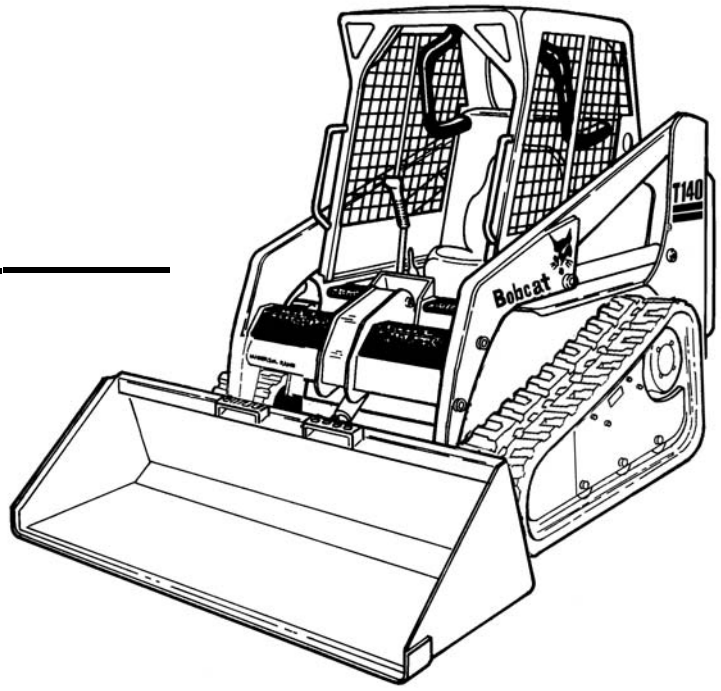
T140

Bobcat®

Service Manual

S/N 527111001 & Above
S/N 527211001 & Above



EQUIPPED WITH BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

Ingersoll Rand
Compact Vehicle Technologies

6903153 (2-06)
Printed in U.S.A.

SAFETY INSTRUCTIONS

Safety Alert Symbol

This symbol with a warning statement means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

WARNING

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-2003-0903

WARNING

Warnings on the machine and in the manuals are for your safety. Failure to obey warnings can cause injury or death.

W-2044-1285

IMPORTANT

This notice identifies procedures which must be followed to avoid damage to the machine.

I-2019-0284

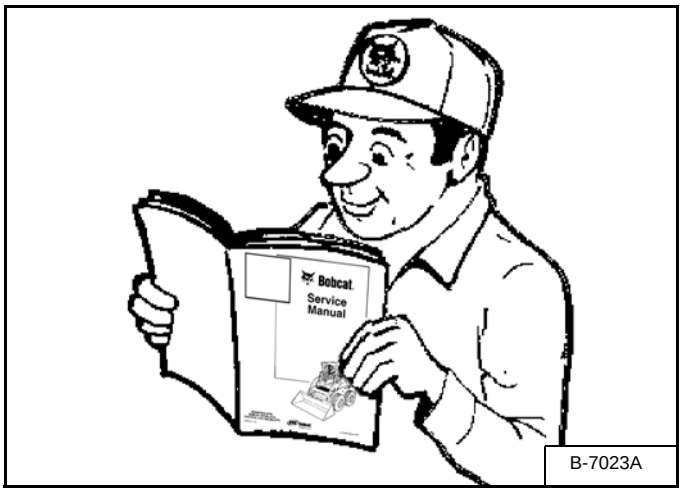
The following publications provide information on the safe use and maintenance of the Bobcat machine and attachments:

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the machine or attachment contains operating information as well as routine maintenance and service procedures. It is a part of the machine and can be stored in a container provided on the machine. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat dealer.
- Machine signs (decals) instruct on the safe operation and care of your Bobcat machine or attachment. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat dealer.
- An Operator's Handbook fastened to the operator cab. It's brief instructions are convenient to the operator. The handbook is available from your dealer in an English edition or one of many other languages. See your Bobcat dealer for more information on translated versions.
- The AEM Safety Manual delivered with the machine gives general safety information.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop-type service and repair work.
- The Skid-Steer Loader Operator Training Course is available through your local dealer or at **www.training.bobcat.com** or **www.bobcat.com**. This course is intended to provide rules and practices of correct operation of the Skid-Steer Loader. The course is available in English and Spanish versions.
- Service Safety Training Courses are available from your Bobcat dealer or at **www.training.bobcat.com** or **www.bobcat.com**. They provide information for safe and correct service procedures.
- The Skid-Steer Loader Safety Video is available from your Bobcat dealer or at **www.training.bobcat.com** or **www.bobcat.com**.

LIFTING AND BLOCKING THE LOADER

Procedure

Figure 10-10-1



⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, 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-2003-0199

Always park the loader on a level surface.

⚠ WARNING

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

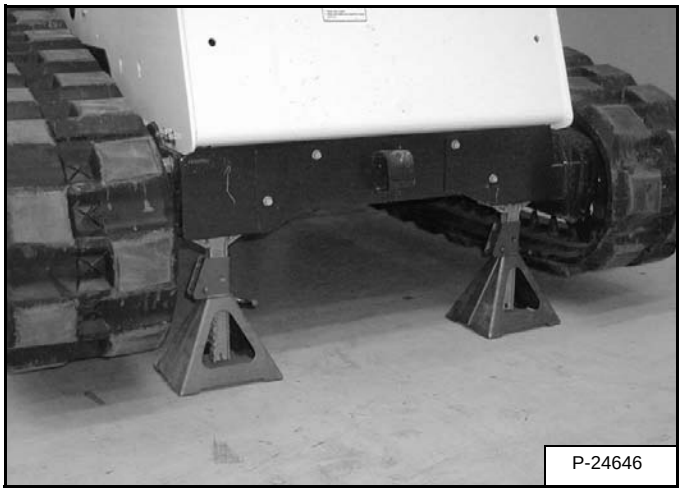
W-2017-0286

Figure 10-10-2

Put floor jack under the rear of the loader.

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

Figure 10-10-3



Put the floor jack under the front of the loader **[Figure 10-10-3]**.

Lift the front of the loader and put jack stands under the axle tubes **[Figure 10-10-3]**.

NOTE: Make sure the jack stands do not touch the tires. Make sure tires clear floor or any obstacles.

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.

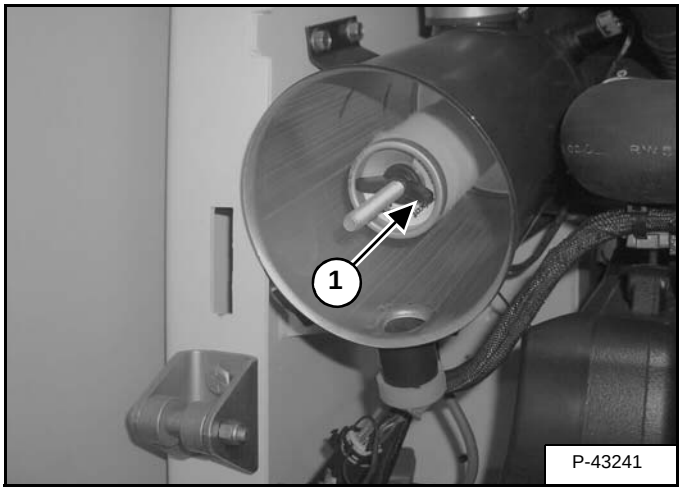
- The loader can be skidded a short distance to move for service (EXAMPLE: Move onto a transport vehicle.) without damage to the hydrostatic system. (The tires/tracks will not turn.) There might be slight wear to the tires/tracks when the loader is skidded.

  The towing chain (or cable) must be rated at 1 & 1/2 times the weight of the loader(See LOADER SPECIFICATIONS (T140) on Page SPEC-10-1.)

Replacing Filter Element(s) (Cont'd)

INNER FILTER

Figure 10-80-6

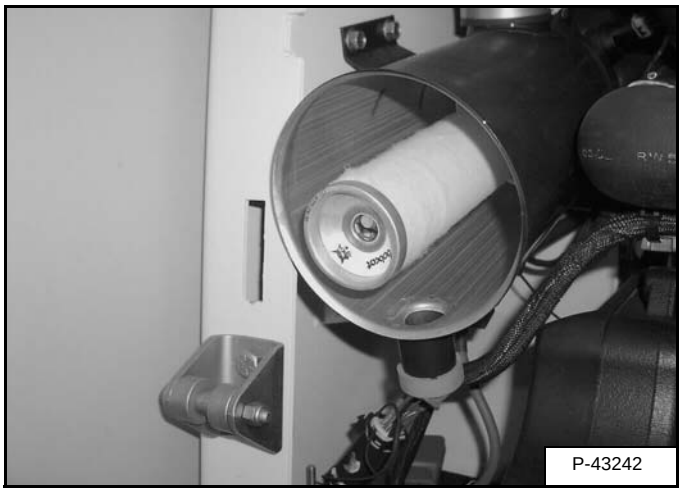


Only replace the inner filter element under the following conditions:

- Replace the inner filter element every *third* time the outer filter is replaced.
- After the outer element has been replaced, start the engine and run at full RPM. If the HOURMETER / CODE DISPLAY shows [**01-17**] **(Air Filter Plugged)**, replace the inner filter element.

Remove the inner filter wing nut (Item 1) **[Figure 10-80-6]**.

Figure 10-80-7



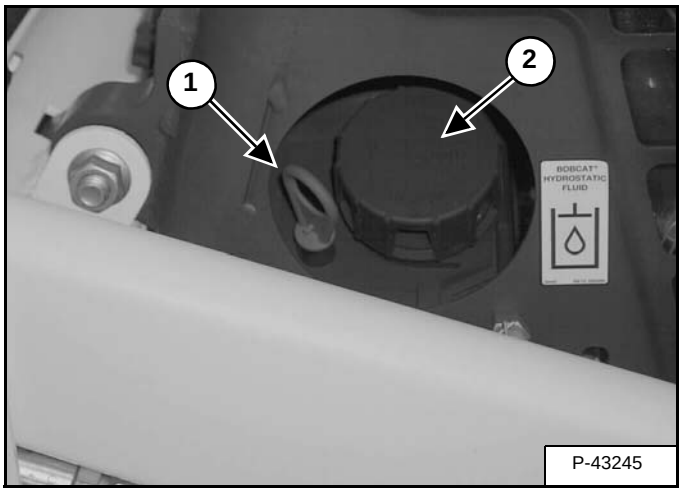
Remove the inner filter **[Figure 10-80-7]**.

Install a new filter and tighten the wing nut.

HYDRAULIC/HYDROSTATIC SYSTEM

Checking And Adding Fluid

Figure 10-120-1



Use only recommended fluid in the hydraulic system. (See Hydraulic System on Page SPEC-10-3.)

Stop the loader on a level surface,

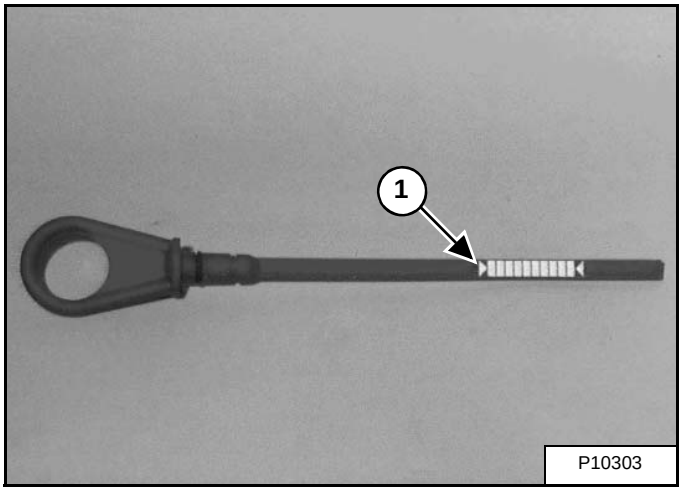
Lower the lift arms and tilt the Bob-Tach™ fully back.

Stop the engine.

Remove the dipstick (Item 1) **[Figure 10-120-1]** and check the fluid level.

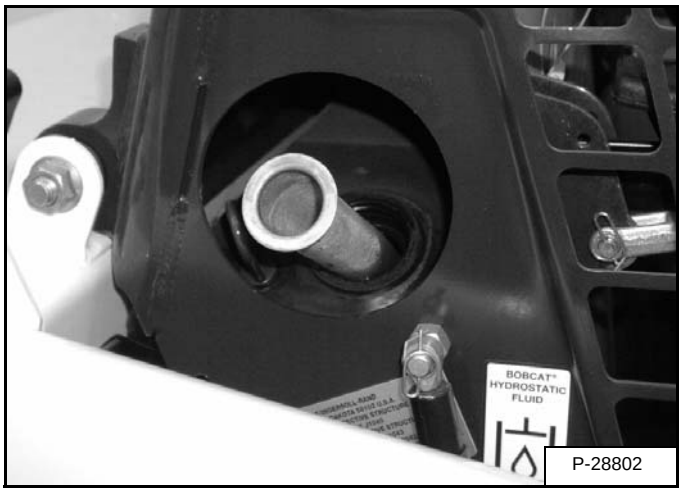
Remove the fill cap (Item 2) **[Figure 10-120-1]**.

Figure 10-120-2



Add the correct fluid to the reservoir until the fluid level is between the marks on the dipstick (Item 1) **[Figure 10-120-2]**. Do not fill above the top mark on the dipstick

Figure 10-120-3

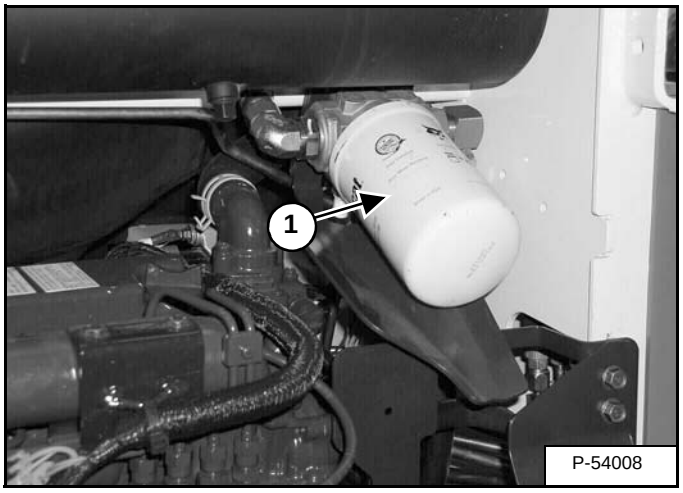


Remove the screen and clean with solvent as needed **[Figure 10-120-3]**.

Install the fill cap.

Replacing Hydraulic/Hydrostatic Filter

Figure 10-120-4



(See SERVICE SCHEDULE on Page 10-70-1) for the correct service intervals.

Open the rear door.

Remove the filter element (Item 1) **[Figure 10-120-4]**.

Clean the gasket sealing surface on the filter housing.

Put clean oil on the seal of the new filter element.

Install and hand tighten the filter element.

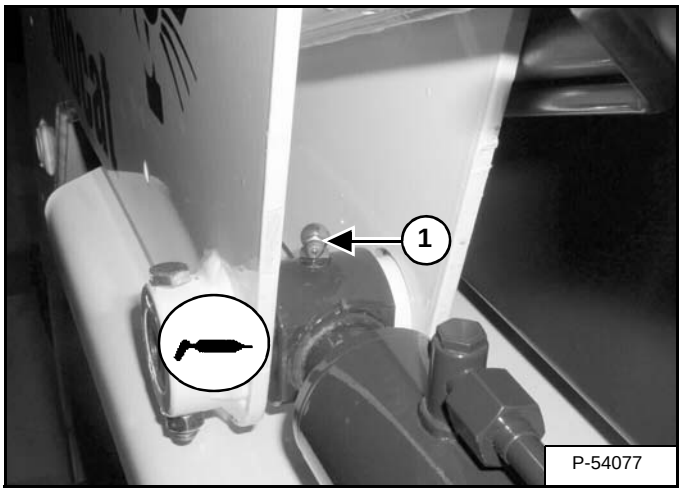
Close the rear door before operating the loader.

Start the engine, check for leaks and the proper fluid level in the reservoir.

LUBRICATION OF THE BOBCAT LOADER

Procedure

Figure 10-150-1



Lubricate the loader as specified in the *SERVICE SCHEDULE* Contents Page 10-01 for the best performance of the loader.

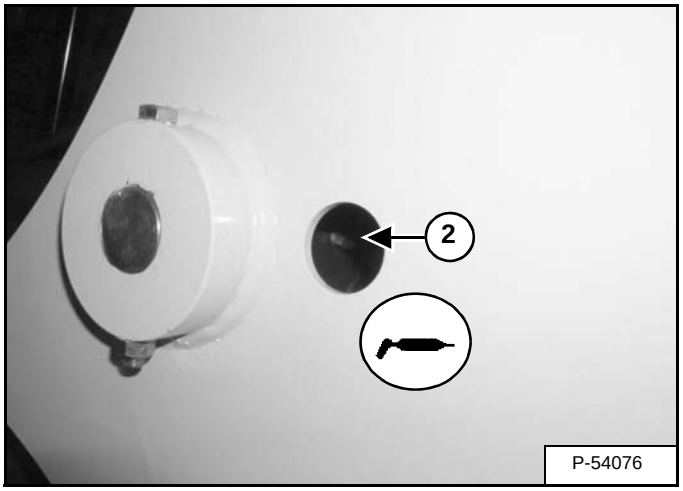
Record the operating hours each time you lubricate the Bobcat loader.

Always use a good quality lithium based multi-purpose grease. Apply lubricant until extra grease shows.

Lubricate the following locations on the loader:

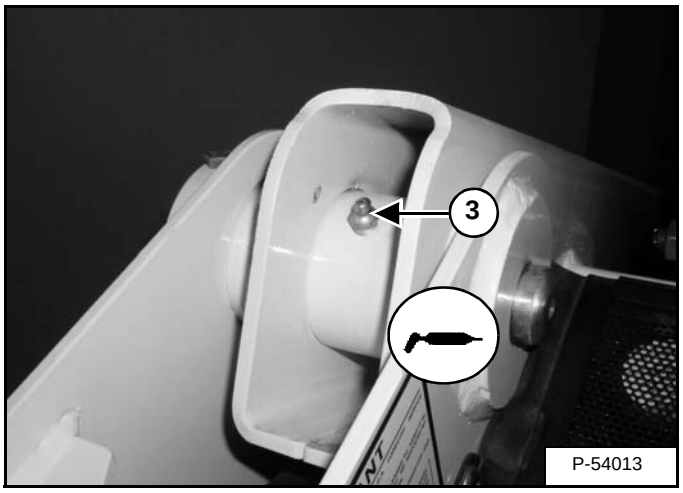
1. Rod End Lift Cylinder (Both Sides) **[Figure 10-150-1]**.

