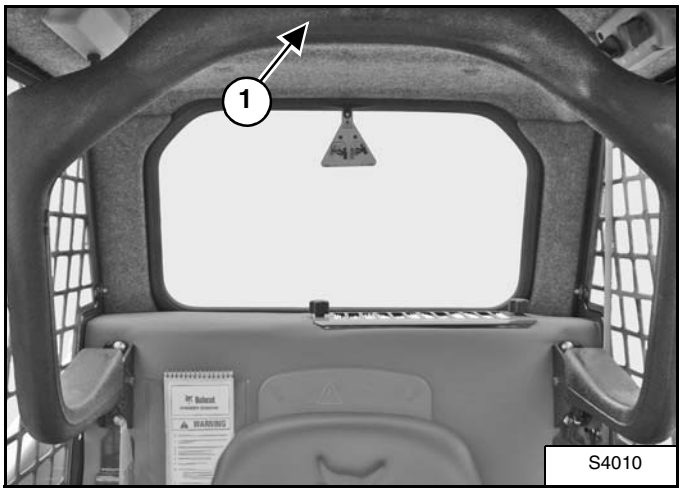
Service Codes List (Cont'd)

CODE	DESCRIPTION	CODE	DESCRIPTION
D7521	Left joystick Y-axis out of range high	D7572	Drive pump not calibrated
D7522	Right joystick Y-axis out of range high	D7573	Operating mode switch flipped while operating
D7523	Right front wheel angle sensor out of range high	D7574	Right wheel speed uncommanded motion
D7524	Left front wheel angle sensor out of range high	D7575	Left wheel speed uncommanded motion
D7525	Right rear wheel angle sensor out of range high	D7576	No communication from ACS controller
D7526	Left rear wheel angle sensor out of range high	D7577	Left speed sensor out of range high
D7527	Left swash plate out of position	D7578	Right speed sensor out of range high
D7528	Right swash plate out of position	D7579	Left speed sensor out of range low
D7529	Left joystick X-axis out of range low	D7580	Right speed sensor out of range low
D7531	Left joystick Y-axis out of range low	D7581	Right front steer retract short to battery
D7532	Right joystick Y-axis out of range low	D7582	Left front steer retract short to battery
D7533	Right front wheel angle sensor out of range low	D7583	Right rear steer retract short to battery
D7534	Left front wheel angle sensor out of range low	D7584	Left rear steer retract short to battery
D7535	Right rear wheel angle sensor out of range low	D7585	Sensor supply 1 out of range high
D7536	Left rear wheel angle sensor out of range low	D7586	Sensor supply 2 out of range high
D7537	Sensor supply 1 out of range low	D7587	Software update required
D7538	Sensor supply 2 out of range low	D7588	Switched power stuck ON
D7539	Left swash plate sensor out of range high	D7589	Switched power error OFF
D7540	Left swash plate sensor out of range low	D7591	Left swash plate sensor reversed
D7541	Right swash plate sensor out of range high	D7592	Right swash plate sensor reversed
D7542	Right swash plate sensor out of range low	D7593	Right speed sensor unresponsive
D7543	Left forward drive solenoid error ON	D7594	Left speed sensor unresponsive
D7544	Left reverse drive solenoid error ON	D7595	Left speed sensor reversed
D7545	Right forward drive solenoid error ON	D7596	Right speed sensor reversed
D7546	Right reverse drive solenoid error ON	D7597	Controller programmed
D7547	Right front steer extend short to battery	D7598	In drive calibration mode
D7548	Left front steer extend short to battery	D7599	In angle calibration mode
D7549	Right rear steer extend short to battery		
D7550	Left rear steer extend short to battery	H1221	Right Primary out of range high
D7551	Steer pressure short to battery	H1222	Right Primary out of range low
D7552	Back-up alarm error ON	H1224	Right Primary not in neutral
D7553	Left forward drive solenoid error OFF	H1321	Left Primary out of range high
D7554	Left reverse drive solenoid error OFF	H1322	Left Primary out of range low
D7555	Right forward drive solenoid error OFF	H1324	Left Primary not in neutral
D7556	Right reverse drive solenoid error OFF	H2005	Boost solenoid short to battery
D7557	Right front steer extend short to earth	H2006	Boost solenoid short to earth
D7558	Right front steer retract short to earth	H2007	Boost solenoid open circuit
D7559	Left front steer extend short to earth	H2032	Boost solenoid overcurrent
D7560	Left front steer retract short to earth	H2205	Pressure control solenoid short to battery
D7561	Right rear steer extend short to earth	H2206	Pressure control solenoid short to earth
D7562	Right rear steer retract short to earth	H2207	Pressure control solenoid open circuit
D7563	Left rear steer extend short to earth	H2232	Pressure control solenoid overcurrent
D7564	Left rear steer retract short to earth	H2305	Rear base solenoid short to battery
D7565	Steer pressure short to earth	H2306	Rear base solenoid short to earth
D7566	Back-up alarm error OFF	H2307	Rear base solenoid open circuit
D7567	No communication from Gateway controller	H2332	Rear base solenoid overcurrent
D7568	Angle sensors not calibrated	H2405	Rear rod solenoid short to battery
D7569	Battery voltage out of range high	H2406	Rear rod solenoid short to earth
D7570	Interrupted power	H2407	Rear rod solenoid open circuit
D7571	Battery voltage out of range low	H2432	Rear rod solenoid overcurrent

SEAT BAR SENSOR (CONT'D)

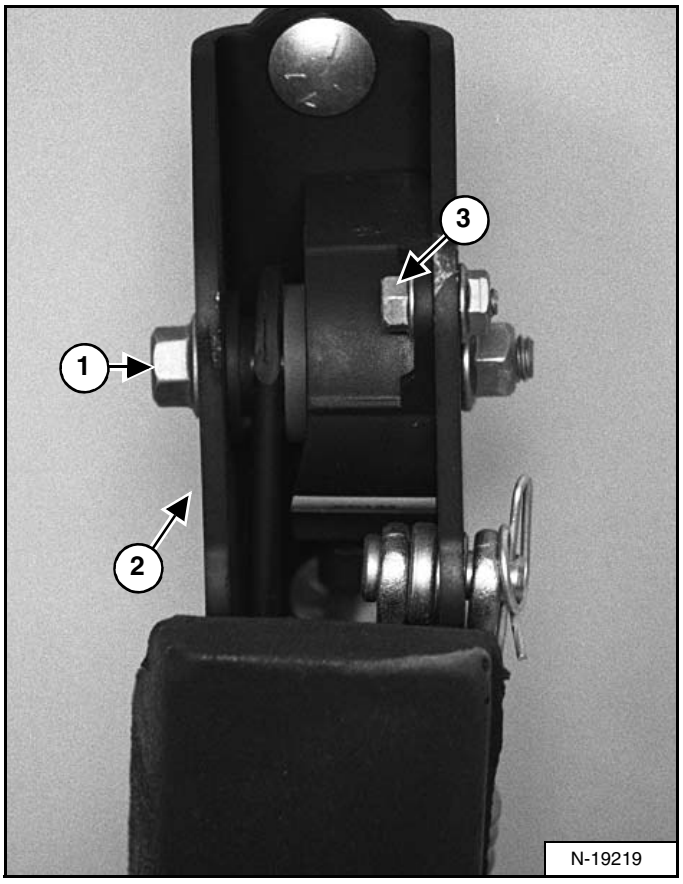
Removal And Installation

Figure 60-100-5



Remove the seat bar (Item 1) **[Figure 60-100-5]** from the loader. (See Removal And Installation on Page 60-100-3.)

Figure 60-100-6

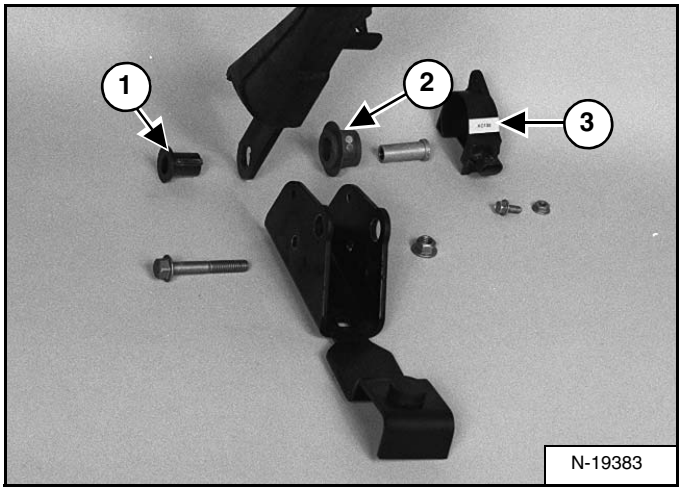


Remove the mounting bolt (Item 1) from the seat bar mount (Item 2) **[Figure 60-100-6]**.

Installation: Tighten the mounting bolt to 50 - 70 in.-lb. (5,6 - 7,9 N•m) torque.

Remove the sensor mounting bolt (Item 3) **[Figure 60-100-6]** and nut.

Figure 60-100-7



Remove the keyed plastic bushing (Item 1), the magnetic bushing assembly (Item 2) and the sensor bracket (Item 3) **[Figure 60-100-7]**.

IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.

I-2088-1095

Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[Figure 60-100-7]** of the seat bar.

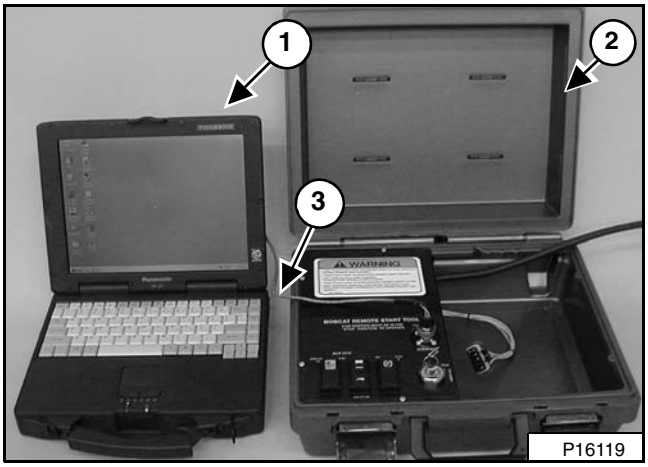
Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

SERVICE PC (LAPTOP COMPUTER)

Connecting Remote Start Tool

Figure 60-130-1



The tools listed will be needed to do the following procedure:

MEL1563 or 6689779 - Remote Start Tool
MEL1565 - Service Tool Harness Control
MEL1566 - Service Tool Harness Communicator (Computer Interface)

NOTE: Make all connections with the key switch in the OFF position.

The Service PC (Item 1) with the Remote Start Tool (Item 2) **[Figure 60-130-1]**. When connected to the loader, the Service PC is used to monitor, conduct diagnostics, and upgrade software.

Connect the Service Tool Harness Communicator (MEL1566) (Item 3) **[Figure 60-130-1]** to the designated serial port on the Service PC.

NOTE: The recommended serial cable length should not exceed 15 feet. A serial cable longer than 15 feet will create a degraded signal causing communication errors.

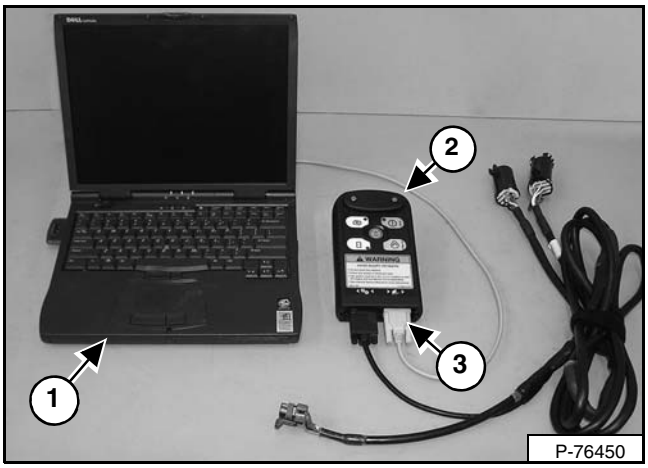
Connect the other end to the connector on the Remote Start Tool.

Connect the remote start tool to the loader. (See Remote Start Tool - MEL1563 on Page 10-60-1.)

NOTE: Refer to BobcatNET for PC requirements and the latest Service Analyzer software.

Connecting Remote Start Tool (Service Tool)

Figure 60-130-2



The tools listed will be needed to do the following procedure:

Order from Bobcat Parts P/N: 6689779 - Remote Start Tool (Service Tool) Kit

Kit Includes:
6689778 - Remote Start Tool (Service Tool)
6689747 - Loader Service Tool Harness
6689746 - Computer Service Tool Harness
6689745 - BOSS® Service Tool Harness

NOTE: Make all connections with the key switch in the OFF position.

The Service PC (Item 1) with the Remote Start Tool (Service Tool) (Item 2) **[Figure 60-130-2]**. When connected to the loader, the Service PC is used to monitor, conduct diagnostics, and upgrade software.

Connect the Remote Start Tool (Service Tool) Computer Service Tool Harness (Item 3) **[Figure 60-130-2]** to the designated serial port on the Service PC.

NOTE: The recommended serial cable length should not exceed 15 feet. A serial cable longer than 15 feet will create a degraded signal causing communication errors.

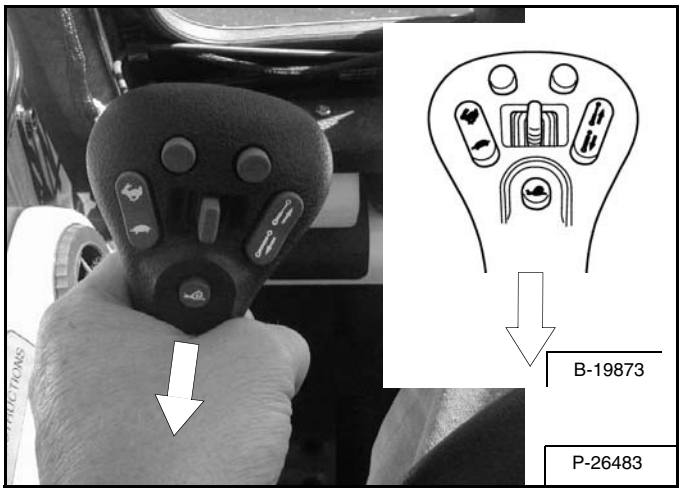
Connect the other end to the connector on the Remote Start Tool (Service Tool).

Connect the Remote Start Tool (Service Tool) to the loader. (See Remote Start Tool (Service Tool) - 6689778 on Page 10-61-2.)

NOTE: Refer to BobcatNET for PC requirements and the latest Service Analyzer software.

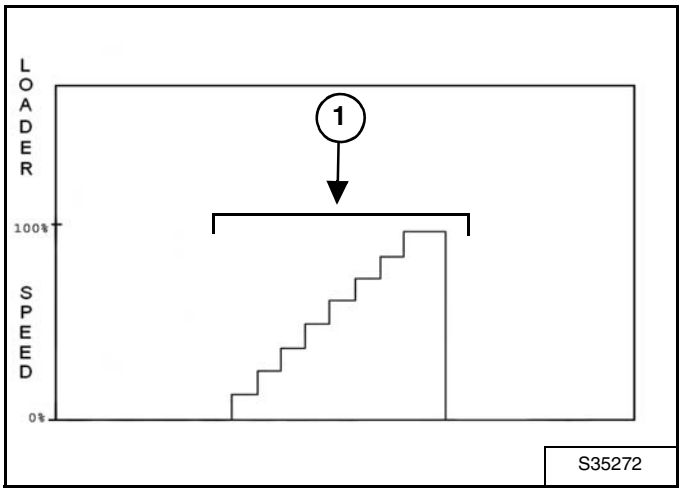
Hydrostatic Pump Calibration (SJC) (Cont'd)

Figure 60-140-20



Move and hold the left joystick to the reverse position **[Figure 60-140-20]** until the reverse calibration is completed.

Figure 60-140-21



The loader will “stair step” the speed (Item 1) **[Figure 60-140-21]** until it reaches full speed and then come to a stop.

Continue to hold the left joystick in the reverse position until the loader wheels or tracks come to a stop and an audible beep is heard.

Reverse calibration is complete.

NOTE: If the wheels or tracks do not stop moving in Full Speed Reverse in 2 minutes or less, there was an error in the calibration procedure. The operator must shut the loader OFF, and start the calibration procedure from the beginning.

There will be an audible beep and the PRESS TO OPERATE LOADER and TRACTION lights will go out. The SEAT BAR and LIFT AND TILT lights will remain on. The **75-98** error code will clear. There should be no other codes in the display area.

Allow the joystick to go to the neutral position.

Once the calibration procedure is complete the Steering Drift Compensation values will be reset to [S----] or neutral.

Press the *PRESS TO OPERATE LOADER* button. Move the left joystick to forward position **[Figure 60-140-18 on Page 8]** and check for normal forward wheel or track rotation.

Move the left joystick to the reverse position **[Figure 60-140-20]** and check for normal reverse wheel or track rotation.

Stop the engine, and remove the loader from jackstands.

The calibration procedure is completed.

After calibration is complete, use Steering Drift Compensation for fine tuning or if an acceptable line of drift can not be achieved (See STEERING DRIFT COMPENSATION on Page 60-141-1.).

If loader does not maintain a desired travel path with Steering Drift Compensation at maximum setting **[S-r10]** or **[S-L10]**, see the electrical and hydrostatic troubleshooting (See Troubleshooting on Page 30-10-2.) or (See Troubleshooting on Page 60-10-8.).

PASSWORD SETUP (KEYLESS START PANEL)

Password Description

Master Password:

A permanent, randomly selected password set at the factory which cannot be changed. This password is used for service by the Bobcat dealer if the owner password is not known; or to change the owner password.

Owner Password:

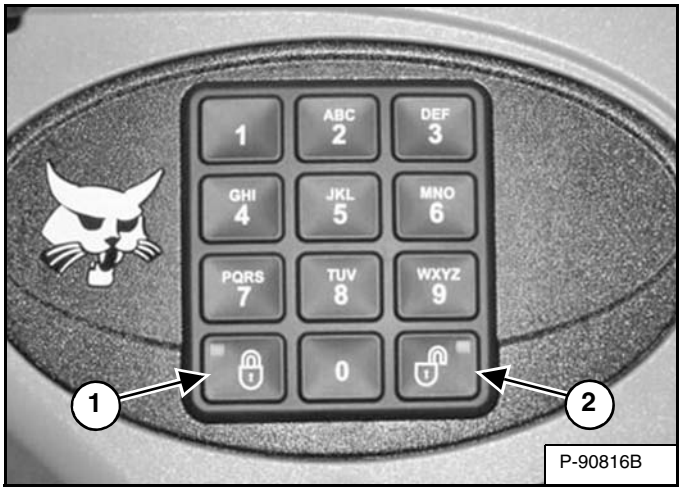
Allows for full use of the loader. It must be used to change the owner password.