Figure 10-150-2



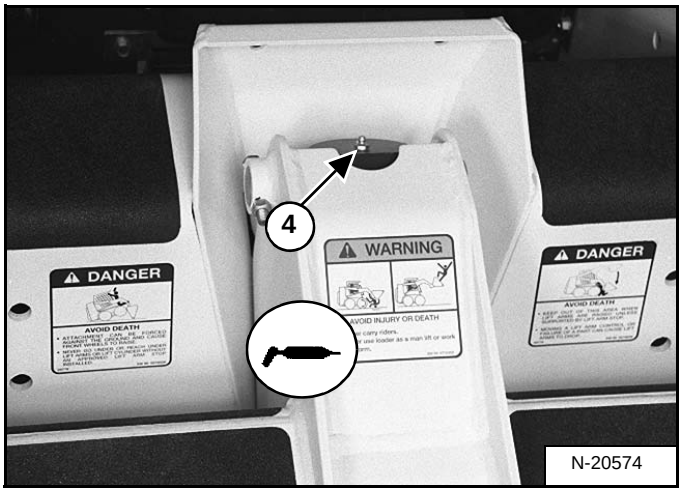
2. Base End Lift Cylinder (Both Sides) **[Figure 10-150-2]**.

Figure 10-150-3



3. Lift Arm Pivot Pin (Both Sides) **[Figure 10-150-3]**.

Figure 10-150-4



4. Base End Tilt Cylinder **[Figure 10-150-4]**.

HYDRAULIC/HYDROSTATIC SCHEMATIC

T140 (S/N 527111001 AND ABOVE)
(S/N 527211001 AND ABOVE)

(PRINTED JUNE 2005)
V-0709legend

LEGEND

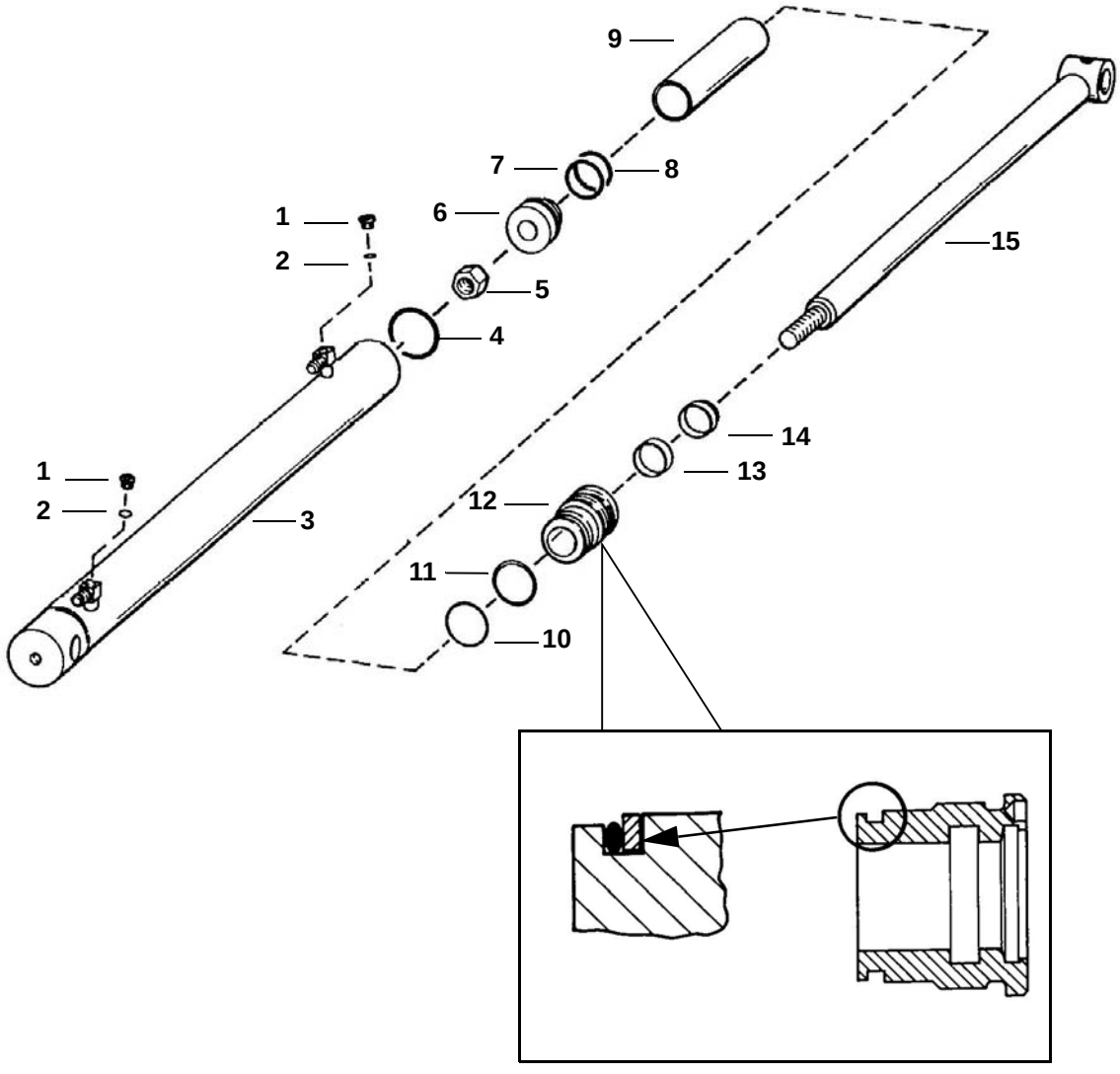
1. RESERVOIR:
   Capacity . . . . . 14 Qts. (13,2 L)
2. SPRING LOADED FILTER BY-PASS VALVE: 45-55 PSI (3,1-3,8 Bar)
3. DIFFERENTIAL PRESSURE SWITCH:
   36-44 PSI (2,5-3,0 Bar)
   Normally Closed
4. DRIVE MOTOR SHUTTLE VALVE
5. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
6. RELIEF VALVE - CHARGE INLET:
   220-270 PSI (15,1-18,6 Bar)
   at High Engine Idle
   With 140 degrees F. (49 degrees C.) Fluid
7. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
8. HYDRAULIC PUMP . . . . . Gear Type
   16.9 GPM (64 L/min.) at High Engine Idle
9. RELIEF VALVE - MAIN:
   2650-2750 PSI (182-189 Bar)
   at Front Quick Couplers
10. PORT RELIEF/ANTICAVITATION:
    3500 PSI (241,3 Bar)
11. ANTICAVITATION VALVE
12. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
13. PORT RELIEF/ANTICAVITATION (Optional)
    3100 PSI (213,8 Bar)
14. LOAD CHECK VALVE
15. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
16. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
17. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
18. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
19. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
20. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
21. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
22. FLOW DIVIDER ADJUSTMENT VALVE
23. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BASE
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - ROD
25. LOAD SHUTTLE VALVE - BLEED OFF
26. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO COIL
27. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - REAR AUXILIARY
28. RESTRICTOR - 0.140 inch (3,6 mm)
29. RESTRICTOR - 0.031 inch (0,8 mm)
30. RELIEF VALVE: 3300 PSI (228 Bar)
31. FILTER - HYDRAULIC (CANISTER)
32. FILTER - CASE DRAIN (SINTERED BRONZE)
33. FILTER - BICS CONTROL VALVE (SCREEN)
34. CHECK VALVE - BUCKET POSITION VALVE
35. RESTRICTION
36. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
37. SHUTTLE RELIEF VALVE
    (Not Adjustable - Factory Set)
    65 PSI (4,5 Bar)
38. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
39. CHECK VALVE - With 80 PSI (5,5 Bar) Spring
40. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
41. CHECK VALVE - BICS CONTROL VALVE
42. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE
43. PORT RELIEF/ANTICAVITATION VALVE
    3500 PSI (241,3 Bar)
44. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
45. RESTRICTION - 0.089 inch (2,26 mm)
46. RESTRICTION - 0.025 inch (0,6 mm)
47. RELIEF VALVE - 2000 PSI (137 Bar)
48. RELIEF VALVE - 1200 PSI (83 Bar)
49. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
50. CHECK VALVE - With 300 PSI (20,7 Bar) Spring with 0.016 inch (0,40 mm) orifice
51. HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE
52. CHECK VALVE
53. RELIEF VALVE - BRAKE PRESSURE
    500 PSI (34,5 Bar)
54. FILTER - Bob-Tach Valve
55. CHECK VALVE

NOTE: Unless otherwise specified, springs have NO significant pressure value.

Printed in U.S.A.

Identification

1. Plug
2. O-ring
3. Cylinder
4. O-ring
5. Nut
6. Piston
7. Seal
8. O-ring
9. Spacer
10. Seal
11. O-ring
12. Head
13. Rod Seal
14. Wiper Seal
15. Rod



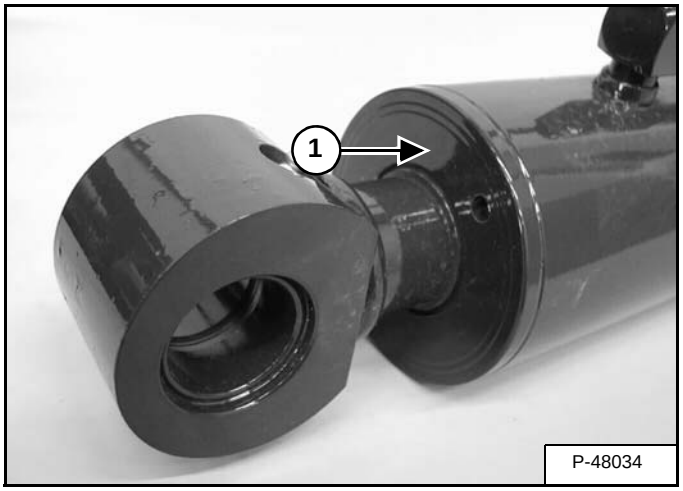
Disassembly

Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook
Spanner Wrench

Hold the hydraulic cylinder over a drain pan and move the rod in and out slowly to remove the fluid from the cylinder.

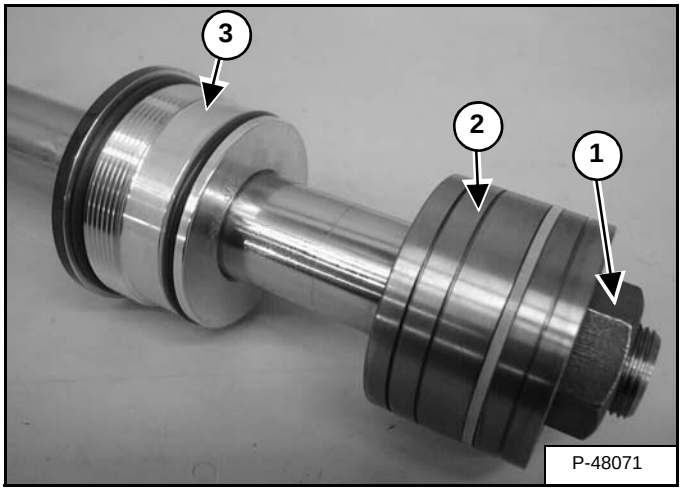
Figure 20-21-9



Put the base end of the cylinder in a vise.

Use a spanner wrench to loosen the head (Item 1) **[Figure 20-21-9]**.

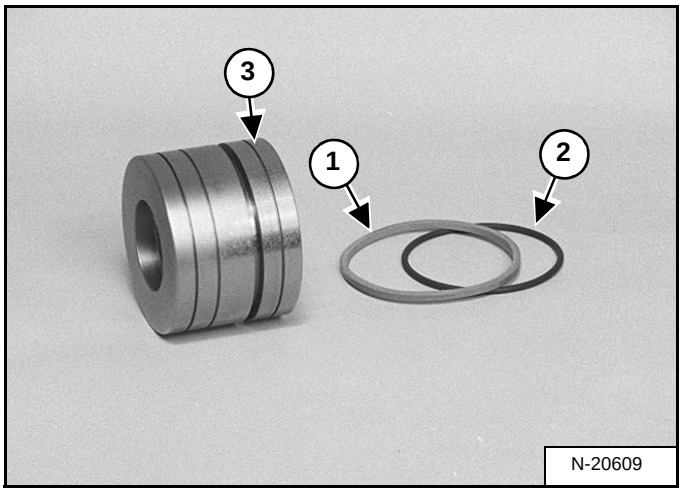
Figure 20-21-10



Remove the head and rod assembly from the cylinder **[Figure 20-21-10]**. Put the rod end in a vise.

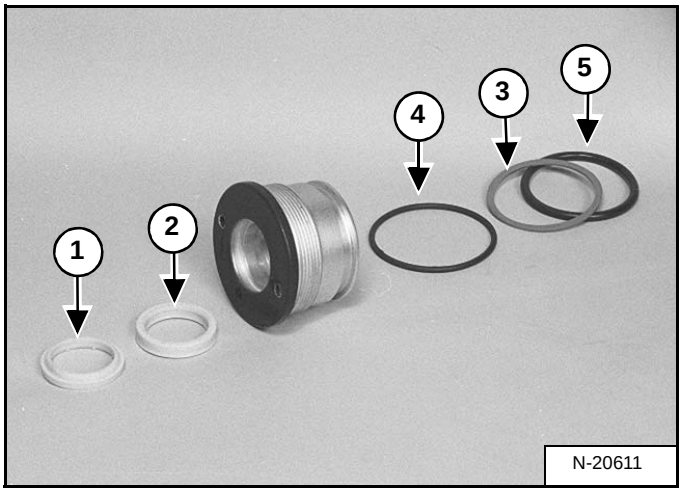
Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-21-10]**.

Figure 20-21-11



Remove the seal (Item 1), and O-ring (Item 2) from the piston (Item 3) **[Figure 20-21-11]**.

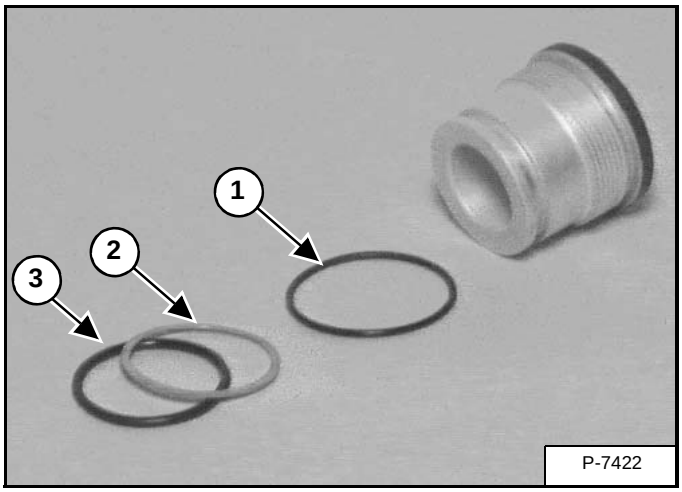
Figure 20-21-12



Remove the wiper seal (Item 1), and rod seal (Item 2), the back up washer (Item 3) the thin O-ring (Item 4) and the thick O-ring (Item 5) **[Figure 20-21-12]** from the head.

Assembly (Cont'd)

Figure 20-22-14

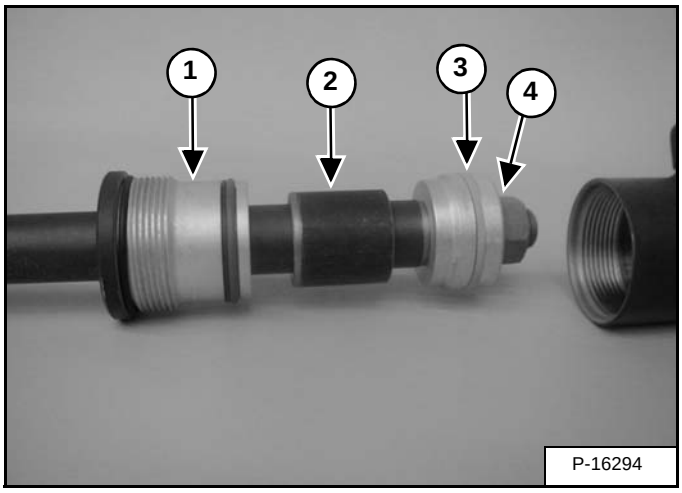


Install the thin O-ring (Item 1) **[Figure 20-22-14]**.

Install the back-up washer (Item 2) and thick O-ring (Item 3) **[Figure 20-22-14]** into the groove on the head.

NOTE: Clean and dry the threads before installing the nut. Install the new nut from the seal kit.

Figure 20-22-15



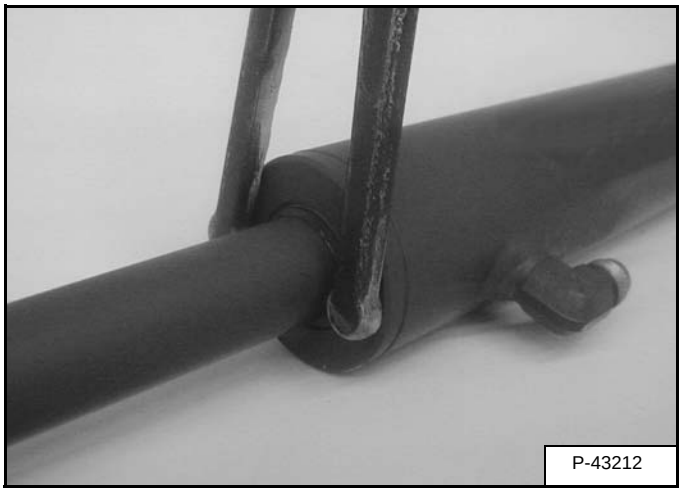
Install the head (Item 1), and spacer (Item 2) **[Figure 20-22-15]**.

Install the piston (Item 3) **[Figure 20-22-15]**.

Lift Cylinder: Grease the piston where the nut contacts the piston, do not get grease on the threads. Install the new nut (Item 4) **[Figure 20-22-15]**.

Tighten the nut to 90 ft.-lb. (122 N•m) torque.

Figure 20-22-16

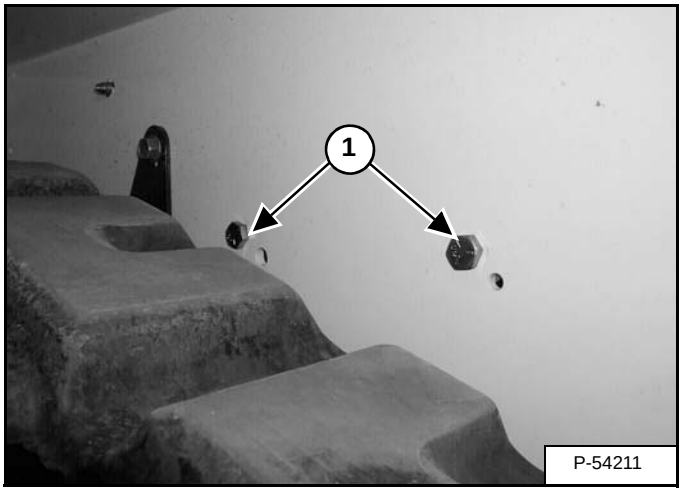


Put the base end of the hydraulic cylinder in a vise.

Tighten the head using a spanner wrench **[Figure 20-22-16]**.

Removal And Installation (Cont'd)

Figure 20-40-15



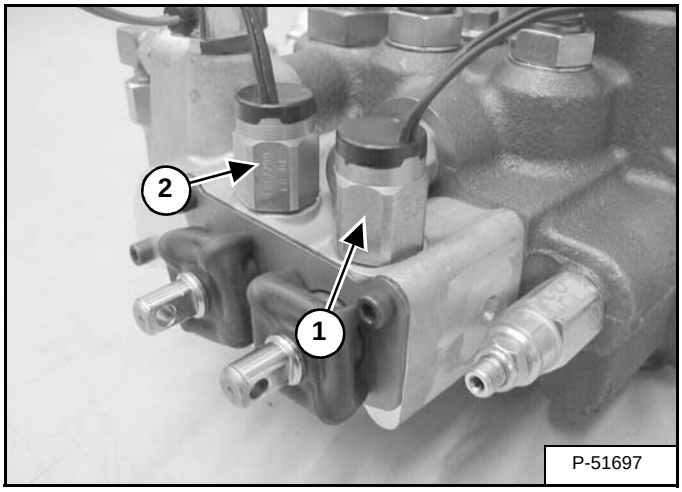
Remove the two mounting bolts (Item 1) **[Figure 20-40-15]** mounting the control valve to the side of the loader.

Remove the control valve from the loader.

Reverse procedure for installation.

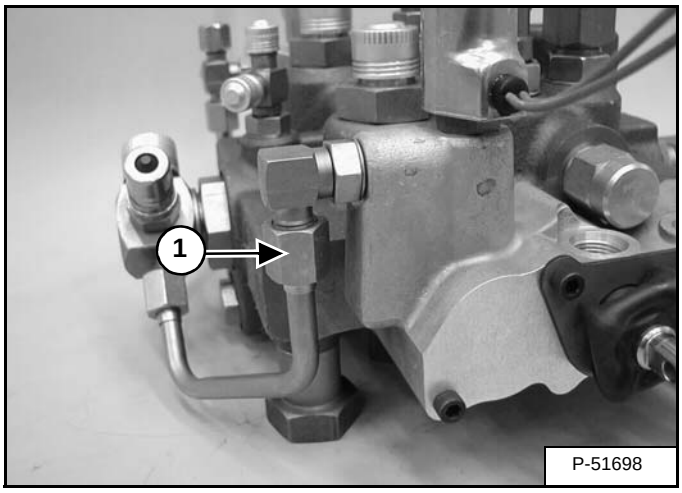
End Cap/Spool Lock Block Removal and Installation

Figure 20-40-41



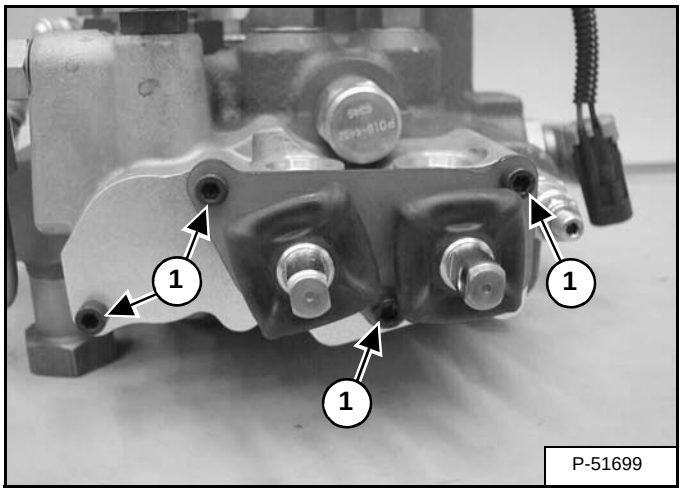
Remove the lift spool lock solenoid (Item 1) and the tilt spool lock solenoid (Item 2) **[Figure 20-40-41]** from the end cap/spool lock block.

Figure 20-40-42



Disconnect the tube line (Item 1) **[Figure 20-40-42]** from the end cap/spool lock block.

Figure 20-40-43

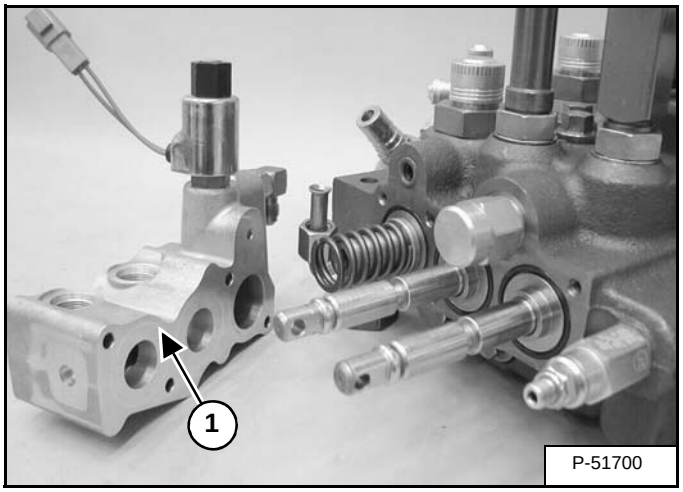


Remove the four end cap/spool lock block mount screws (Item 1) **[Figure 20-40-43]**.

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.

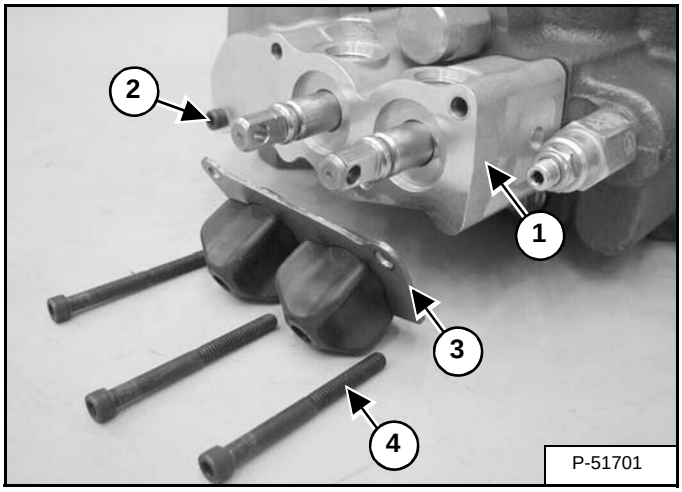
Figure 20-40-44



Remove the end cap/spool lock block (Item 1) **[Figure 20-40-44]** from the control valve.

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

Figure 20-40-80

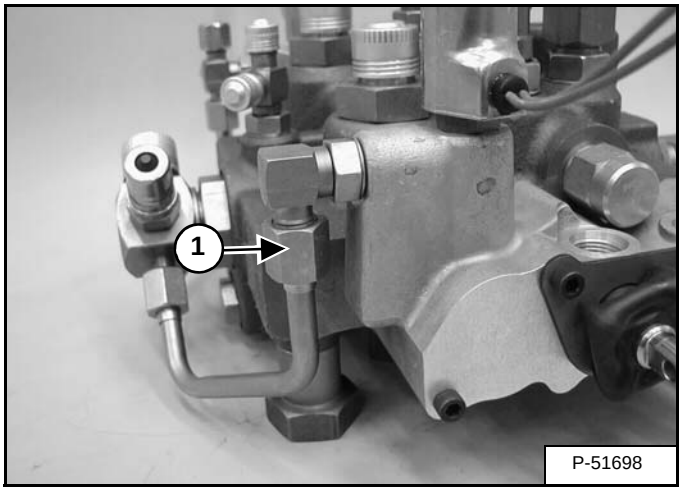


Install the end cap/spool lock block (Item 1) and the mount bolt (Item 2) **[Figure 20-40-80]**.

Install the lift and tilt spool rubber boots and mount plate (Item 3) and install the three mounting screws (Item 4) **[Figure 20-40-80]**.

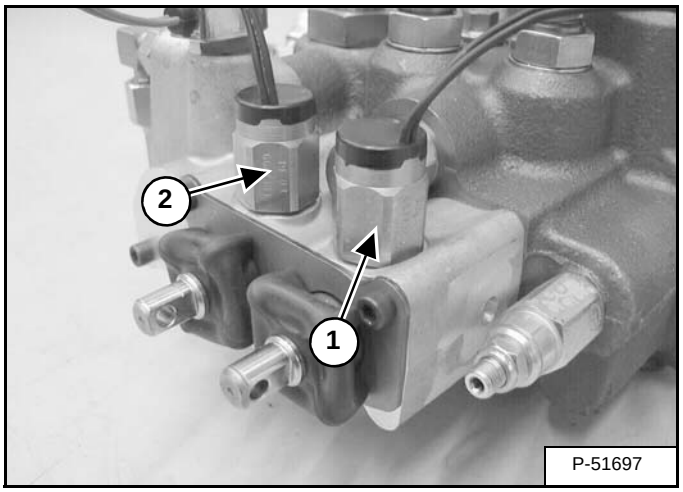
Installation: Tighten the screws to 90-100 in.-lb. (10-11,3 N•m) torque.

Figure 20-40-81



Connect the tubeline (Item 1) **[Figure 20-40-81]**.

Figure 20-40-82



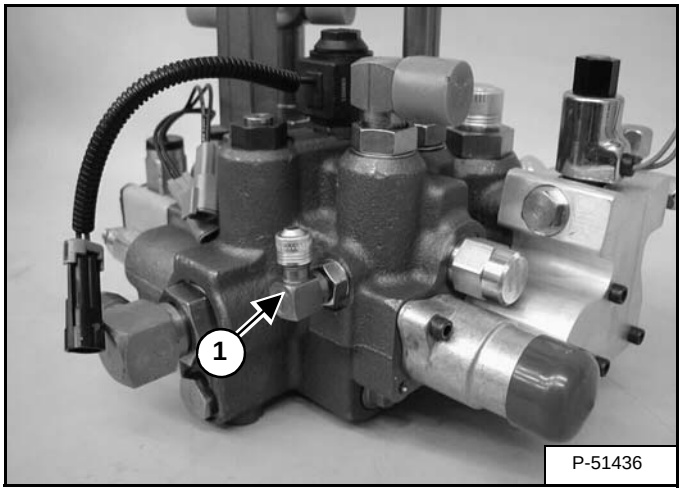
Use an Ohm meter to measure the lock solenoid coils resistance.

The correct resistance for the coil is **5.5 ± .28 Ohms**.

Installation: Install the lift spool (Item 1) and tilt spool (Item 2) **[Figure 20-40-82]** lock solenoids and tighten to 38-45 ft.-lb. (52-61 N•m) torque.

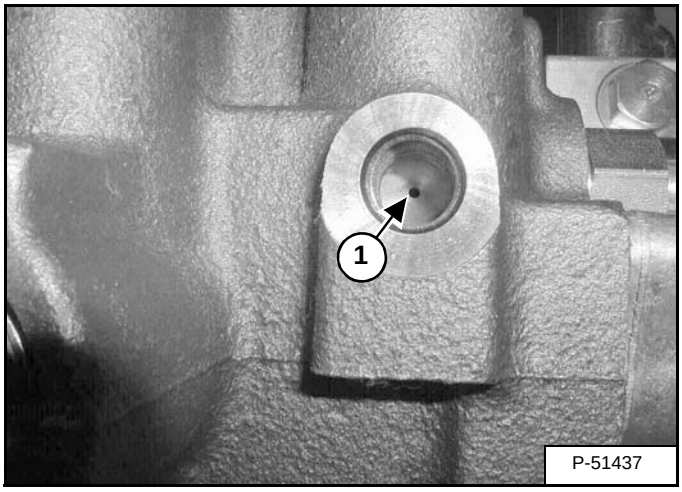
BICS Valve, Lift Arm By-Pass Orifice Disassembly And Assembly

Figure 20-40-115



Remove the fitting (Item 1) **[Figure 20-40-115]** from the valve.

Figure 20-40-116

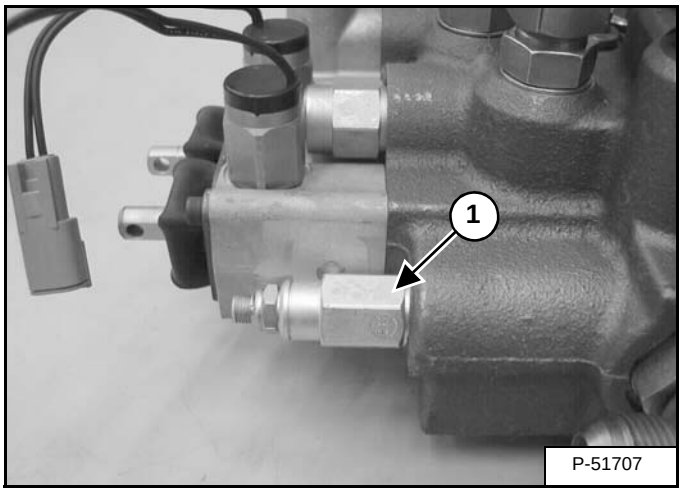


Check the lift arm by-pass orifice (Item 1) **[Figure 20-40-116]**.

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

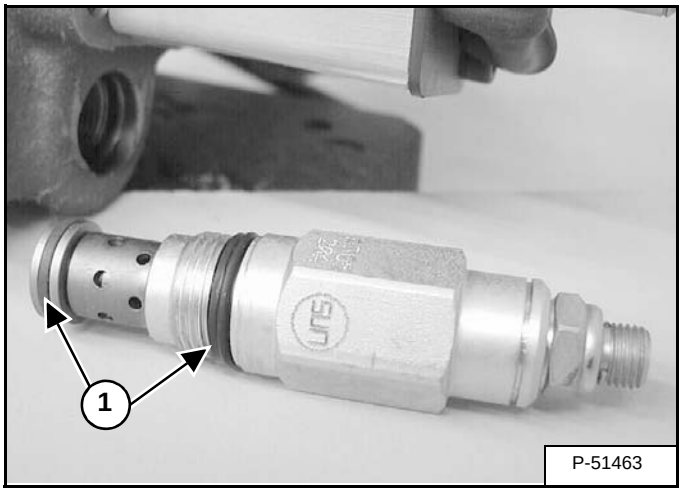
Main Relief Valve

Figure 20-40-117



Remove the main relief valve (Item 1) **[Figure 20-40-117]**.

Figure 20-40-118

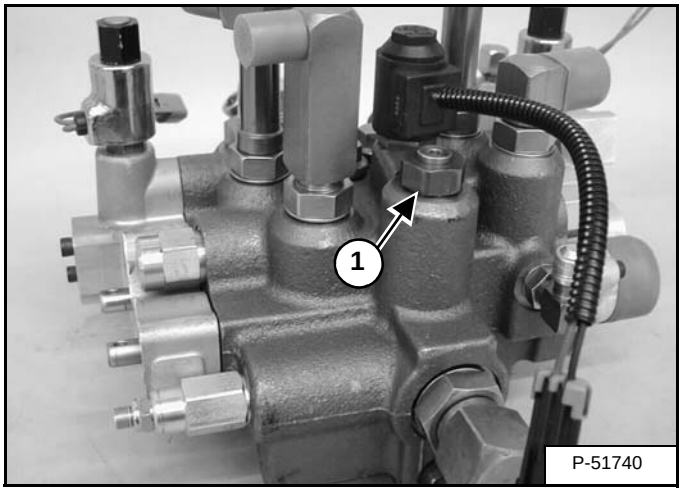


Remove the O-rings from the main relief valve (Item 1) **[Figure 20-40-118]**.

Installation: Always use new O-rings. Tighten to 38-45 ft.-lb. (52-61 N•m) torque.

BICS Valve, Load Check Valve Removal And Installation (Lift)

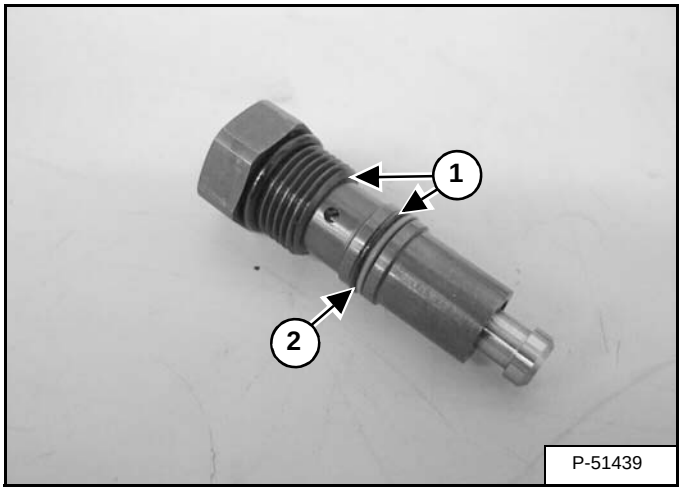
Figure 20-41-25



Remove the lift load check valve (Item 1) **[Figure 20-41-25]**.