Changing The Owner Password

Press the RUN button to turn on the loader's electrical system.

Enter the five digit owner password using the number keys (1 through 0) if locked.

Figure 60-171-1



Press and hold the lock (Item 1) and unlock (Item 2) **[Figure 60-171-1]** keys for two seconds.

The lock key red light will flash and the left panel display screen will show **[ENTER]**.

Enter a new five digit password using the number keys (1 through 0). An asterisk will show in the left panel display screen for each key press.

The left panel display screen will show **[AGAIN]**.

Enter the new five digit password again.

The lock key red light will become solid.

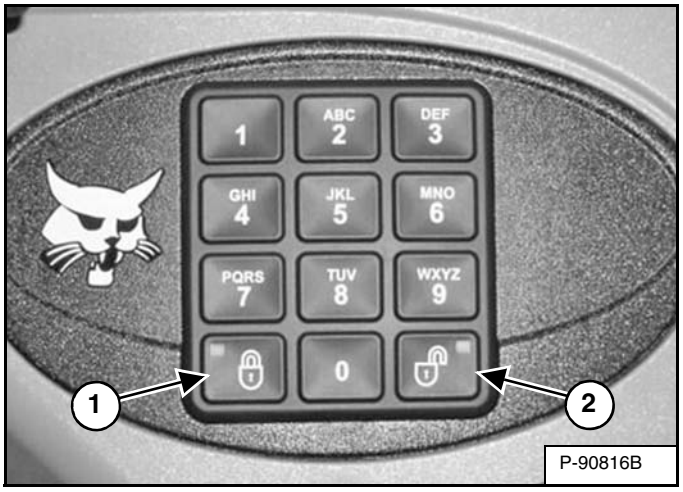
Password Lockout Feature

This feature allows the owner to unlock the password feature so that a password does not need to be used every time the engine is started.

Press the RUN button to turn on the loader's electrical system.

Enter the five digit owner password using the number keys (1 through 0).

Figure 60-171-2



Press the unlock key (Item 2) **[Figure 60-171-2]**.

The left panel display screen will show **[CODE]**.

Enter the five digit owner password using the number keys (1 through 0). The unlock key green light will flash, then become solid.

The loader can now be started without using a password.

NOTE: Use the following procedure to reset the machine lock so that the loader requires a password to start the engine.

Press the RUN button to turn on the loader's electrical system.

Press the lock key (Item 1) **[Figure 60-171-2]**.

The lock key red light will flash and the left panel display screen will show **[CODE]**.

Enter the five digit owner password using the number keys (1 through 0). The unlock key green light will flash, then the lock key red light will become solid.

You must now enter the password every time to start the loader.

Troubleshooting

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

⚠ WARNING

AVOID INJURY OR DEATH

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0807

PROBLEM	CAUSE
Back-up alarm will not sound when the operator moves both steering levers in the reverse position.	1, 2, 3, 4, 5, 6, 7
Back-up alarm sounds when steering levers in neutral / forward position.	2, 6, 7

KEY TO CORRECT THE CAUSE
1. The ground connection is not making a good contact.
2. The back-up alarm switches are damaged.
3. The alarm is damaged.
4. The alarm or back-up switch wires are disconnected.
5. Check the fuses.
6. The wiring is damaged.
7. The back-up alarm switches need adjusting.

Specifications (Cont'd)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Crankshaft

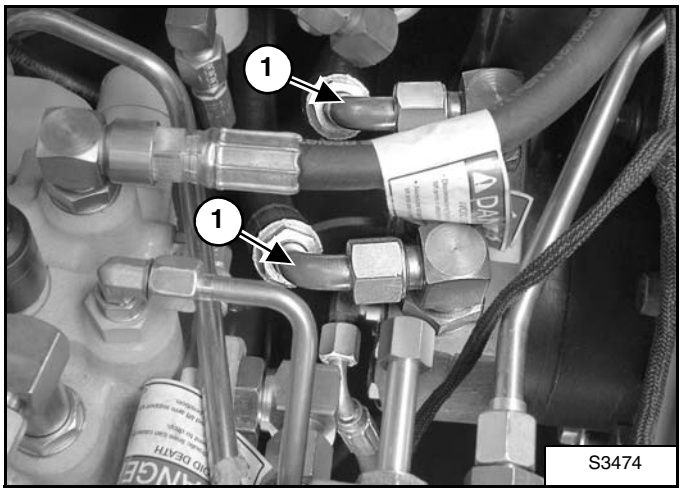
Crankshaft Alignment Allowable Limit	0.00079 (0,02)
Crankshaft Journal to Bearing 1 Oil Clearance	0.00157 - 0.00465 (0,04 - 0,118)
Allowable Limit	0.0079 (0,2)
Crankshaft Journal 1 O.D.	2.35909 - 2.35984 (59,921 - 59,940)
Crankshaft Bearing 1 I.D.	2.36142 - 2.36374 (59,980 - 60,039)
Crankshaft Journal to Bearing 2 Oil Clearance	0.00157 - 0.00409 (0,04 - 0,104)
Allowable Limit	0.0079 (0,2)
Crankshaft Journal 2 O.D.	2.35909 - 2.35984 (59,921 - 59,940)
Crankshaft Bearing 2 I.D.	2.36142 - 2.36318 (59,98 - 60,025)
Oil Clearance Between Crank Pin & Bearing	0.0010 - 0.0034 (0,025 - 0,087)
Allowable Limit	0.0079 (0,2)
Crank Pin O.D.	1.84878 - 1.84941 (46,959 - 46,975)
Crank Pin Bearing I.D.	1.85039 - 1.85220 (47,0 - 47,046)
Crankshaft Side Clearance	0.0059 - 0.0138 (0,15 - 0,35)
Allowable Limit	0.0197 (0,5)
Crankshaft Sleeve Wear Allowable Limit	0.0039 (0,1)

Balancer Shaft

Balancer Shaft Side Clearance	0.0028 - 0.0087 (0,07 - 0,22)
Allowable Limit	0.0118 (0,3)
Balancer Shaft Journal 1 to Balancer Shaft Bearing 1 Clearance	0.00118 - 0.00437 (0,030 - 0,111)
Allowable Limit	0.0079 (0,2)
Balancer Shaft Journal 1 O.D.	1.72968 - 7.73031 (43,934 - 43,950)
Balancer Shaft Bearing 1 I.D.	1.73149 - 1.73405 (43,980 - 44,045)
Balancer Shaft Journal 2 to Balancer Shaft Bearing 2 Clearance	0.00118 - 0.00437 (0,030 - 0,111)
Allowable Limit	0.0079 (0,2)
Balancer Shaft Journal 2 O.D.	1.65094 - 1.65157 (41,934 - 41,950)
Balancer Shaft Bearing 2 I.D.	1.65275 - 1.65531 (41,980 - 42,045)
Balancer Shaft Journal 3 to Balancer Shaft Bearing 3 Clearance	0.00079 - 0.00370 (0,020 - 0,094)
Allowable Limit	0.0079 (0,2)
Balancer Shaft Journal 3 O.D.	0.86405 - 0.86456 (21,947 - 21,960)
Balancer Shaft Bearing 3 I.D.	0.86535 - 0.86775 (21,980 - 22,041)

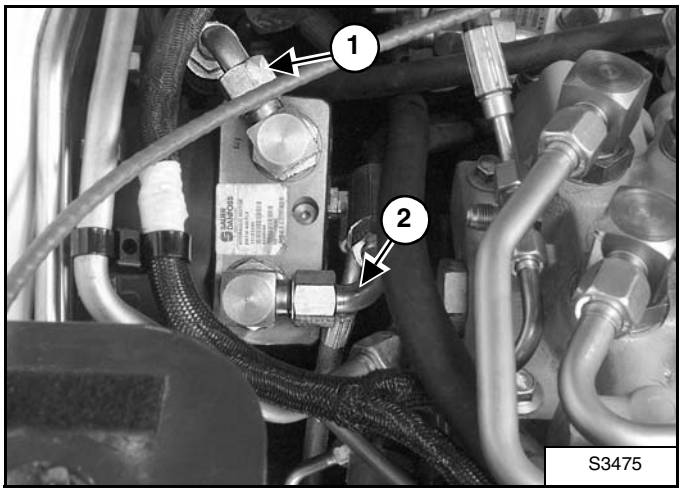
Removal And Installation (Cont'd)

Figure 70-10-20



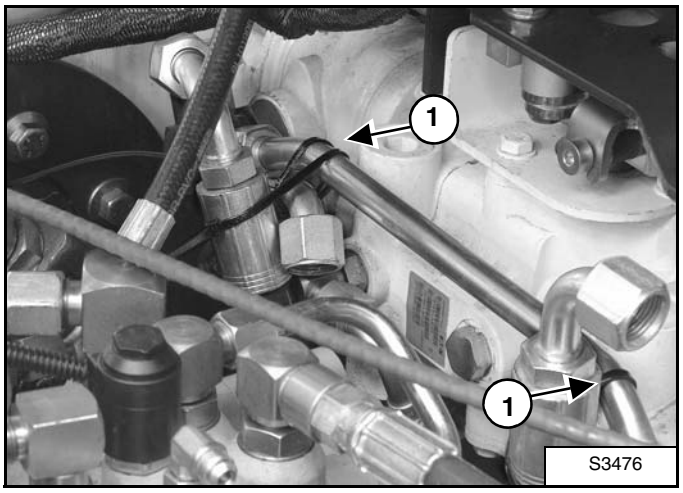
Mark and remove the main drive hoses (Item 1) **[Figure 70-10-20]** from the left hydrostatic motor.