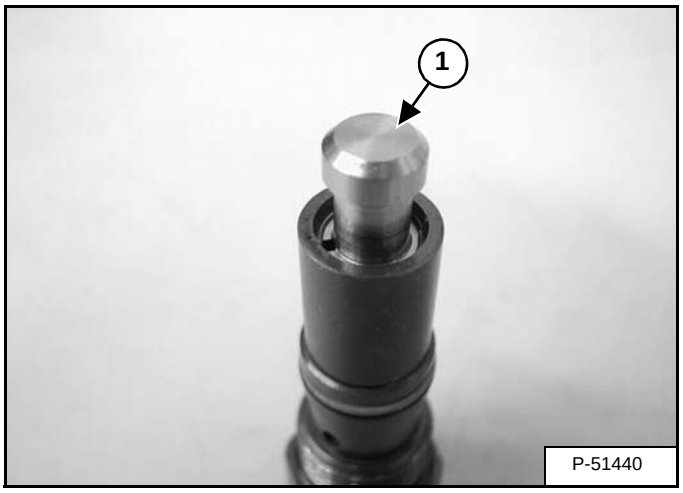
Installation: Lubricate the o-ring and tighten the valve to 55-65 ft.-lb. (75-88 N•m) torque.

Figure 20-41-26



Remove and install new O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-26]**.

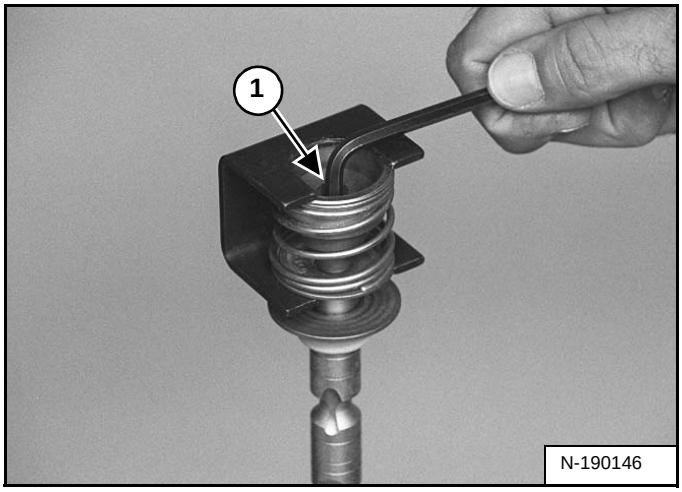
Figure 20-41-27



Check for free movement of the load check valve (Item 1) **[Figure 20-41-27]**.

Lift Spool Removal and Installation (Cont'd)

Figure 20-41-57

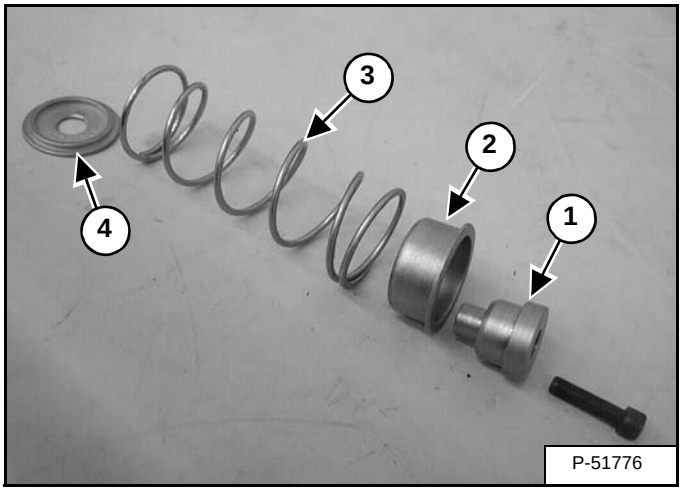


Remove the bolt (Item 1) **[Figure 20-41-57]** holding the centering spring to the spool.

Installation: Tighten the bolt to 90-100 in.-lb. (10,2-11,3 N•m) torque.

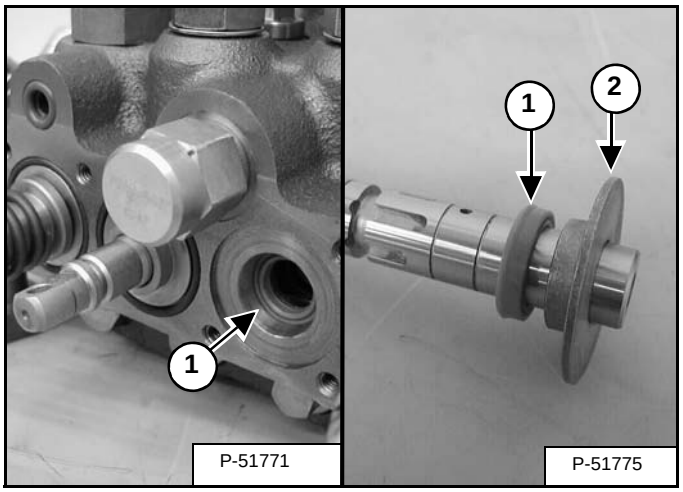
Remove spring tool from the spring assembly.

Figure 20-41-58



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-41-58]**.

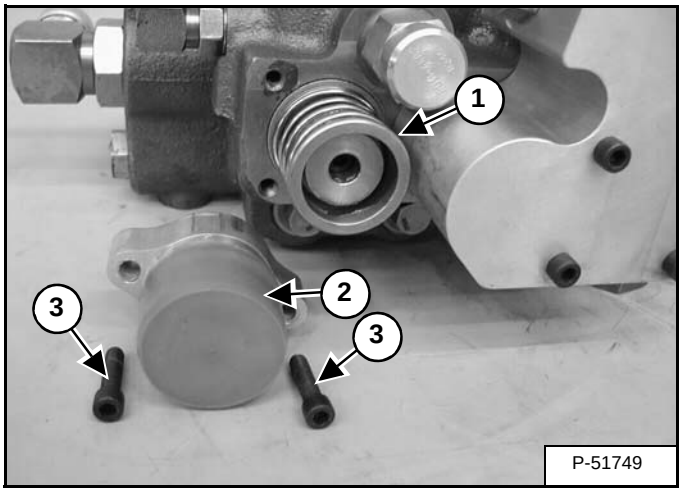
Figure 20-41-59



Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-41-59]**.

Assembly: Always use a new spool seal.

Figure 20-41-60



Install the lift spool assembly (Item 1) **[Figure 20-41-60]** in the spool bore.

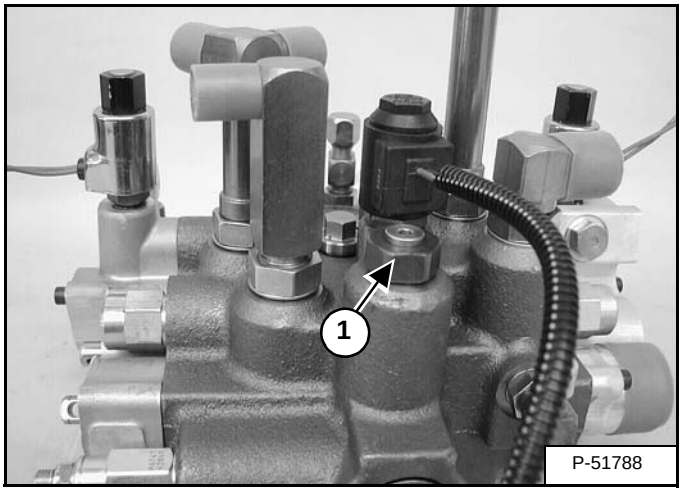
Install the end cap (Item 2) **[Figure 20-41-60]**.

Install the mounting screws (Item 3) **[Figure 20-41-60]**.

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

BICS Valve, Check Valve Removal And Installation

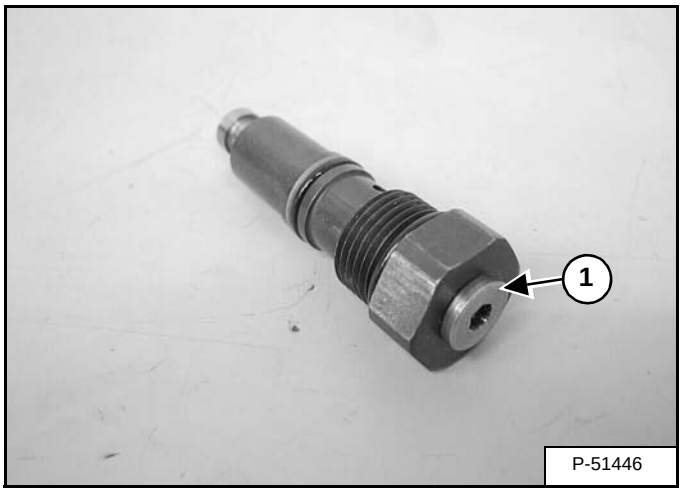
Figure 20-41-92



Remove the BICS valve (Item 1) **[Figure 20-41-92]**.

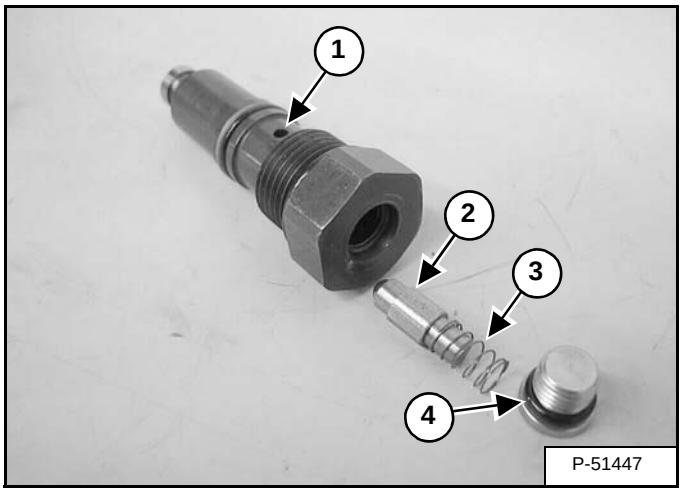
Installation: Lubricate the o-ring and tighten the valve to 55-65 ft.-lb. (75-88 N•m) torque.

Figure 20-41-93



Remove the plug (Item 1) **[Figure 20-41-93]** from the top of the BICS valve.

Figure 20-41-94



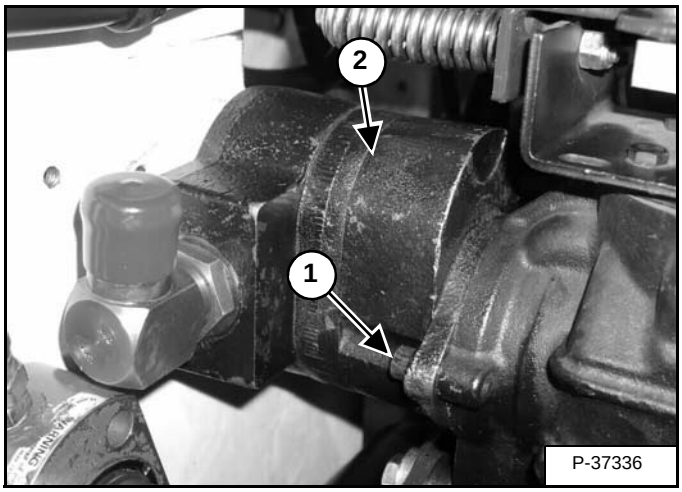
Check that there is no blockage in the orifice (Item 1) **[Figure 20-41-94]**.

Inspect the check valve (Item 2) and spring (Item 3) **[Figure 20-41-94]**.

Replace the O-ring (Item 4) **[Figure 20-41-94]** on the plug before installation.

Removal And Installation (Cont'd)

Figure 20-60-13

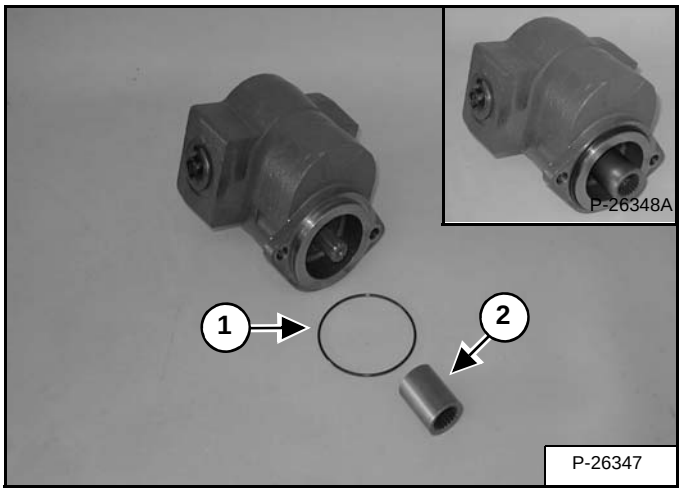


Remove the two mounting bolts (Item 1) **[Figure 20-60-16]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 27-37 ft.-lb. (37-50 N•m) torque.

Remove the hydraulic pump (Item 2) **[Figure 20-60-16]** from the loader.

Figure 20-60-14



Remove the O-ring (Item 1) **[Figure 20-60-17]**.

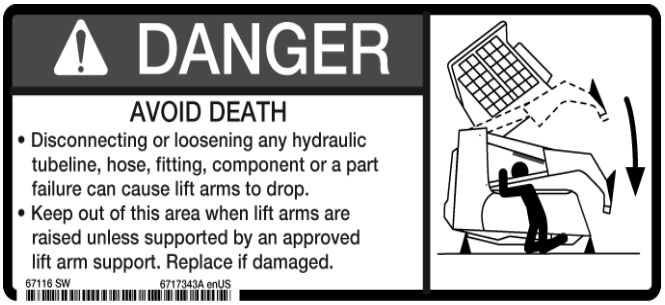
Remove the coupler (Item 2) **[Figure 20-60-17]** from the hydraulic pump shaft.

Reverse the removal procedure to install the hydraulic pump.

Installation: Use a new O-ring (Item 1) **[Figure 20-60-17]** when installing the hydraulic pump.

HYDRAULIC FLUID RESERVOIR

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

Start the engine. Raise the lift arms and install an approved lift arm support device. (See Installing Lift Arm Support Device on Page 10-20-1.)

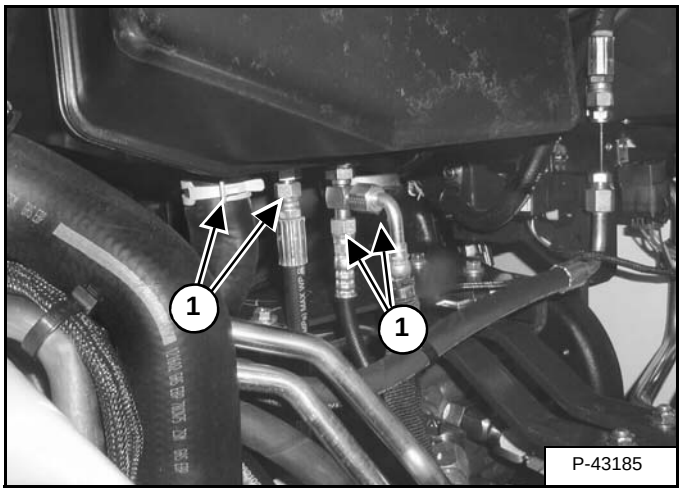
Stop the engine.

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

Figure 20-80-1

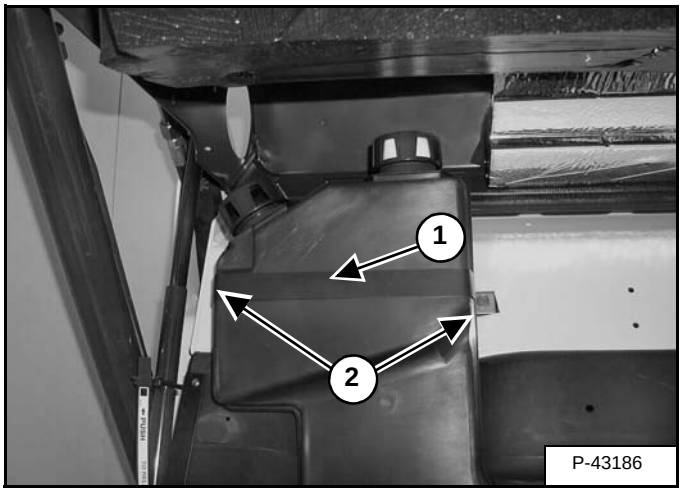
Drain the hydraulic fluid reservoir **[Figure 20-80-1]**. (See Replacing Hydraulic Fluid on Page 10-120-3.)

Figure 20-80-2



Mark and disconnect the hoses (Item 1) **[Figure 20-80-2]** from the hydraulic fluid reservoir.

Figure 20-80-3



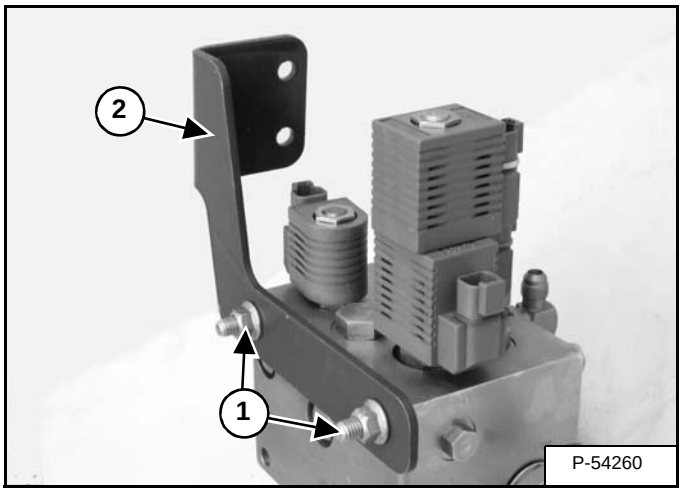
Remove the hydraulic reservoir bracket (Item 1) by removing the two mounting bolts (Item 2) **[Figure 20-80-3]** .

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

Remove the reservoir.

Disassembly And Assembly

Figure 20-100-7



Remove the two mount bolts (Item 1) from the diverter valve mount plate (Item 2) **[Figure 20-100-7]** and remove the mount plate.

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 20-100-8

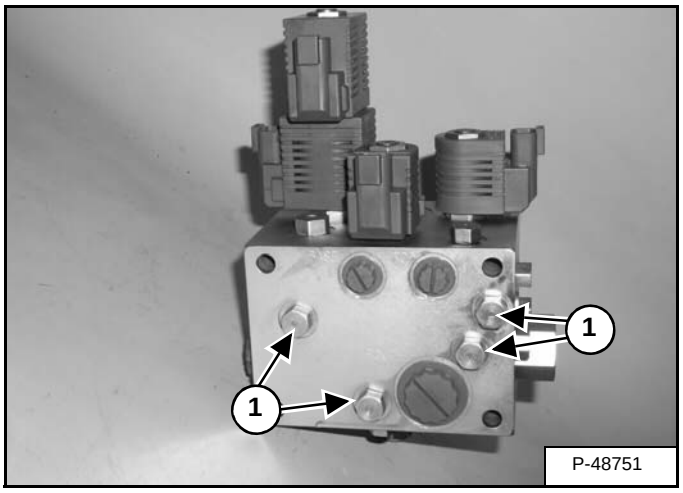
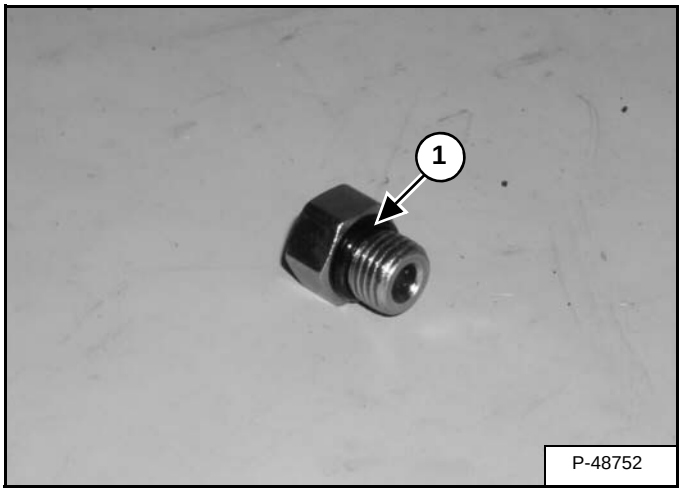


Figure 20-100-9



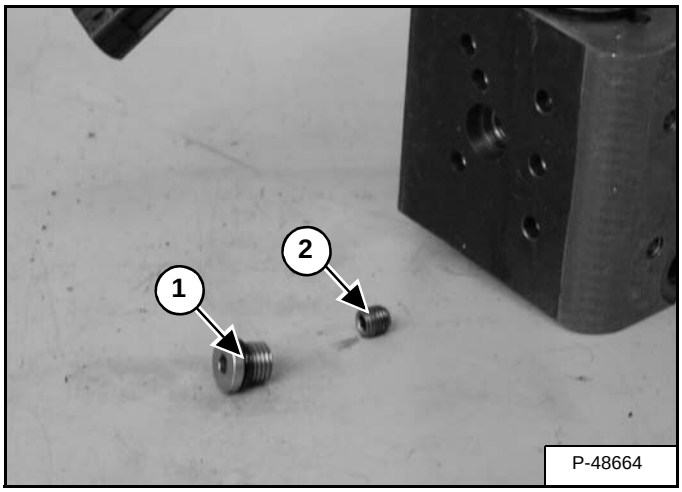
Clean the diverter valve to remove dirt before disassembly. Valve ports are labeled for correct assembly.

Several plugs (Item 1) **[Figure 20-100-8]** & **[Figure 20-100-9]** are located all over the diverter valve and can be removed for cleanout purposes..

Installation: Put oil on O-rings and back-up washers. Tighten to 10 ft.-lb. (13,6 N•m) torque.

Disassembly And Assembly (Cont'd)

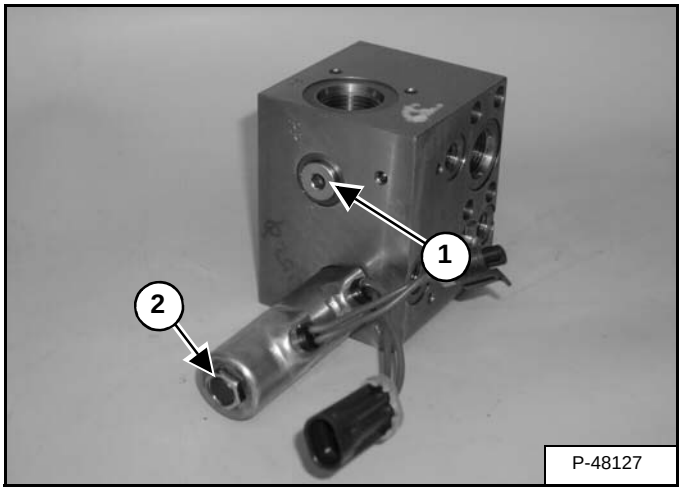
Figure 20-110-12



Remove the orifice screw (Item 2) located behind the plug (Item 1) **[Figure 20-110-12]**.

Installation: Tighten the orifice screw (Item 2) **[Figure 20-110-12]** to 6-8 ft.-lb. (8,1-10,8 N•m) torque.

Figure 20-110-13



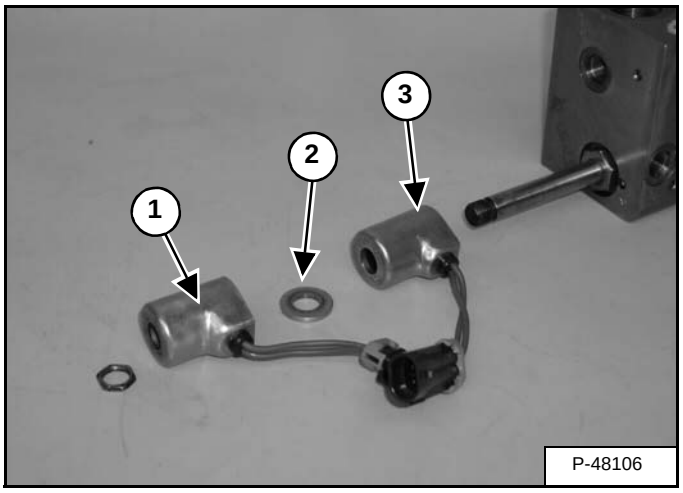
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-110-13]**.

Remove the solenoid nut (Item 2) **[Figure 20-110-13]**.

Installation: Tighten the solenoid valve stem nut to 15-45 in.-lb. (1,7-5,1 N•m) torque.

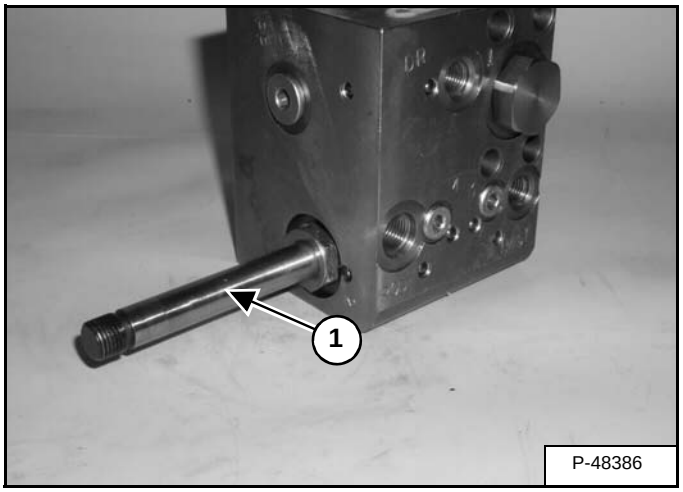
Figure 20-110-14



Remove the first solenoid coil (Item 1), spacer (Item 2) and the second solenoid coil (Item 3) **[Figure 20-110-14]**.

NOTE: Remember the solenoid coil orientation for ease of installation.

Figure 20-110-15

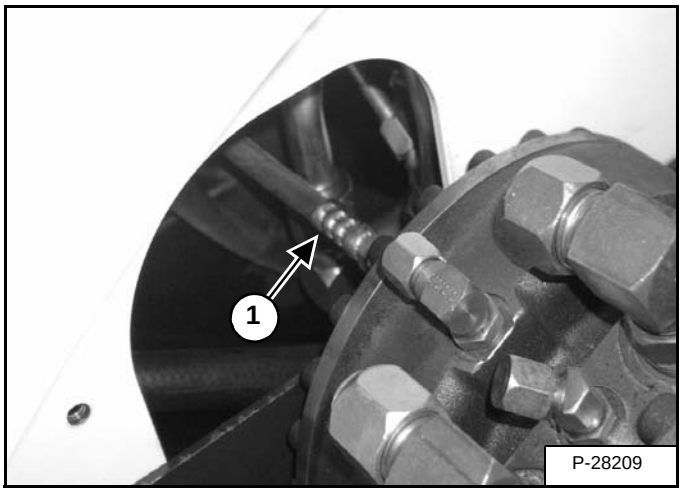


Remove the the solenoid stem (Item 1) **[Figure 20-110-15]**.

Installation: Tighten the solenoid stem to to 20-25 ft.-lb. (27,1-34 N•m) torque.

Removal And Installation (Cont'd)

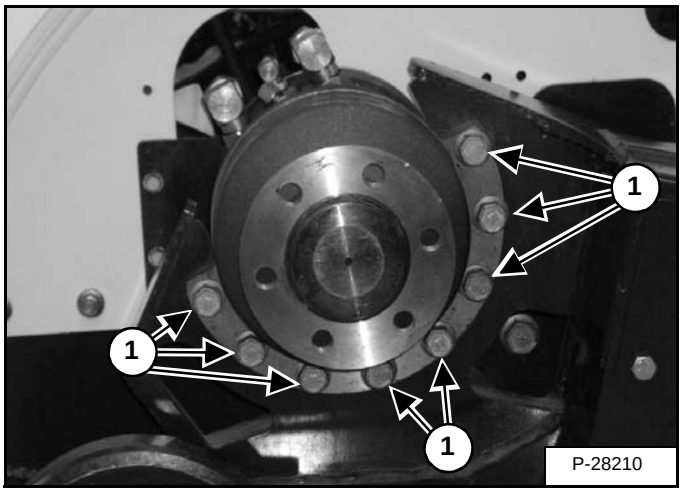
Figure 30-20-7



Mark and remove the brake power assist hose (Item 1) **[Figure 30-20-7]**.

Cap and plug all hydraulic lines and hoses.

Figure 30-20-8



With an arm hoist support the hydraulic motor.

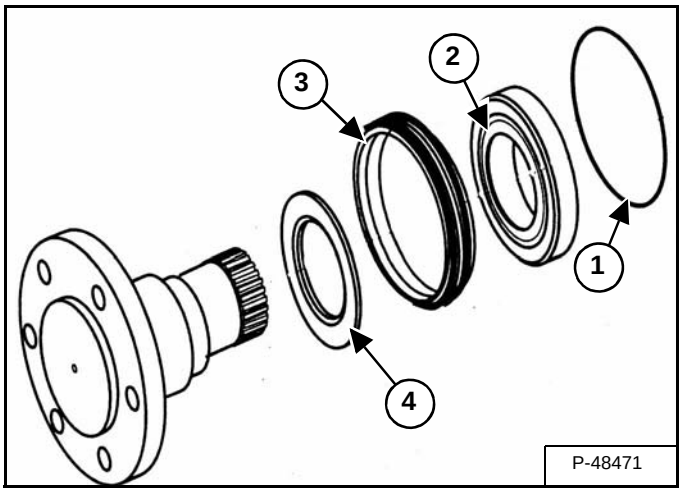
Remove the eight hydraulic motor mounting bolts (Item 1) **[Figure 30-20-8]**.

Installation: Tighten the motor mounting bolts to 175-190 ft.-lb. (240-260 N•m) torque. Apply thread locker equivalent to (Loctite™ 242).

Remove the hydrostatic motor from the loader.

Disassembly (Cont'd)

Figure 30-20-37

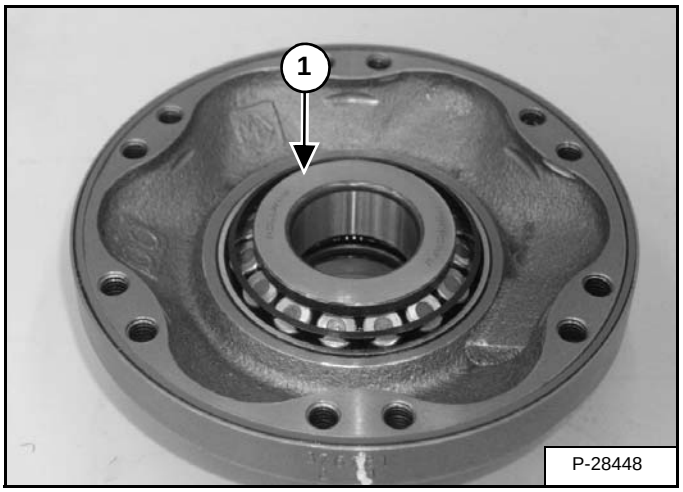


Use a bearing puller to remove the bearing from the shaft **[Figure 30-20-37]**.

NOTE: The bearing will be destroyed during the removal procedure. Be sure to have a new bearing on hand before removing the old bearing.

Replace the O-ring (Item 1), bearing (Item 2), face seal (Item 3) and the bushing (Item 4) **[Figure 30-20-37]**.

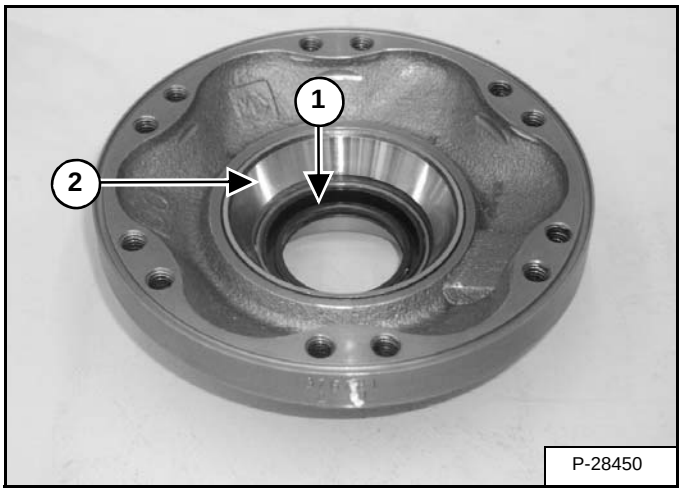
Figure 30-20-38



Remove and inspect the bearing (Item 1) **[Figure 30-20-38]**.

Replace the bearing if worn or damaged.

Figure 30-20-39

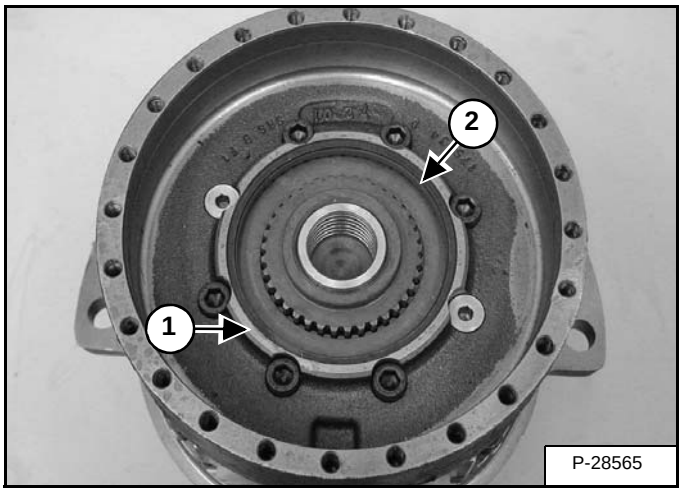


Remove the shaft seal (Item 1) **[Figure 30-20-39]**.

Remove the bearing cup (Item 2) **[Figure 30-20-39]** if it needs replacement.

Assembly (Cont'd)

Figure 30-20-72

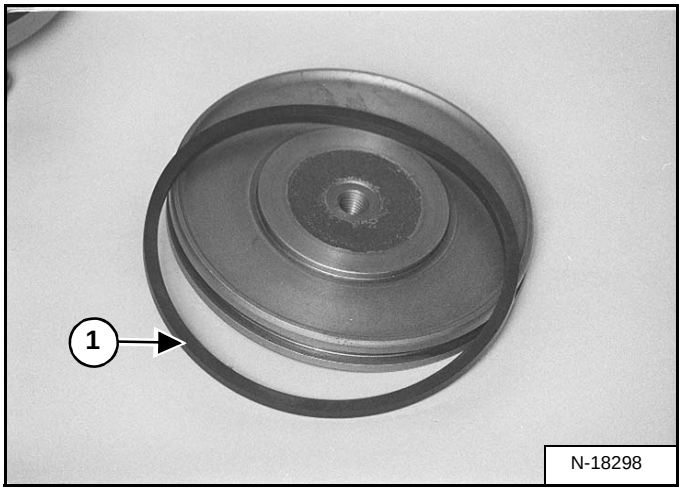


Install a new piston inner seal (Item 1) **[Figure 30-20-72]**.

NOTE: Install seal with metal case end towards the brake pack.

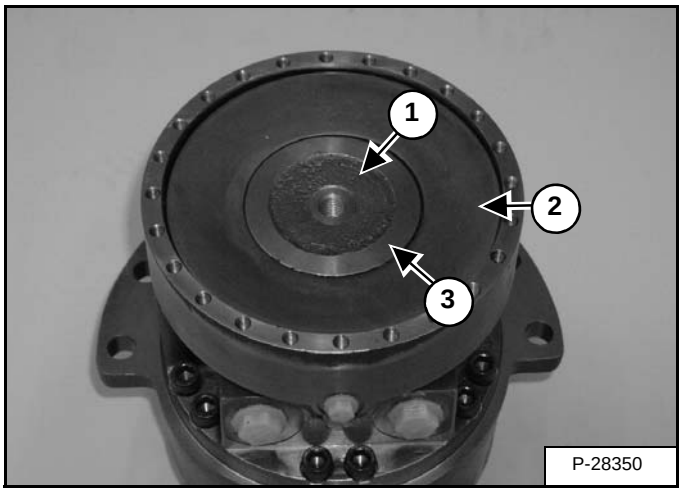
Install snap ring (Item 2) **[Figure 30-20-72]**.

Figure 30-20-73



Install a new piston seal (Item 1) **[Figure 30-20-73]** on the piston.

Figure 30-20-74

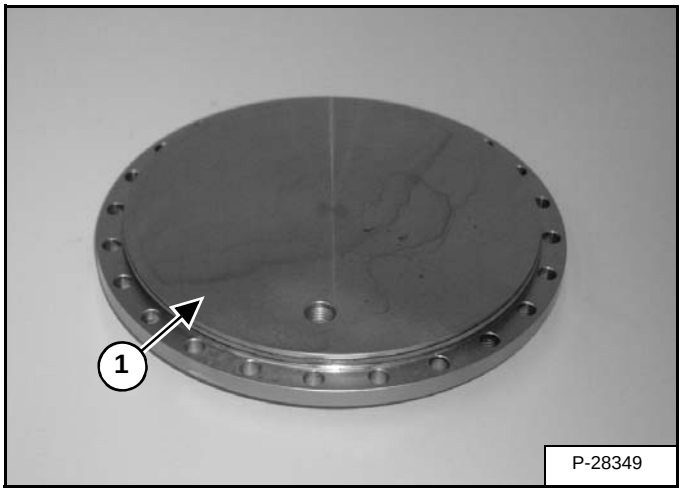


Put a slight amount of oil on the piston seal.