Figure 70-10-21



Mark and remove the main drive hoses (Item 1) **[Figure 70-10-21]** from the right hydrostatic motor.

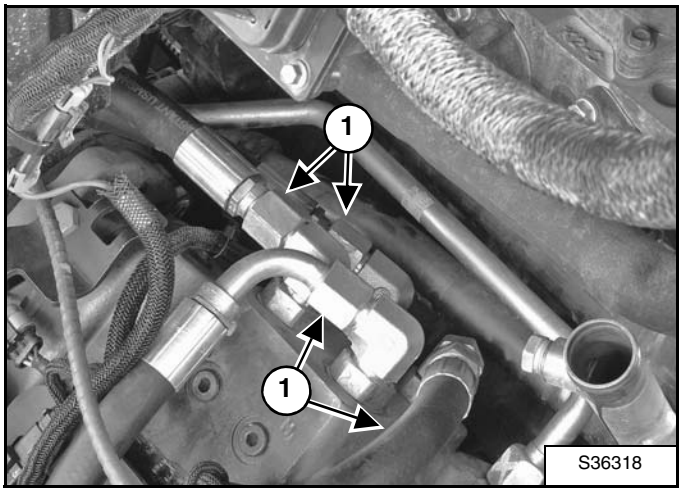
Figure 70-10-22



Use tie straps (Item 1) **[Figure 70-10-22]** to attach the four left and right drive motor hoses to the pump assembly.

Installation: Install the drive motor hoses prior to alignment with engine mount bolts.

Figure 70-10-23



If loader is not equipped with SJC, skip to **[Figure 70-10-32]**.

Mark and remove the four hoses (Item 1) **[Figure 70-10-23]** from the hydrostatic pump.

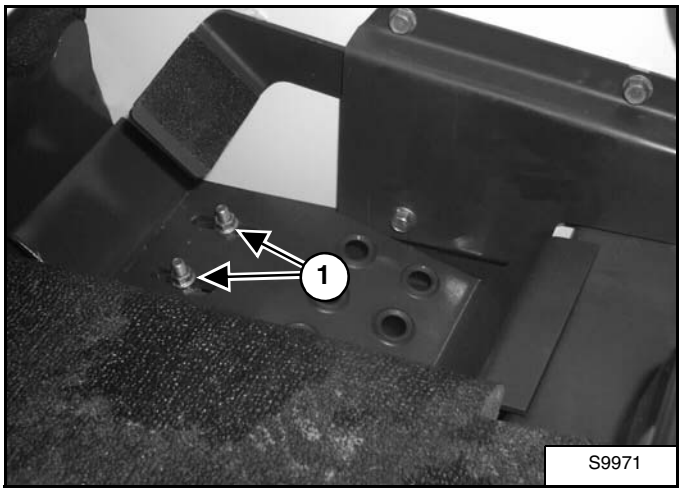
ENGINE SPEED CONTROL (SJC)

Removal And Installation

Raise the lift arms and install an approved lift arm support device (See Installing on Page 10-20-1.).

Raise the operator cab (See Raising on Page 10-30-1.).

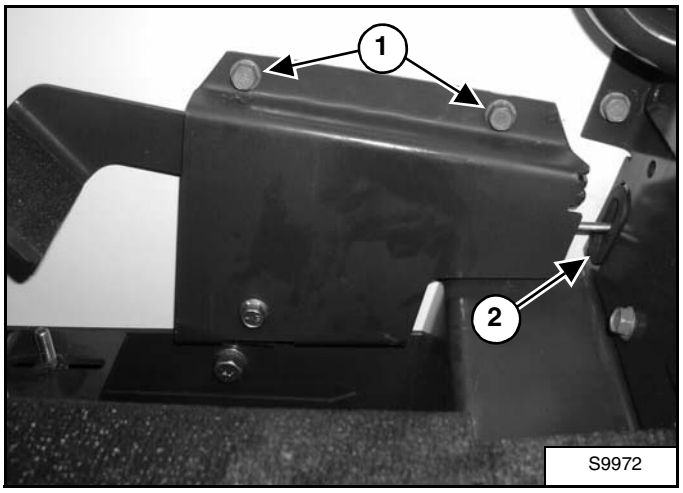
Figure 70-21-1



Remove the two mounting bolts (Item 1) **[Figure 70-21-1]** from the right side foot rest.

Remove the foot rest from the loader.

Figure 70-21-2

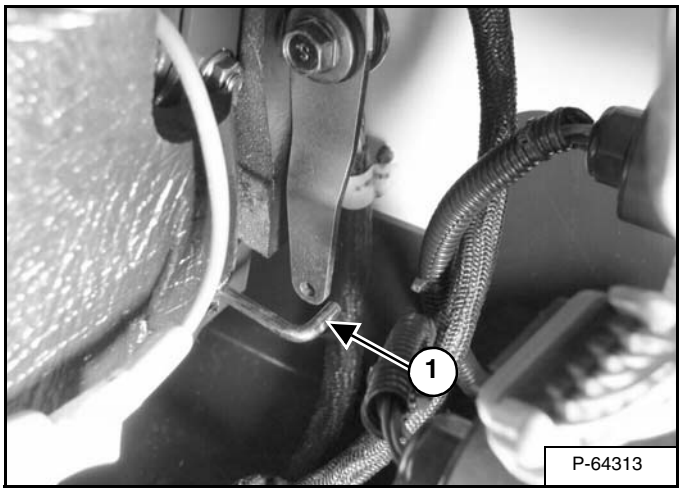


Remove the two screws from the mount (Item 1) **[Figure 70-21-2]**.

Remove the rubber grommet (Item 2) **[Figure 70-21-2]**.

Installation: Tighten screws to 15 - 20 ft.-lb. (20 - 27 N•m) torque.

Figure 70-21-3

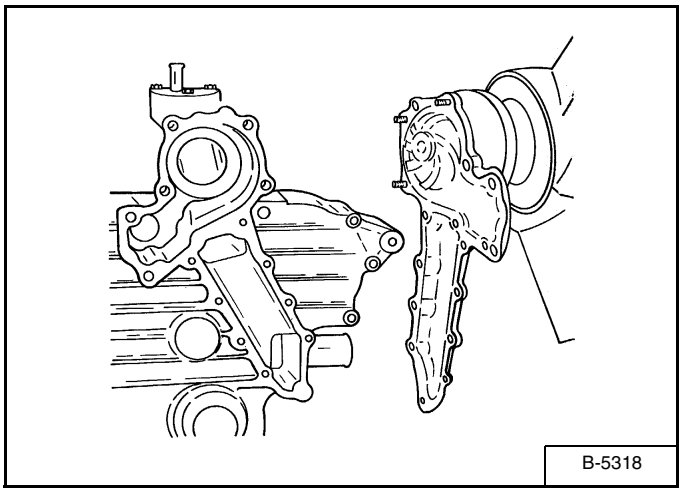


Disconnect the foot speed control linkage (Item 1) **[Figure 70-21-3]** from the hand control pivot arm.

Remove the foot speed control assembly from the loader.

Water Pump Removal And Installation (Cont'd)

Figure 70-50-7

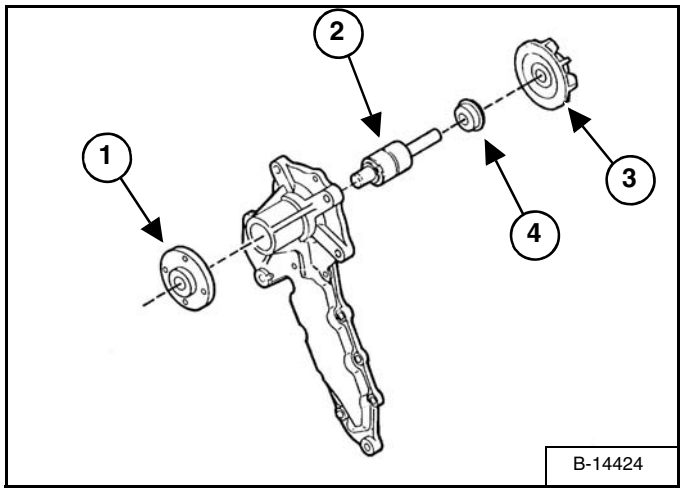


Remove the water pump **[Figure 70-50-7]**.

Installation: Always use a new gasket when installing the water pump.

Water Pump Disassembly And Assembly

Figure 70-50-8



Remove the flange (Item 1) **[Figure 70-50-8]**.