Install the piston (Item 1) **[Figure 30-20-74]** in the brake housing.

Install disc spring (Item 2) on the top of the piston. Disc spring will fit flush with piston center shoulder (Item 3) **[Figure 30-20-74]**.

Figure 30-20-75



Replace O-ring on cover (Item 1) **[Figure 30-20-75]** and slightly coat with oil.

Parts Identification (Left Half) (Cont'd)

Ref.	Description
1.	Snap Ring
2.	Washer
3.	Seal
4.	Snap Ring
5.	Snap Ring
6.	Bearing
7.	Snap Ring
8.	Key
9.	Shaft
10.	Housing
11.	Plug
12.	O-ring
13.	Bearing
14.	Seal
15.	O-ring
16.	Cover
17.	Bolt
18.	Pin
19.	O-ring
20.	Plug
21.	Bearing
22.	O-ring
23.	Plate
24.	Bolt
25.	Swash Plate
26.	Wear Plate
27.	Piston Assembly
28.	Piston Retainer
29.	Retainer
30.	Washer
31.	Pin
32.	Retainer
33.	Block
34.	Washer
35.	Spring
36.	Washer
37.	Washer
38.	Valve Plate
39.	Pin
40.	Gasket
41.	Bearing
42.	Plug
43.	Poppet
44.	Spring
45.	Shim
46.	O-ring
47.	Plug
48.	Relief Valve
49.	O-ring
50.	O-ring
51.	Plug
52.	Pin
53.	O-ring
54.	Coupler
55.	O-ring
56.	Bolt
57.	O-ring
58.	O-ring
59.	Relief Valve

Assembly (Cont'd)

Figure 30-40-43

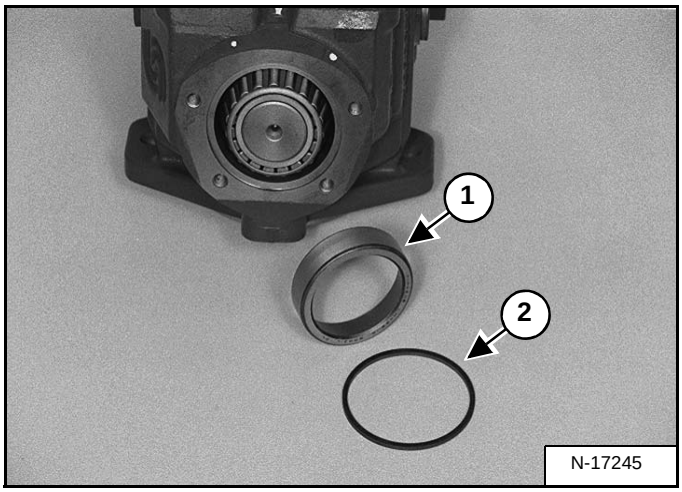
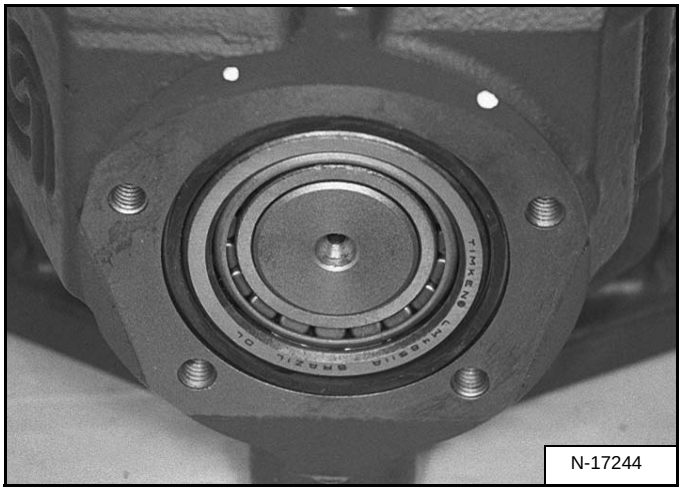
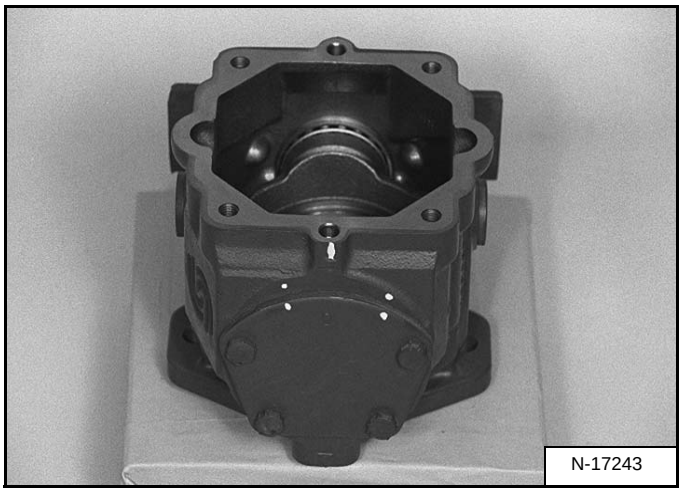


Figure 30-40-44



Install the bearing race (Item 1) **[Figure 30-40-43]** and O-ring (Item 2) **[Figure 30-40-43]** at the lower trunnion as shown in **[Figure 30-40-44]**.

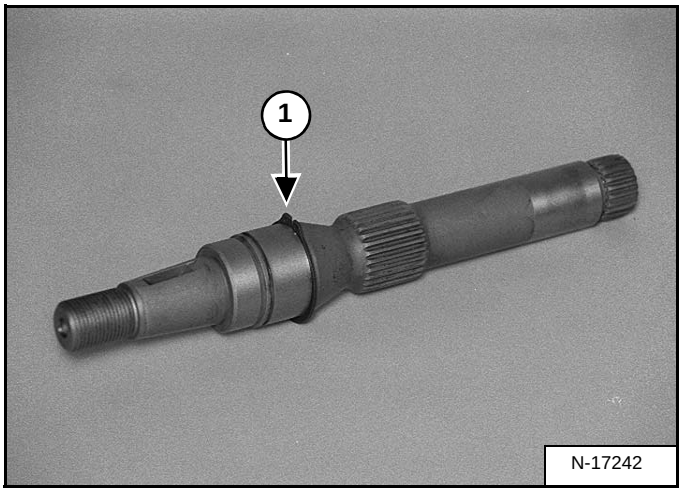
Figure 30-40-45



Align the marks on the lower trunnion cover and pump housing as shown in **[Figure 30-40-45]**.

Install the four mounting bolts and tighten to 18-22 ft.-lb. (24-30 N•m) torque.

Figure 30-40-46

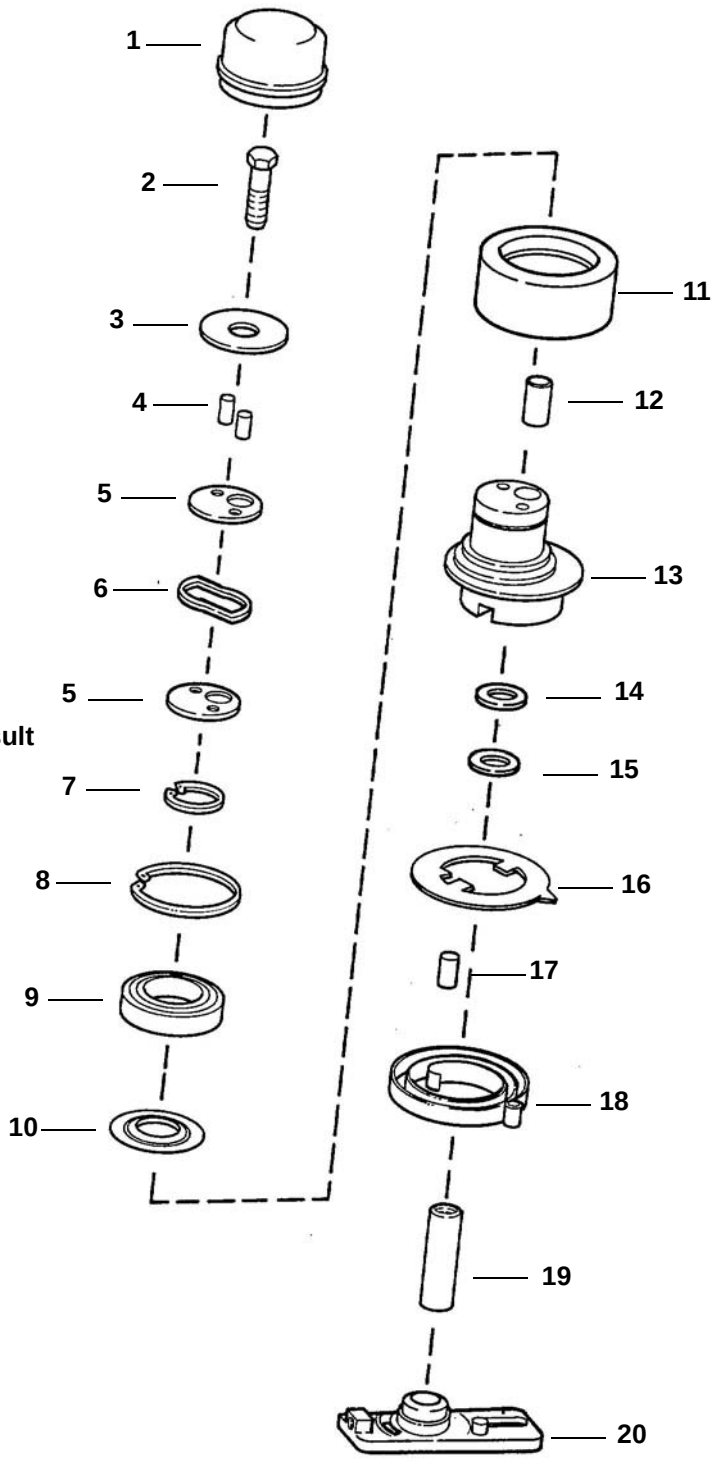


Install the snap ring (Item 1) **[Figure 30-40-46]** on the pump shaft.

Tensioner Pulley Parts Identification

1. Cover
2. Bolt
3. Washer
4. Pins
5. Washer
6. Spring
7. Snap Ring
8. Snap Ring
9. Bearing
10. Dust Shield
11. Pulley
12. Bushing
13. Hub
14. Washer
15. Seal
16. Arrow Indicator Plate
17. Locating Pin
18. Spring
19. Shaft
20. Bracket

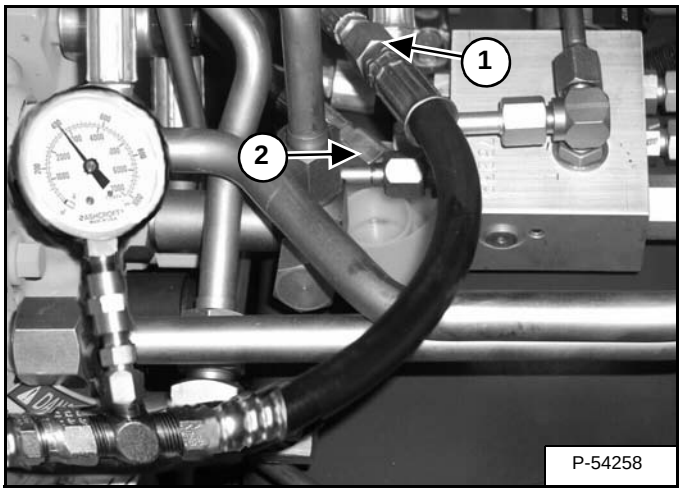
NOTE: Drive idler parts are not available individually. Consult parts catalog for available sub-assemblies.



E-2296

Right Motor Brake Test (Cont'd)

Figure 40-10-5



Connect the port-a-power and gauge to the right motor brake release hose (Item 1) **[Figure 40-10-5]**.

Drain the right motor power assist hose (Item 2) **[Figure 40-10-5]** into a container.

Pump the port-a-power up to 400 PSI (Max. 435 PSI).

Verify that the brake release holds pressure and hydraulic fluid flows from the power assist hose.

If the brake does not hold pressure and/or hydraulic fluid does not flow, the motor needs to be removed and serviced.

If the brake holds pressure and hydraulic fluid flows from power assist hose, then brake is okay.

Left Motor Brake Test

⚠ WARNING

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.

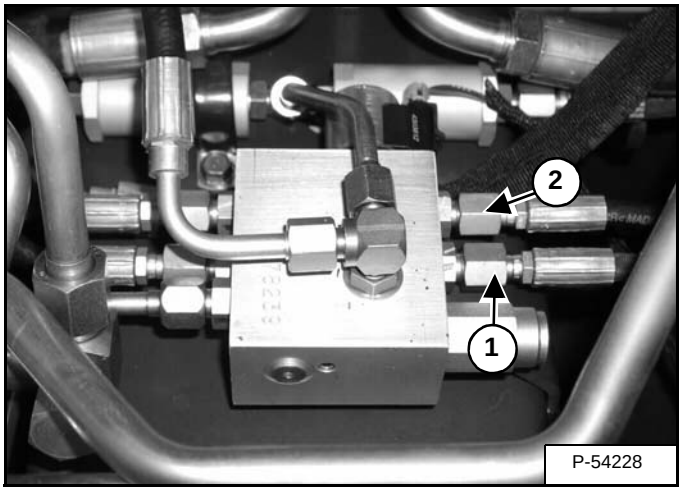
W-2072-0496

⚠ WARNING

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 which can result in injury or death.

W-2103-1285

Figure 40-10-6

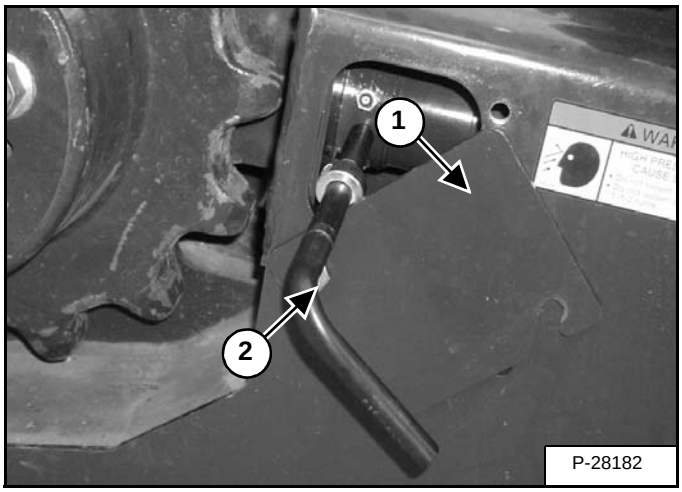


Mark and disconnect the left motor power assist host (Item 1) **[Figure 40-10-6]** from the A2 fitting on the brake block.

Mark and disconnect the left motor brake release (Item 2) **[Figure 40-10-6]** from the B2 fitting on the brake block.

Track Removal And Installation (Cont'd)

Figure 40-20-13



Pivot the track cover (Item 1) **[Figure 40-20-13]** against the MEL tool and lock the mount bolt (Item 2) **[Figure 40-20-13]**.

Give the MEL tool/bleed fitting a 1/4 turn, counterclockwise to release the pressure from the spring assembly.

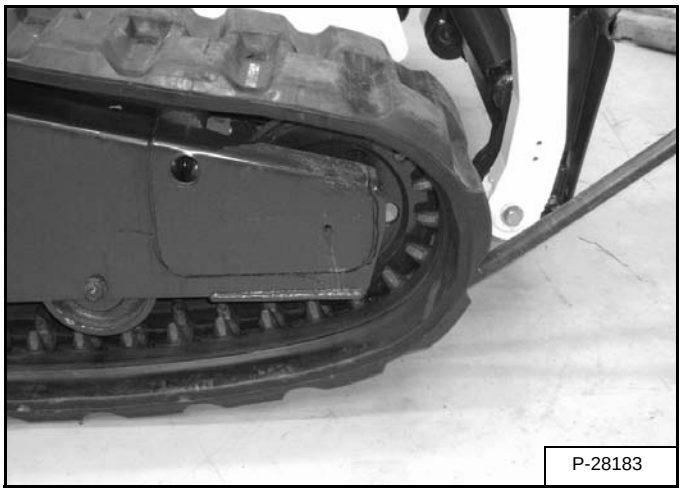
Turn the MEL tool/bleed fitting one more complete turn counterclockwise.

IMPORTANT

Fluid such as engine oil, hydraulic fluid, coolants, grease, etc. must be disposed of in an environmentally safe manner. Some regulations require that certain spills and leaks on the ground must be cleaned in a specific manner. See local, state and federal regulations for the correct disposal.

I-2067-0499

Figure 40-20-14



With a bar pry, move the front idler assembly toward the rear of the track assembly until all track tension has been released **[Figure 40-20-14]**.

Figure 40-20-15

With pry bars, pry the track up and over the front idler **[Figure 40-20-15]**.

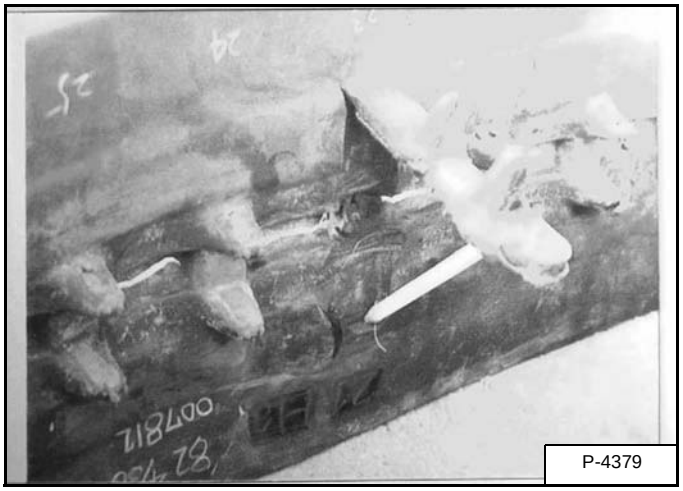
Turn the MEL tool/Bleed fitting clockwise to close fitting.

Remove the MEL1560 tool.

Track Damage Identification (Cont'd)

Separation Of Embedded Metals

Figure 40-20-36



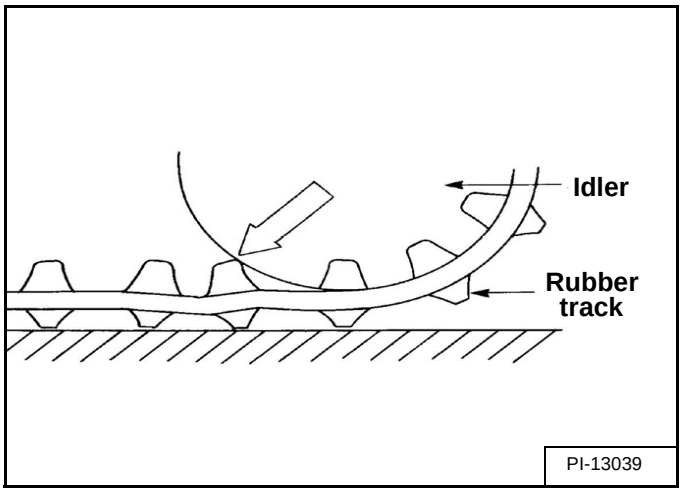
Damage:

Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body **[Figure 40-20-36]**.

Replacement:

Even a partial separation of embedded metals requires replacement of the track.

Figure 40-20-37

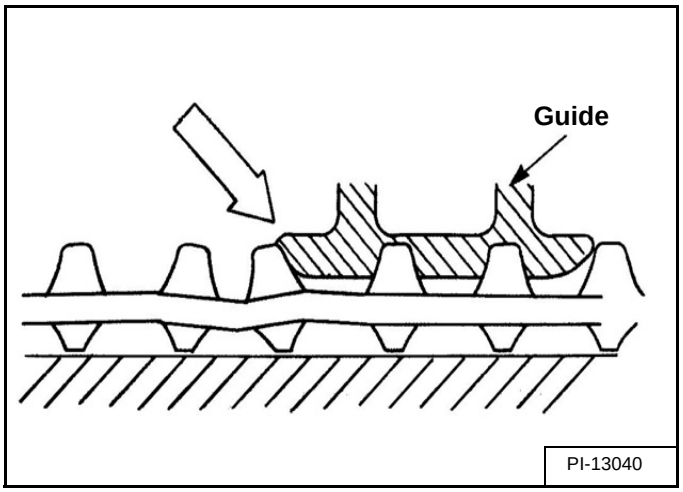


Causes of the damage:

Embedded metals are adhered between the steel cords and the rubber body. The following cases generate external forces greater than the adhesion strength, causing separation of the embedded metals:

When the idler continually rides on the projections of embedded metals, the embedded metals will eventually peel off **[Figure 40-20-37]**.

Figure 40-20-38



When a rubber track is detracked, it becomes stuck between the guide or the undercarriage frame, causing the separation of embedded metals **[Figure 40-20-38]**.

MAIN FRAME

Continued On Next Page

Gas Cylinder Removal And Installation (Cont'd)

Figure 50-20-7

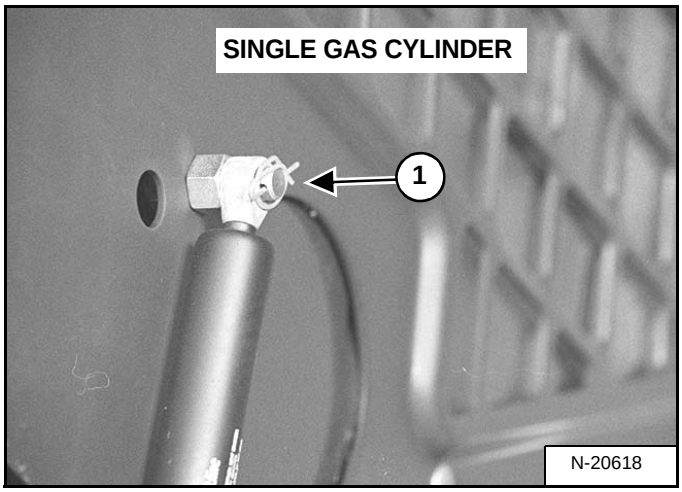
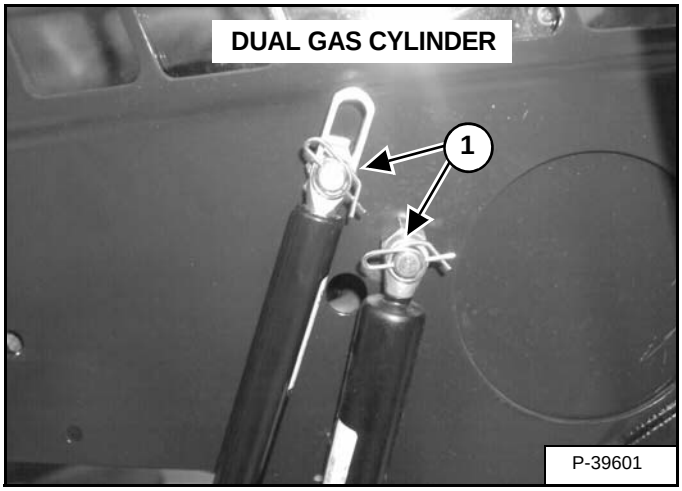


Figure 50-20-8



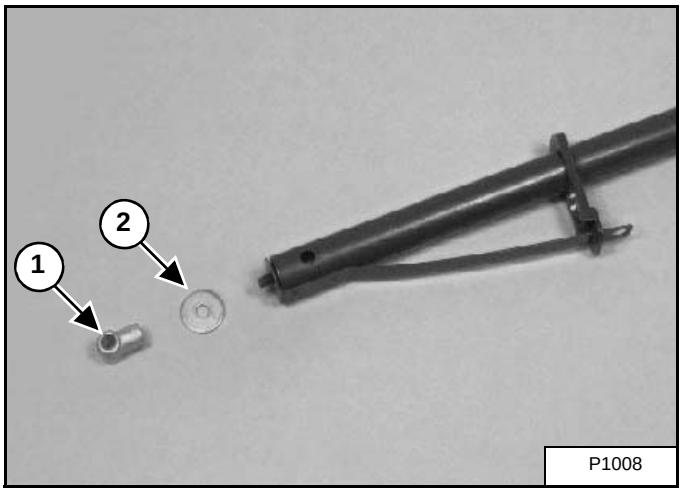
Remove the retaining pin(s) (Item 1) **[Figure 50-20-7]** and **[Figure 50-20-8]** from the top pivot pin(s).

Remove the cylinder(s) from the retaining pin(s).

Reverse the removal procedure to install the gas cylinder(s).

Gas Cylinder Disassembly

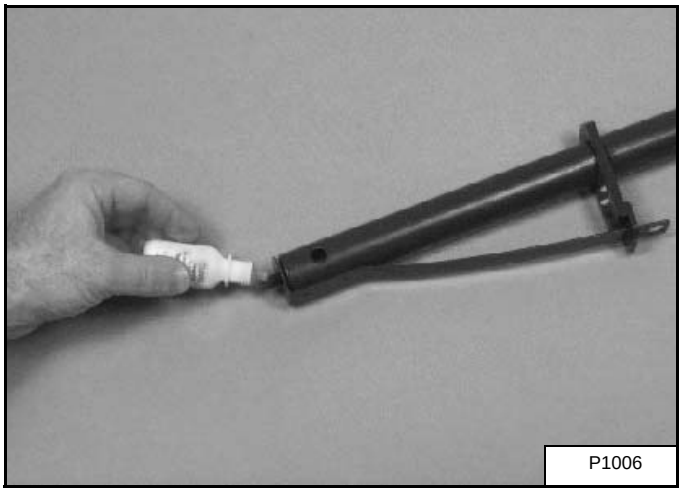
Figure 50-20-9



Remove the clevis (Item 1) and washer (Item 2) **[Figure 50-20-9]** from the end of the gas cylinder.

Remove the gas cylinder from the outer housing.

Figure 50-20-10



Assembly: Install a replacement cylinder inside the cylinder housing.

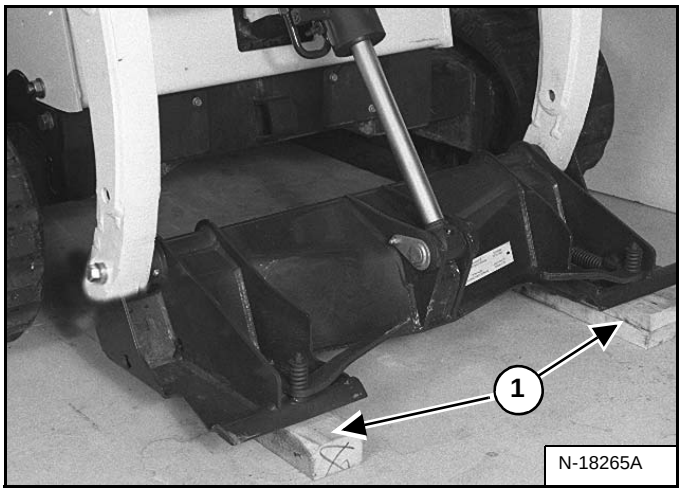
Apply a small amount of Loctite™ 242 on the threads of the cylinder rod **[Figure 50-20-10]**.

Reinstall the washer and clevis on the cylinder rod.

BOB-TACH™

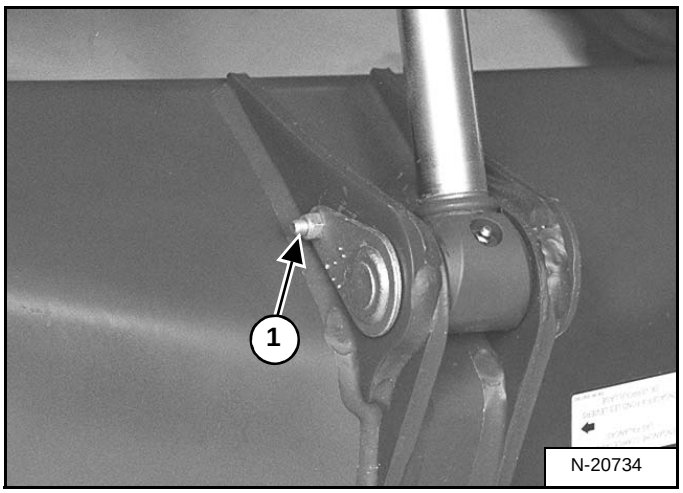
Removal And Installation

Figure 50-40-1



Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (Item 1) approximately 3 inches thick under each side of the Bob-Tach. Lower the Bob-Tach onto the blocks **[Figure 50-40-1]**.

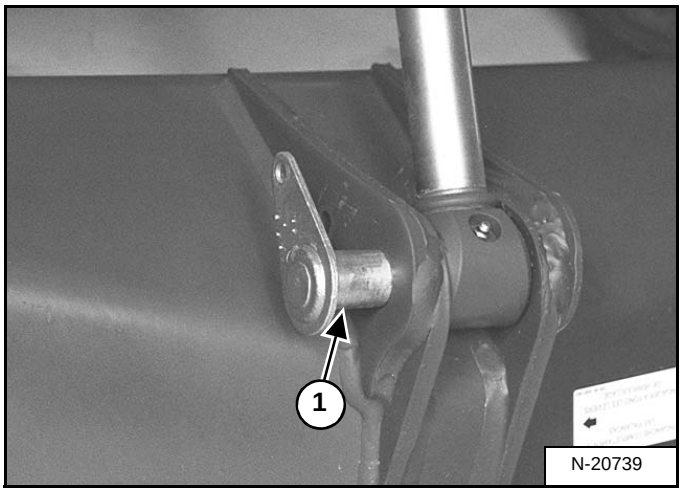
Figure 50-40-2



Remove the retainer bolt (Item 1) **[Figure 50-40-2]** from the pivot pin.

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

Figure 50-40-3

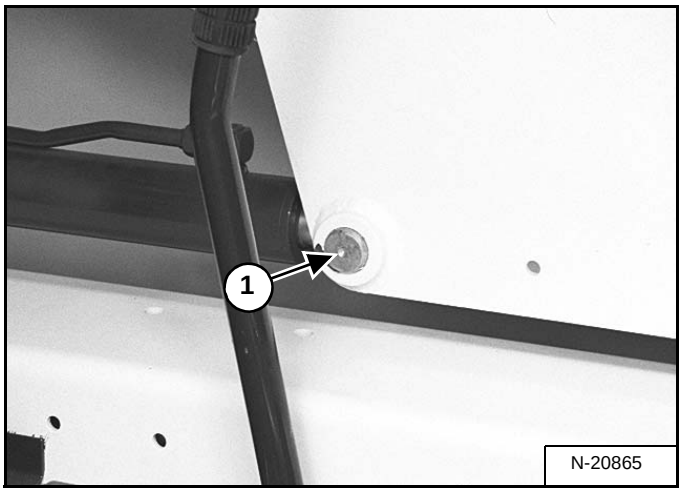


Remove the rod end pivot pin (Item 1) **[Figure 50-40-3]**.

Remove the tilt cylinder rod end.

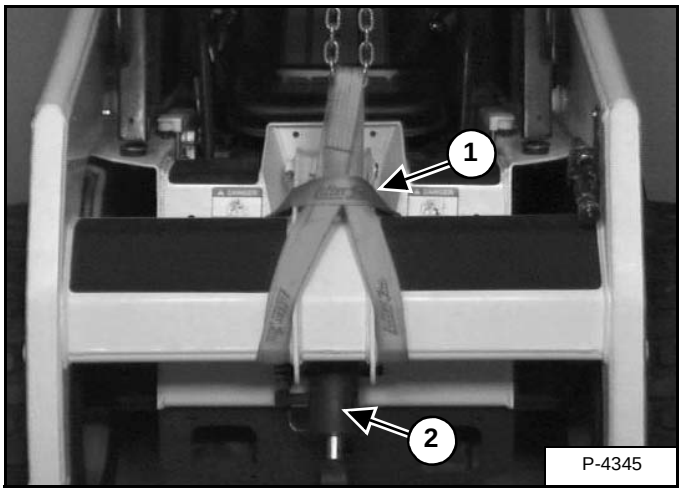
Removal And Installation (Cont'd)

Figure 50-50-9



Remove the left side lift cylinder pivot pin (Item 1) **[Figure 50-50-9]**.

Figure 50-50-10



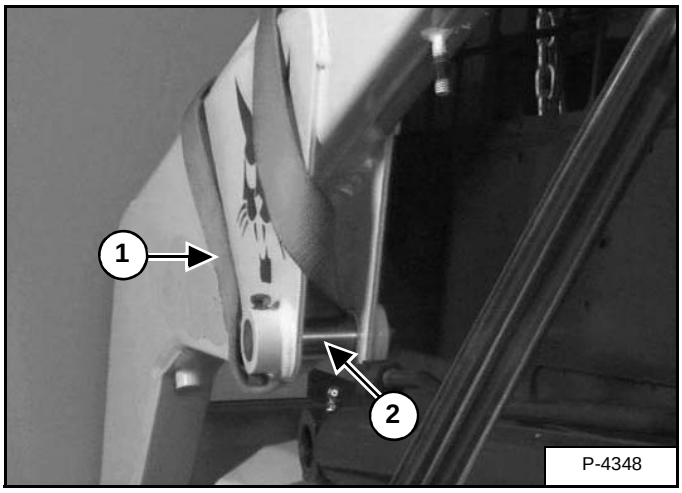
Wrap one of the 7 ft. lifting straps around the lift arm crossmember as shown **[Figure 50-50-10]**.

Both loops of the lifting strap should be supported by the chain hoist **[Figure 50-50-10]**.

Use a chain hoist and lifting strap to raise the lift arms enough to remove the tilt cylinder base end pivot pin (Item 1) **[Figure 50-50-10]**.

Remove the tilt cylinder (Item 2) **[Figure 50-50-10]** from the lift arm crossmember and put on the blocking.

Figure 50-50-11



Put the middle of the second lifting strap (Item 1) **[Figure 50-50-11]** up into the lift arm as shown.

Install the lift cylinder pivot pin (Item 2) **[Figure 50-50-11]** and secure the pin with the mounting bolt and nut.

Wrap both ends of the strap around the top of the lift arm and down the back of the lift arm **[Figure 50-50-11]**.

Figure 50-50-12

Continue to wrap the lifting strap around the lift arm a second time **[Figure 50-50-12]**.

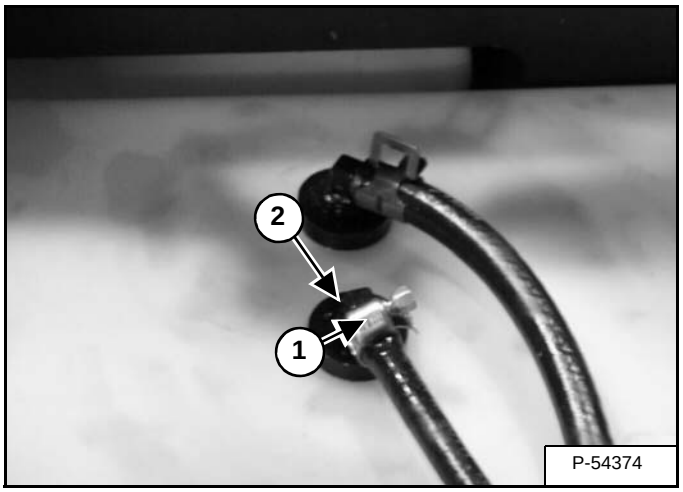
Fasten both loops of the lifting strap to a second chain attached to the chain hoist.

Use the wrapping procedure on the third strap which should be installed on the right side lift arm.

Use the chain hoist and lower the lift arms so they rest on the blocking.

Fuel Pickup Screen

Figure 50-80-8

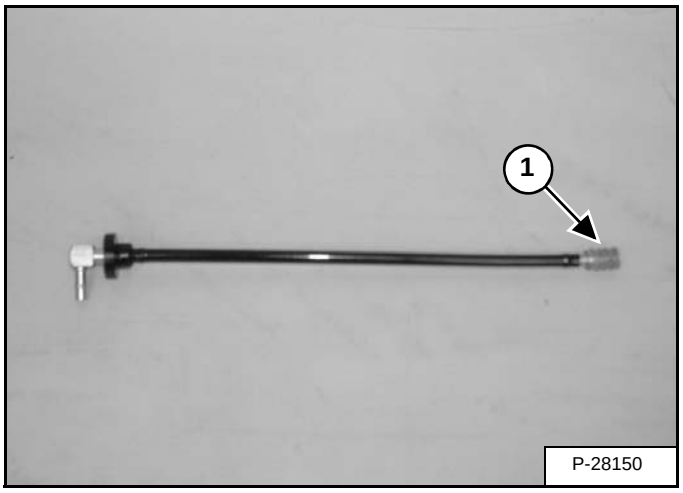


Disconnect fuel hose (Item 1) from fitting (Item 2) **[Figure 50-80-8]**.