Press the shaft (Item 2) and impeller (Item 3) **[Figure 70-50-8]** out of the impeller side of the water pump.

Remove the impeller (Item 3) **[Figure 70-50-8]** from the shaft.

Remove the seal (Item 4) **[Figure 70-50-8]**.

Install a new seal (Item 4) **[Figure 70-50-8]** when assembling the water pump.

Fuel Injection Pump Removal And Installation

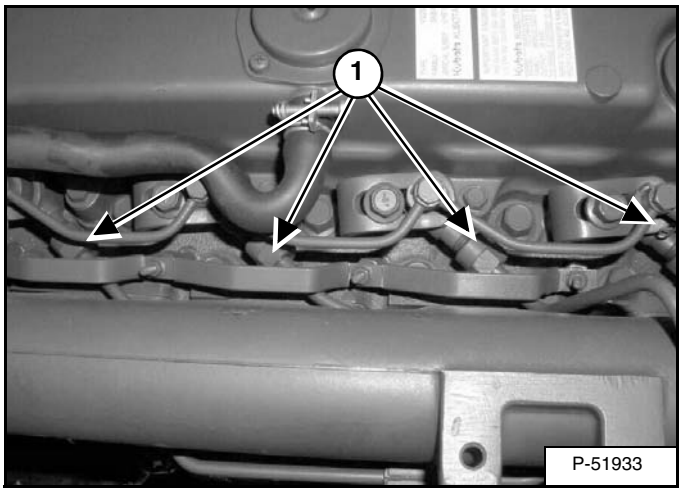
IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

I-2029-0289

Clean the area around the injection pump thoroughly.

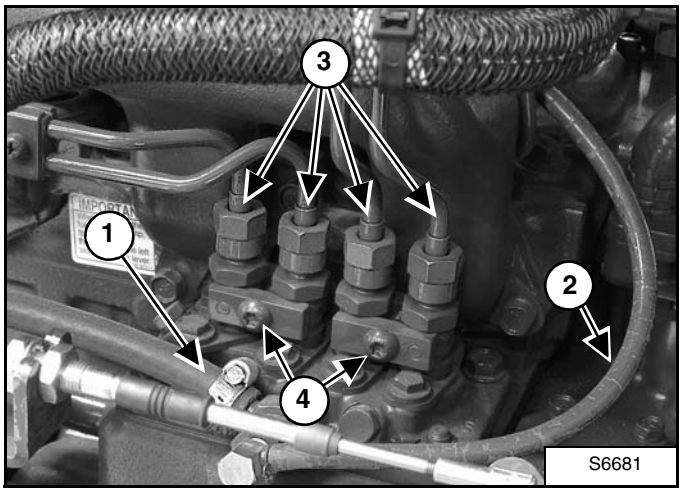
Figure 70-70-6



Disconnect the high pressure fuel lines (Item 1) **[Figure 70-70-6]** from the fuel injectors.

Installation: Tighten the high pressure fuel line nuts to 18 - 25 ft.-lb. (24 - 33 N•m) torque.

Figure 70-70-7



Remove and cap the fuel inlet hose (Item 1) and the fuel return hose (Item 2) **[Figure 70-70-7]** from the injection pump vent.

Remove the high pressure fuel lines (Item 3) **[Figure 70-70-7]** from the injection pump.

Installation: Tighten the high pressure fuel line nuts to 18 - 25 ft.-lb. (24 - 33 N•m) torque.

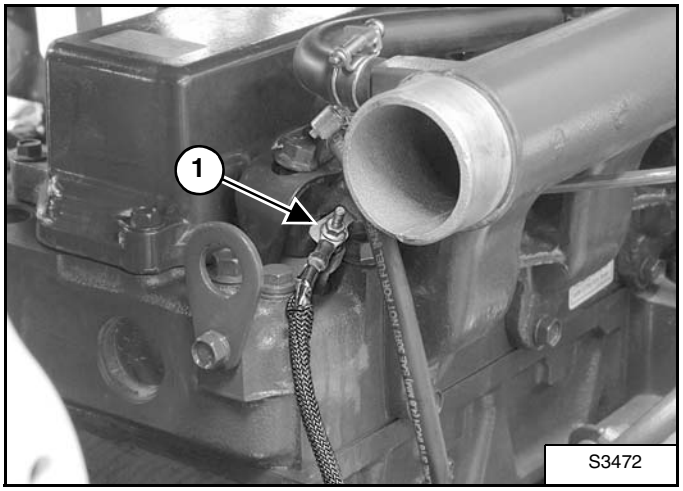
NOTE: Do not loosen the clamp screws (Item 4) [Figure 70-70-7] on the injection pump. This is to be done only when the entire injection pump is sent out to be serviced.

CYLINDER HEAD

Glow Plugs - Testing

Disconnect the negative (-) cable from the battery.

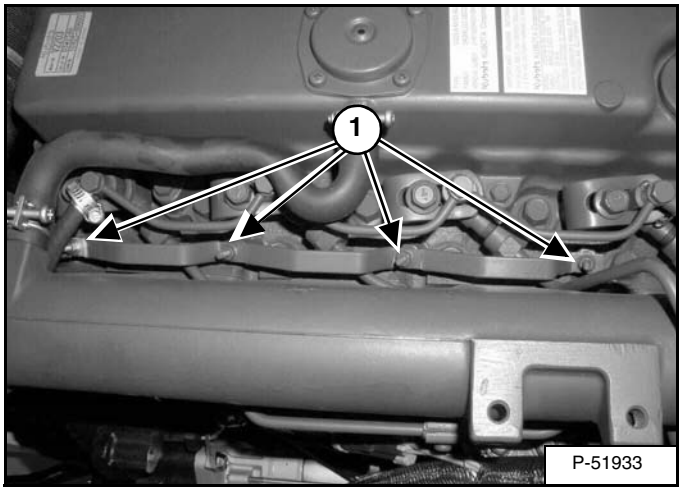
Figure 70-80-1



Disconnect the glow plug cables and leads.

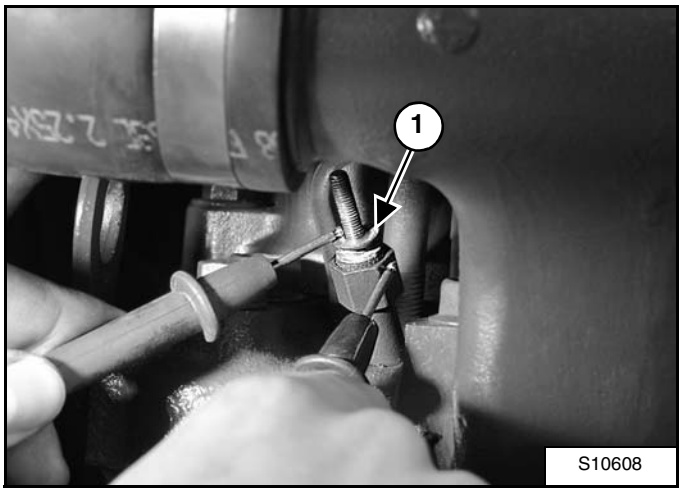
Remove the nut and wire harness (Item 1) **[Figure 70-80-1]**.

Figure 70-80-2



Remove the nut (Item 1) **[Figure 70-80-2]** from the top of each glow plug.

Figure 70-80-3



Use an ohmmeter to check the glow plugs **[Figure 70-80-3]**.

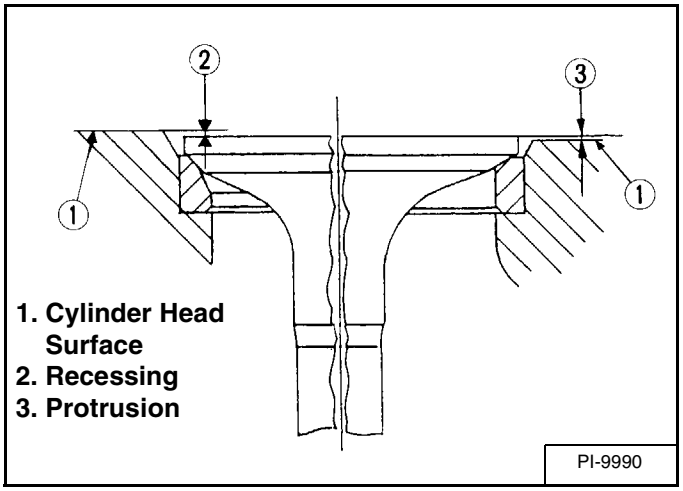
Touch one probe to the end of the glow plug and the other probe to the body of the glow plug (Item 1) **[Figure 70-80-3]**.

The reading should be approximately 0.9 ohm. If the resistance is infinite, the coil of the glow plug is broken. If the resistance is 0 the glow plug is short circuited.

Repeat the procedure for each glow plug.

Reconditioning The Valve And Valve Seat (Cont'd)

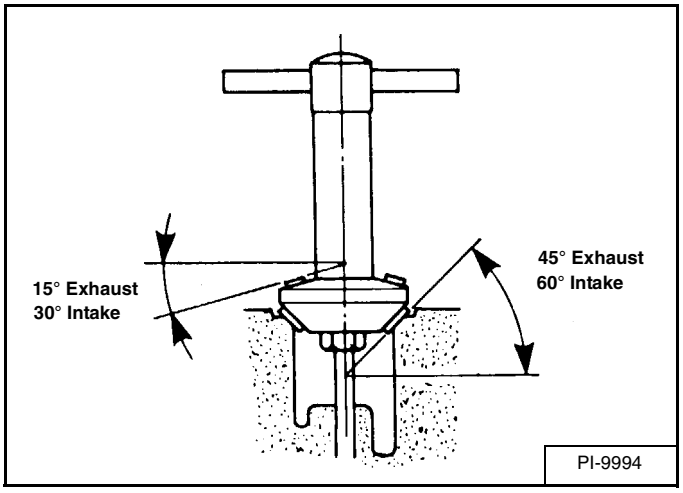
Figure 70-80-32



If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-80-32]**.

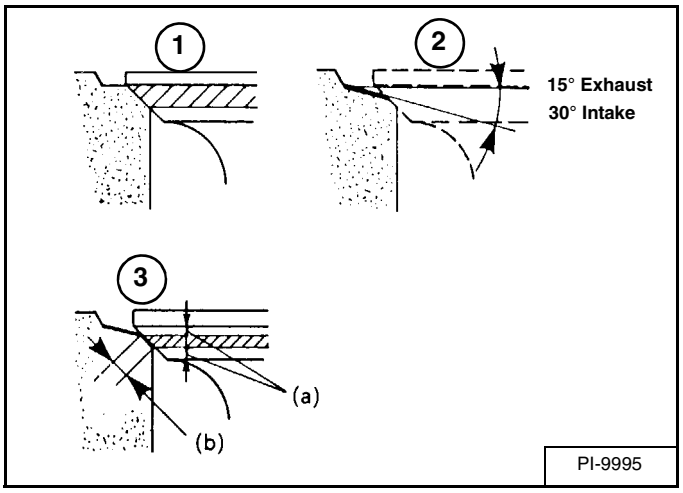
Protrusion	0.002 in. (0,05 mm)
Recessing	0.0059 in. (0,15 mm)
Allowable Limit (Recessing)	0.0157 in. (0,4 mm)

Figure 70-80-33



Grind the valve seat surface in the cylinder head to the correct angle **[Figure 70-80-33]**.

Figure 70-80-34



Check the seat surface and valve face (Item 1) **[Figure 70-80-34]**.

(a) identical dimensions above and below the valve seat

If the seat surface (b) is too wide, use a 30 degree cutter (Item 2) on the intake, and a 15 degree cutter on the exhaust to get the correct width (Item 3) **[Figure 70-80-34]**.

Valve Seat Width

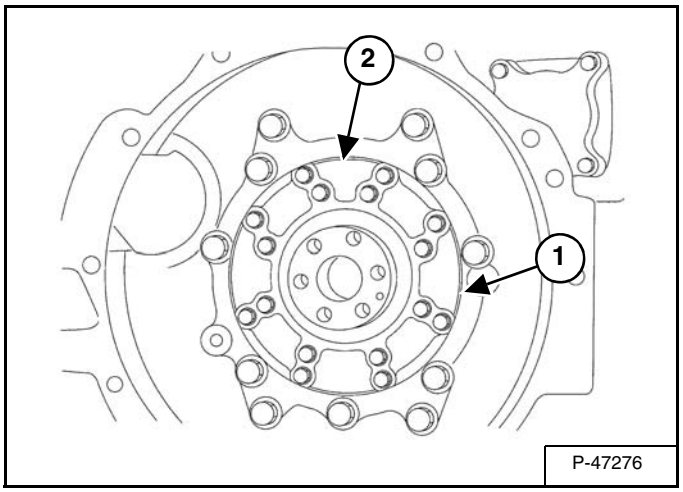
Intake	0.0835 in. (2,12 mm)
Exhaust	0.0835 in. (2,12 mm)

Valve Seat And Face Angle

Intake	60°
Exhaust	45°

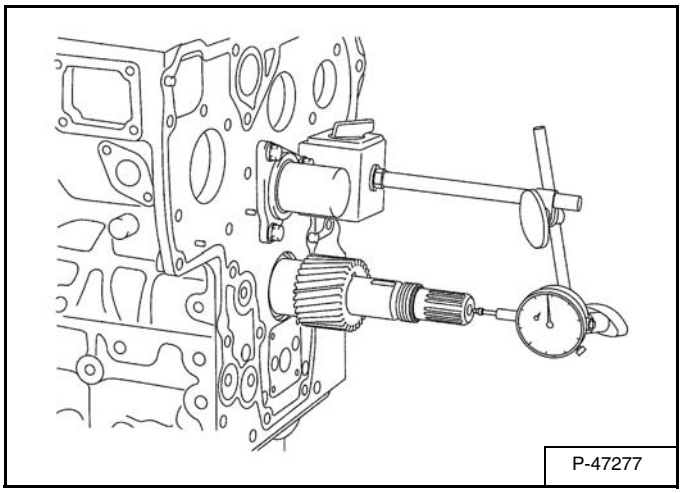
Crankshaft And Bearings Removal And Installation (Cont'd)

Figure 70-90-18



Install the bearing case cover (Item 1) with the casting mark (Item 2) **[Figure 70-90-18]** in the upward position. Tighten the bolts to 17.4 - 20.3 ft.-lb. (23,5 - 27,5 N•m) torque.

Figure 70-90-19

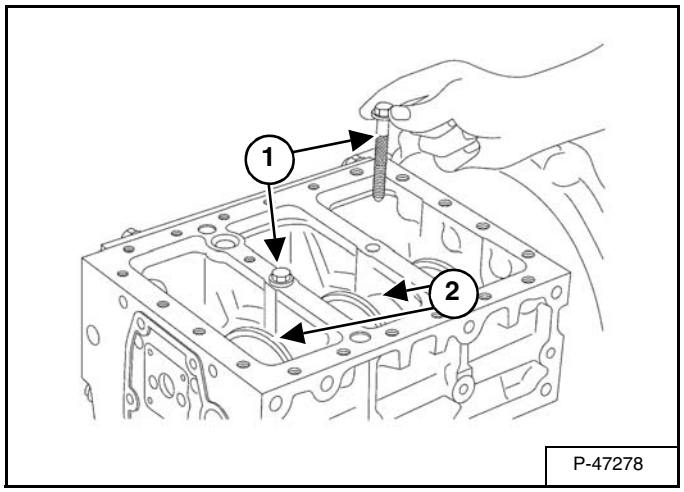


Before removing the crankshaft / main bearings, check the side clearance. Install a dial indicator. Move the crankshaft **[Figure 70-90-19]** to the flywheel side, zero the dial indicator. Measure the side clearance by pulling the crankshaft toward the gear case side.

If the measurement exceeds the allowable limit, replace the thrust washers **[Figure 70-90-19]**.

Side Clearance	0.0059 - 0.0122 in. (0,15 - 0,31 mm)
Allowable Limit	0.0197 in. (0,5 mm)

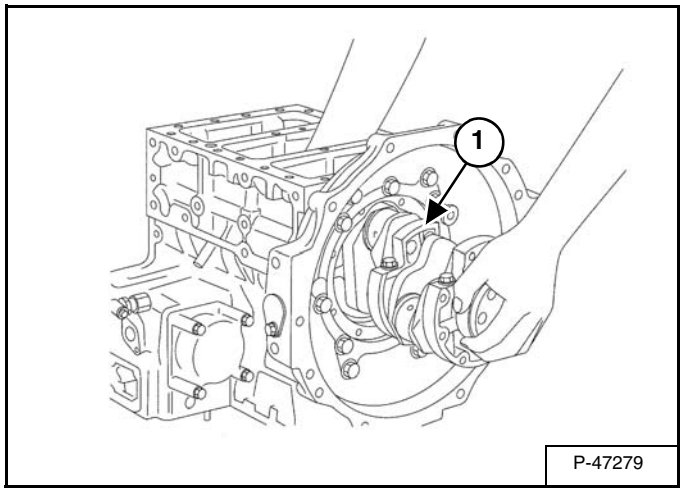
Figure 70-90-20



Remove the main bearing case bolt (Item 1) **[Figure 70-90-20]**.

Installation: Align the bearing case hole (Item 2) **[Figure 70-90-20]** with the hole in the block. Put oil on the bolt threads and tighten to 50.6 - 54.2 ft.-lb. (68,6 - 73,5 N•m) torque.

Figure 70-90-21



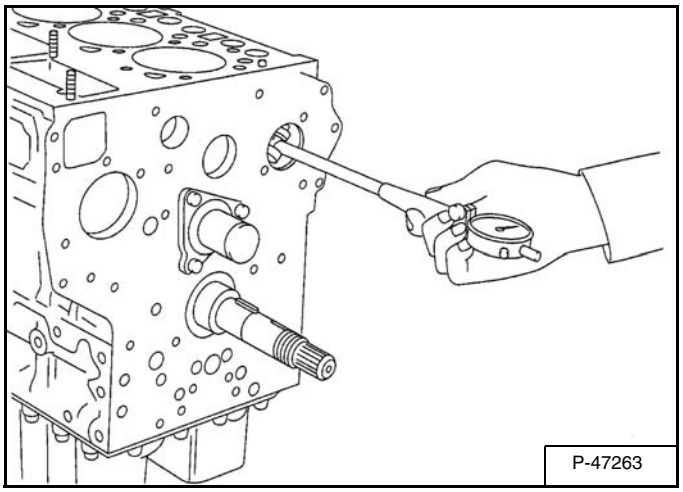
Remove the crankshaft / main bearing assembly from the engine block **[Figure 70-90-21]**.

NOTE: Turn the crankshaft as needed to allow the crank pin journals to pass through the cut out (Item 1) [Figure 70-90-21] of the engine block.

Mark the bearing case halves for correct installation.

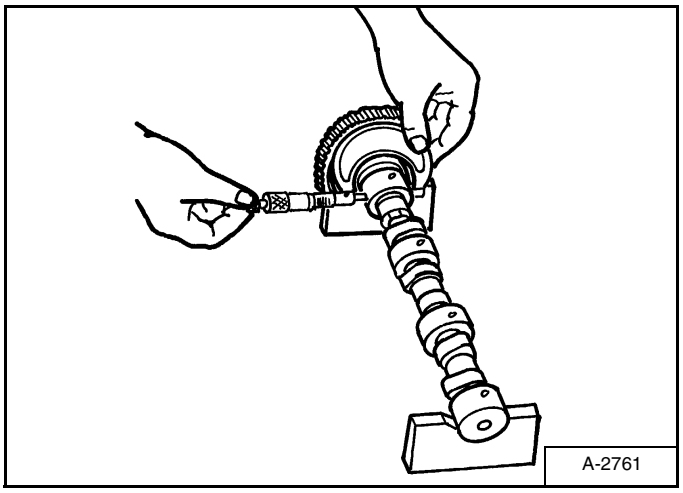
Camshaft - Servicing

Figure 70-100-11



Measure the cylinder block bore in the engine block **[Figure 70-100-11]**.

Figure 70-100-12

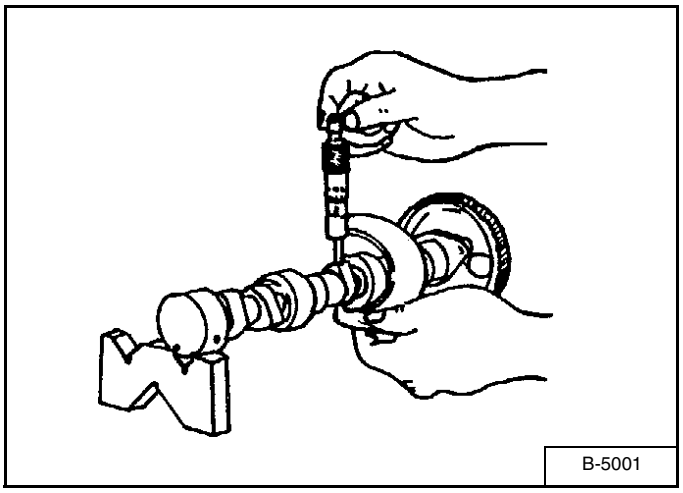


Measure the camshaft journal **[Figure 70-100-12]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the camshaft.

Cylinder Block Bore I.D.	1.57480 - 1.57579 in. (40 - 40,025 mm)
Journal O.D.	1.57221 - 1.57284 in. (39,934 - 39,950 mm)
Oil Clearance of Camshaft Journal	0.0020 - 0.0036 in. (0,05 - 0,091 mm)
Allowable Limit	0.0059 in. (0,15 mm)

Figure 70-100-13

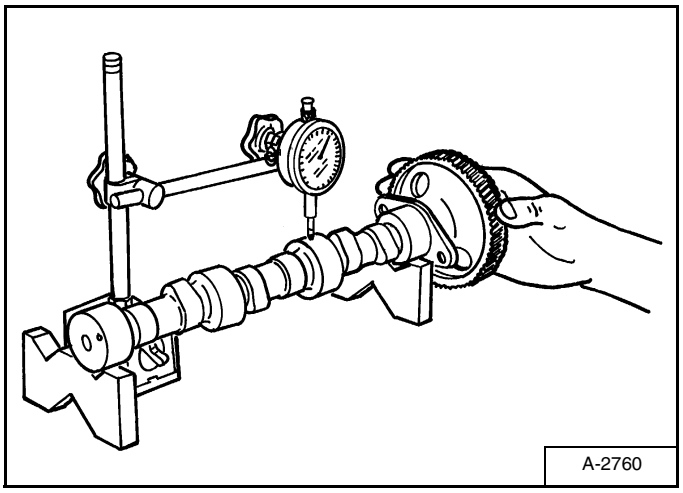


Measure the cam lobes at their highest point **[Figure 70-100-13]**.

If the measurement is less than the allowable limit, replace the camshaft.

Cam Height (Intake/ Exhaust)	1.3346 in. (33,9 mm)
Allowable Limit	1.3327 in. (33,85 mm)

Figure 70-100-14



Put the camshaft in V-blocks. Install a dial indicator **[Figure 70-100-14]**.

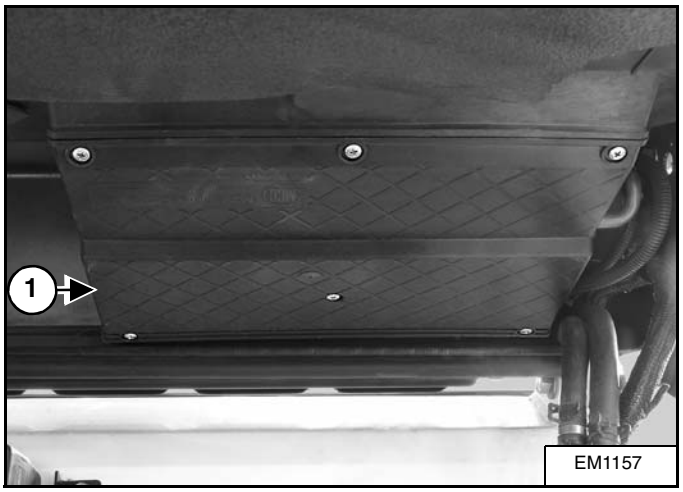
Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft Alignment Allowable Limit	0.0004 in. (0,01 mm)

HEATER SYSTEM

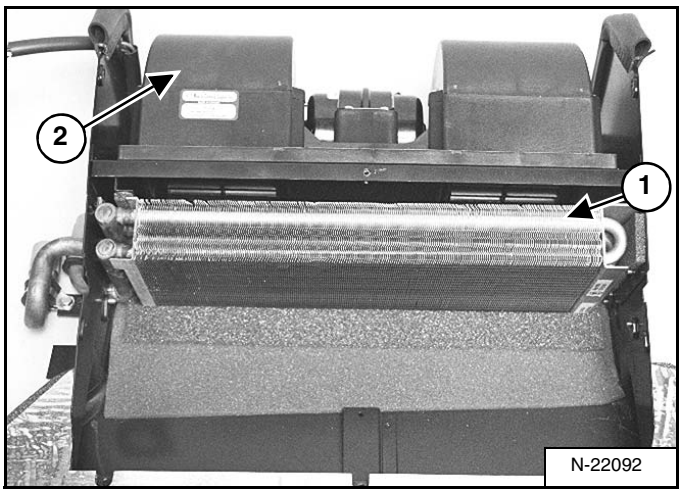
Description

Figure 80-10-1



Heater Unit: The heater (Item 1) **[Figure 80-10-1]** is located behind the loader cab. The unit delivers the warm air for heat into the cab. The unit contains the blower and heater coil.

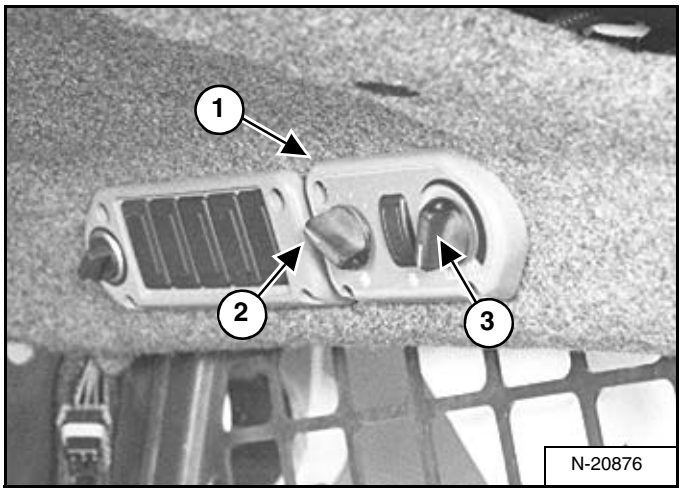
Figure 80-10-2



Heater Coil: The heater coil (Item 1) **[Figure 80-10-2]** supplies the warm air into the cab by passing air through the coil.

Heater Blower: The blower (Item 2) **[Figure 80-10-2]** is used to push air through the heater and into the cab.

Figure 80-10-3

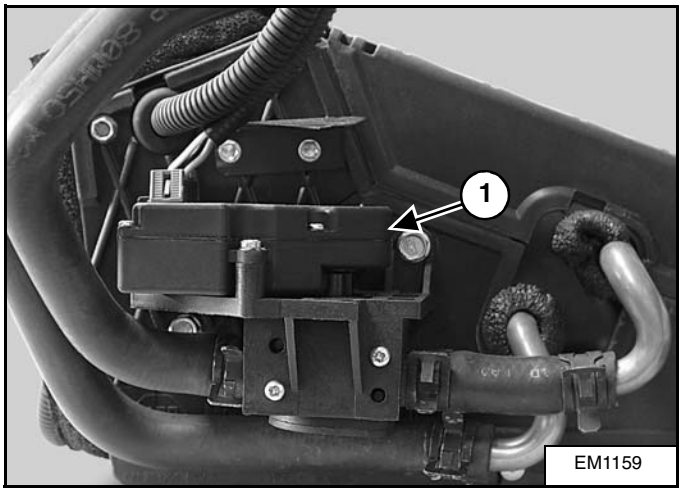


Control Panel: The panel (Item 1) **[Figure 80-10-3]** has two separate components.

Fan Switch: This is a four position rotary switch (Item 2) **[Figure 80-10-3]**. When the fan switch is in the off position the heat valve will operate, as it is controlled by the ignition power.

Potentiometer: The potentiometer (Item 3) **[Figure 80-10-3]** controls the Heater Valve (Item 1) **[Figure 80-10-4]** from fully Off to fully On. This can be used for defrost of the windows and temperature control.

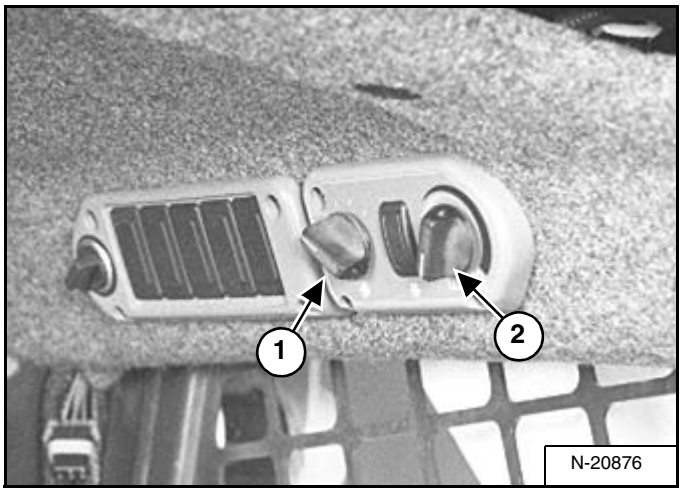
Figure 80-10-4



Heater Valve: The heater valve (Item 1) **[Figure 80-10-4]** is used to control the amount of engine coolant that flows to the heater coil.

Heater Valve Not Opening Or Closing

Figure 80-30-18



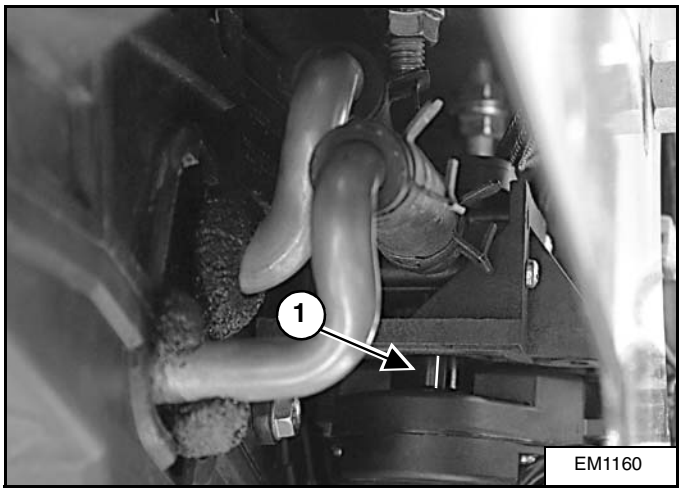
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Turn the fan switch (Item 1) to position **1**. Turn the temperature control (Item 2) **[Figure 80-30-18]** to the High cold position, with the loader ignition switch OFF.

Raise the operator cab. (See Raising on Page 10-30-1.)

Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

Figure 80-30-19



Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-19]**, as the key switch of the remote start tool is turned to the ON position without starting the loader. The heater valve should rotate. Place a mark on the heater valve shaft.

Turn the key switch of the remote start tool to the OFF position and remove the remote start tool from fender.

Lower operator cab.

Turn the temperature control (Item 2) **[Figure 80-30-18]** to the High Heater position, with the loader ignition switch OFF.

Raise the operator cab. (See Raising on Page 10-30-1.)

Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-19]**, as the key switch of the remote start is turned to the ON position without starting the loader. The heater valve should rotate.

If it does not rotate, check the potentiometer for proper function. (See Electrical System on Page 80-30-2.)

Replace the heater valve.

HEATER VALVE

Removal and Installation

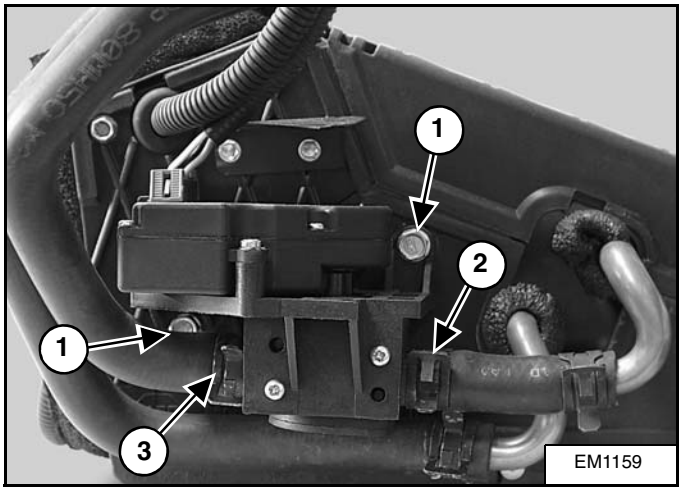
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-1.)

Remove the Heater Unit from under the cab and place it across the mainframe supported by blocks (See Removal And Installation on Page 80-40-1.)

Remove any tie straps that hold the heater hoses.

Figure 80-70-1



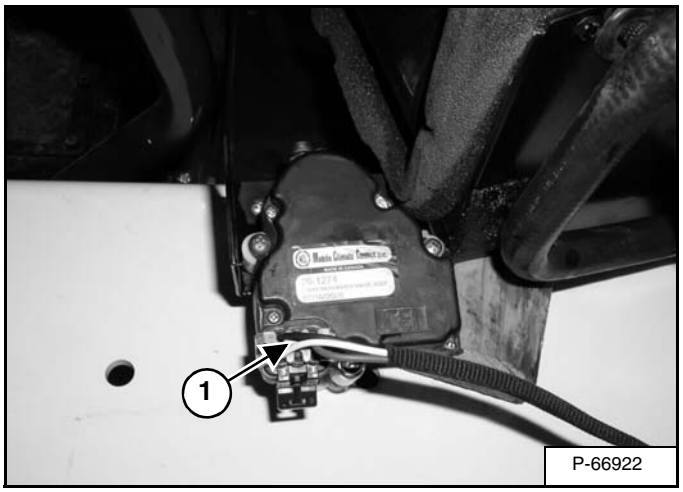
Remove the mount bolts (Item 1) **[Figure 80-70-1]** from the heater valve mount.

Remove the heater hose clamps (Items 2 and 3) **[Figure 80-70-1]**.

Remove the heater hoses from the heater valve.

Cap the heater hoses and the heater valve with plugs to prevent coolant loss from the system.

Figure 80-70-2



Disconnect the loader wiring harness (Item 1) **[Figure 80-70-2]** from the heater valve.

HYDRAULIC CONNECTION SPECIFICATIONS

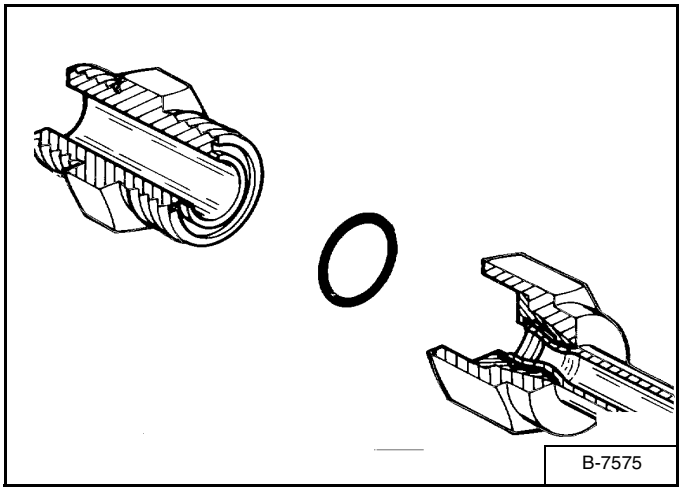
O-ring Face Seal Connection

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure SPEC-30-1



When the fitting is tightened, you can feel when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use vaseline petroleum jelly to hold the O-ring in position until the fittings are assembled **[Figure SPEC-30-1]**.

Figure SPEC-30-1

O-ring Face Seal Tightening Torque		
Tubeline Outside Diameter	**Thread Size**	**TORQUE ft.-lb. (N•m)**
1/4”	9/16” - 18	13 (18)
3/8”	11/16” - 16	22 (30)
1/2”	13/16” - 16	40 (54)
5/8”	1” - 14	60 (81)
3/4”	1-3/16” - 12	84 (114)
7/8”	1-3/16” - 12	98 (133)
1”	1-7/16” - 12	118 (160)
1-1/4”	1-11/16” - 12	154 (209)
1-1/2”	2” - 12	163 (221)