Remove fitting (Item 2) **[Figure 50-80-8]** and grommet from the tank.

Remove fuel supply hose assembly from the tank.

Figure 50-80-9

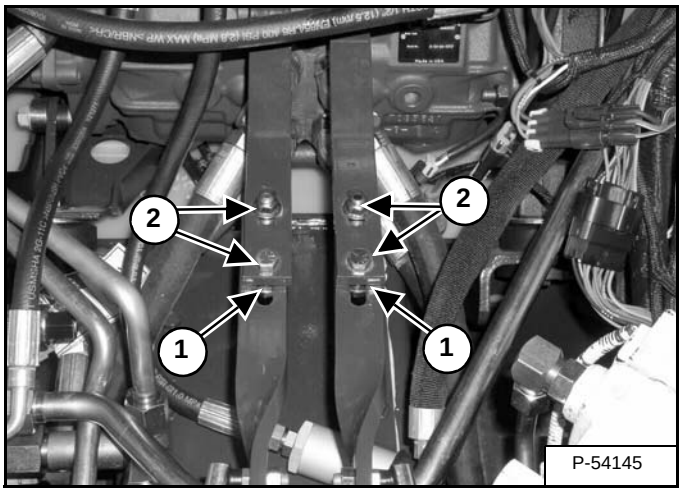


Remove fuel supply screen (Item 1) **[Figure 50-80-9]** from the hose. (If so equipped.)

Check screen for damage, and replace if necessary.

Removal and Installation (Cont'd)

Figure 50-100-4

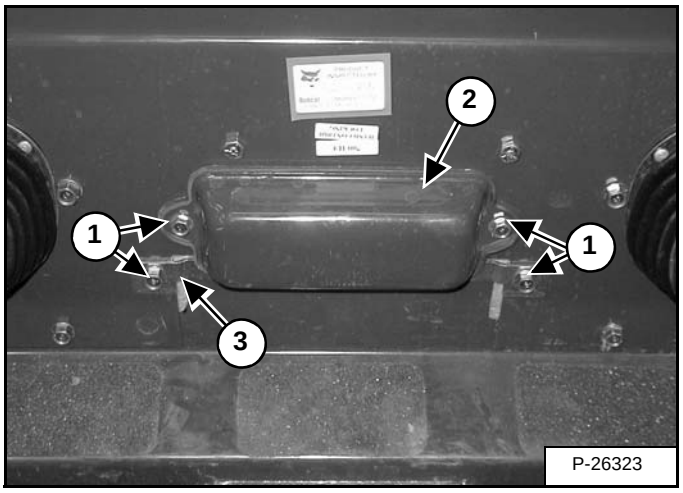


Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-4]** which are connected to the steering shaft on the control panel.

Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-100-4]**.

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

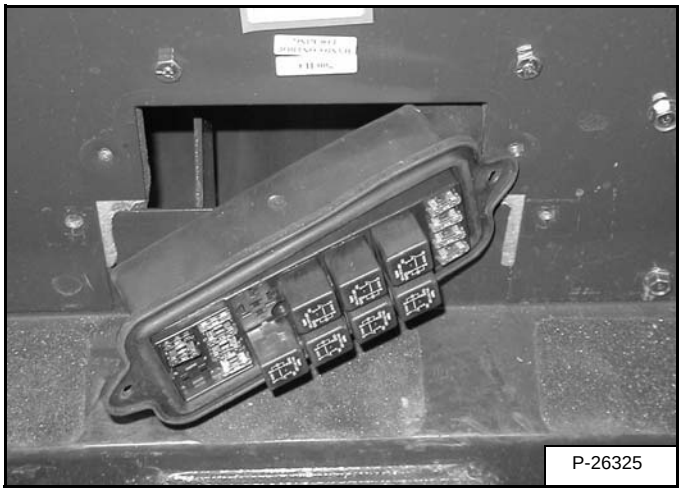
Figure 50-100-5



Remove the fuse/relay mounting bolts (Item 1) **[Figure 50-100-5]**.

Remove the fuse/relay cover (Item 2) and fuse/relay block retaining bracket (Item 3) **[Figure 50-100-5]**.

Figure 50-100-6



Remove the fuse/relay block **[Figure 50-100-6]**.

Linkage Neutral Adjustment

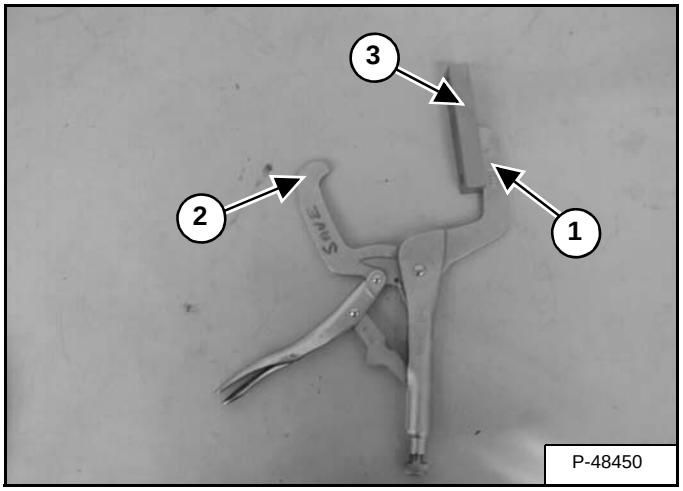
The following tool listed will be needed to do the following procedure:

MEL1563 - Remote Start Tool Kit

Connect the remote start tool to the engine harness. (See Procedure on Page 10-60-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

Figure 50-100-28



Tool that may assist in the neutral adjustment **[Figure 50-100-28]**.

To make this tool use a locking grip C-Clamp and grind one edge flat (Item 1) and grind the other edge (Item 2) **[Figure 50-100-28]** to a small rounded edge.

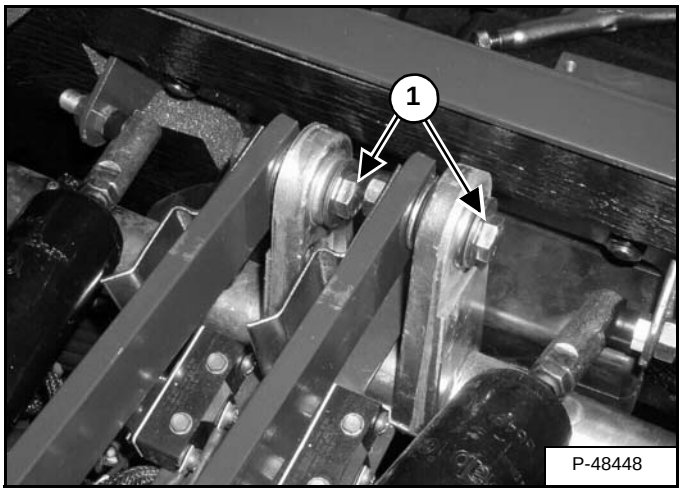
A steering centering block (Item 3) **[Figure 50-100-28]** is also needed. The centering block can be placed as shown and welded to the C-clamp if desired.

⚠ 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.

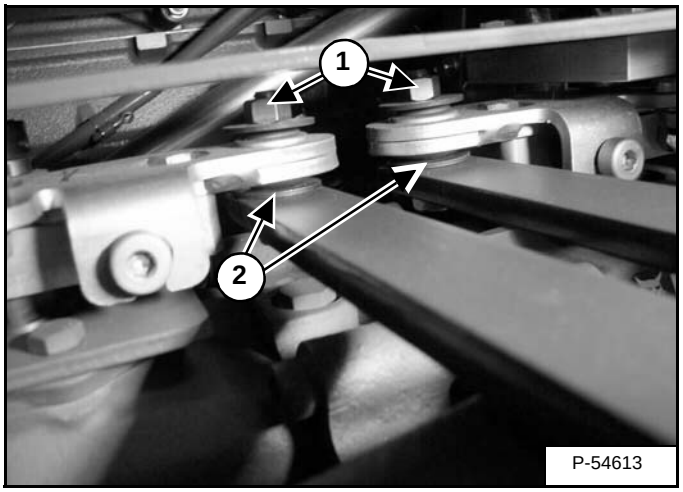
W-2017-0286

Figure 50-100-29



Loosen the bolt/nut (Item 1) **[Figure 50-100-29]** only until the tension is released from the torsion bushing.

Figure 50-100-30



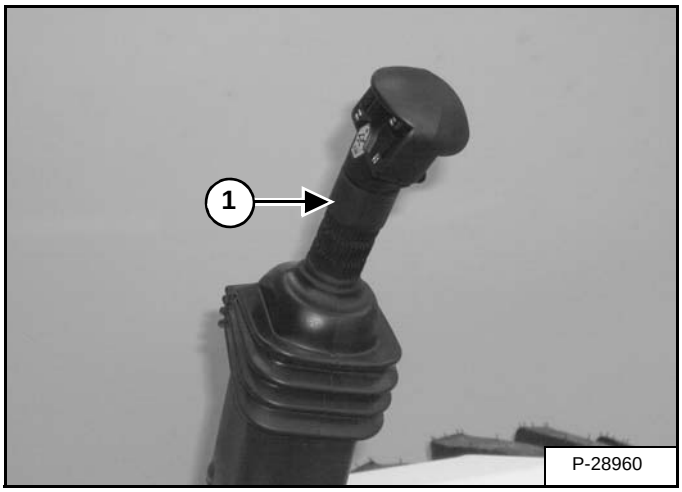
Loosen the nut (Item 1) only until the tension is released from the torsion bushing (Item 2) **[Figure 50-100-30]**.

NOTE: The bolt must be loose enough to allow the torsion bushing (Item 2) [Figure 50-100-30] to turn freely between the torsion bushing and the steering linkage bar.

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL

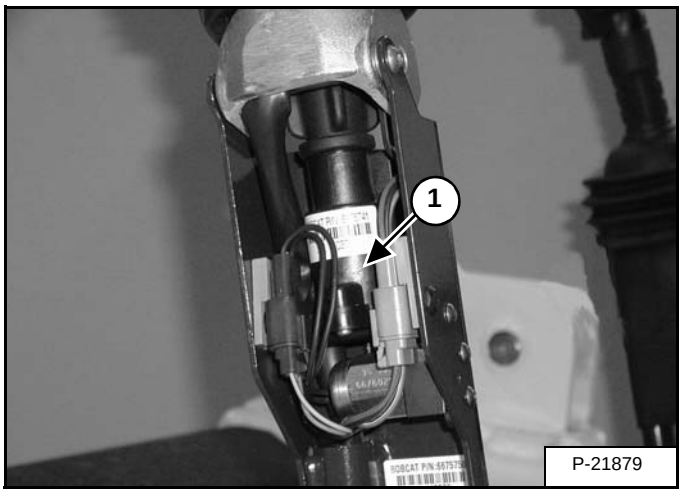
Components Identification

Figure 50-111-1



Control Handle (Item 1) **[Figure 50-111-1]**.

Figure 50-111-2

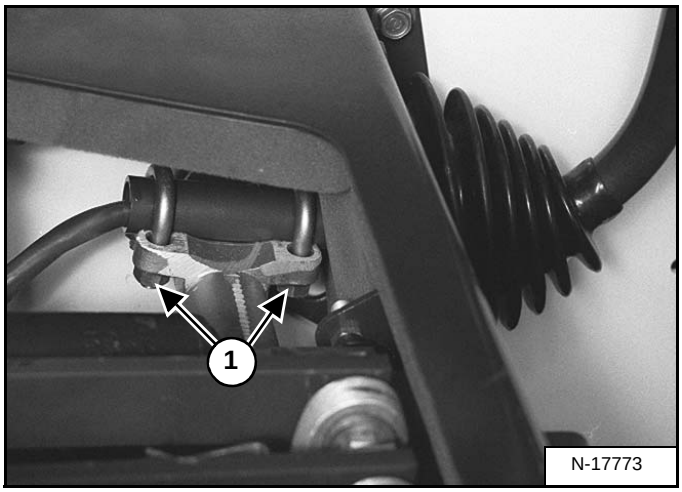


Handle Sensor (Item 1) **[Figure 50-111-2]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See ADVANCED CONTROL SYSTEM (ACS) SELECTABLE HAND/FOOT CONTROL on Page 60-120-1.)

Handle Sensor Removal And Installation

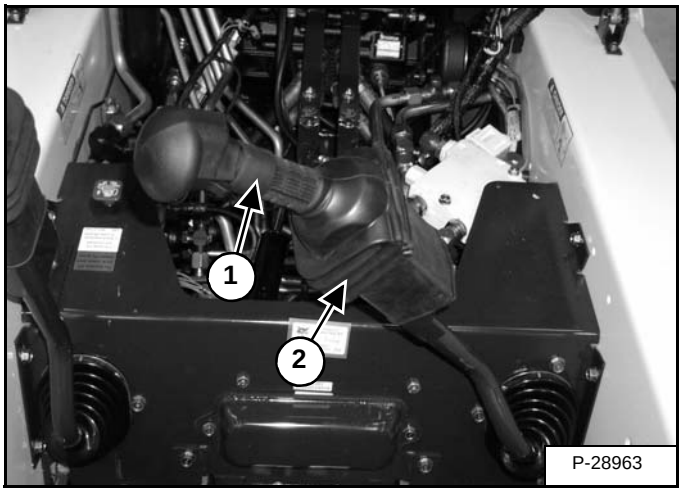
Figure 50-111-3



Loosen the nuts (Item 1) **[Figure 50-111-3]**.

Installation: Tighten the u-bolts so the lever can not be moved either right or left when seated in the operator seat. Be sure the control lever does not interfere with the operator cab when lowering or raising the cab.

Figure 50-111-4



Tilt the control handle (Item 1) **[Figure 50-111-4]** to the center of the loader.

Lift the boot cover (Item 2) **[Figure 50-111-4]**.

WIRING SCHEMATIC
(Without ACS Option)

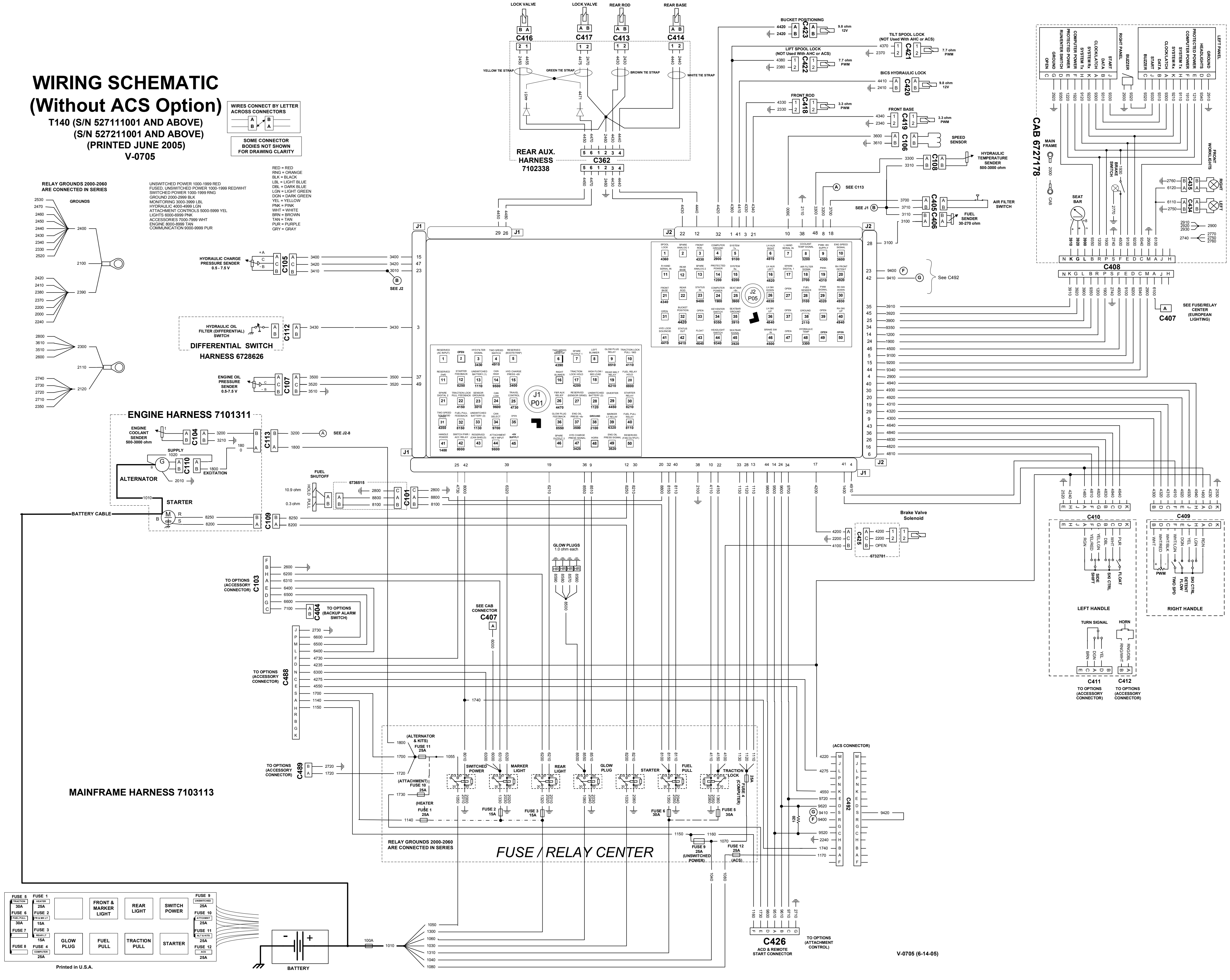
T140 (S/N 527111001 AND ABOVE)
(S/N 527211001 AND ABOVE)
(PRINTED JUNE 2005)
V-0705

WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

UNSWITCHED POWER 1000-1999 RED
FUSED, UNSWITCHED POWER 1000-1999 RED/WHT
SWITCHED POWER 1000-1999 RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY



BATTERY (CONT'D)

Using A Booster Battery (Jump Starting)

⚠ WARNING

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-2065-1296

⚠ WARNING

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine 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-2066-1296

IMPORTANT

Damage to the alternator can occur if:

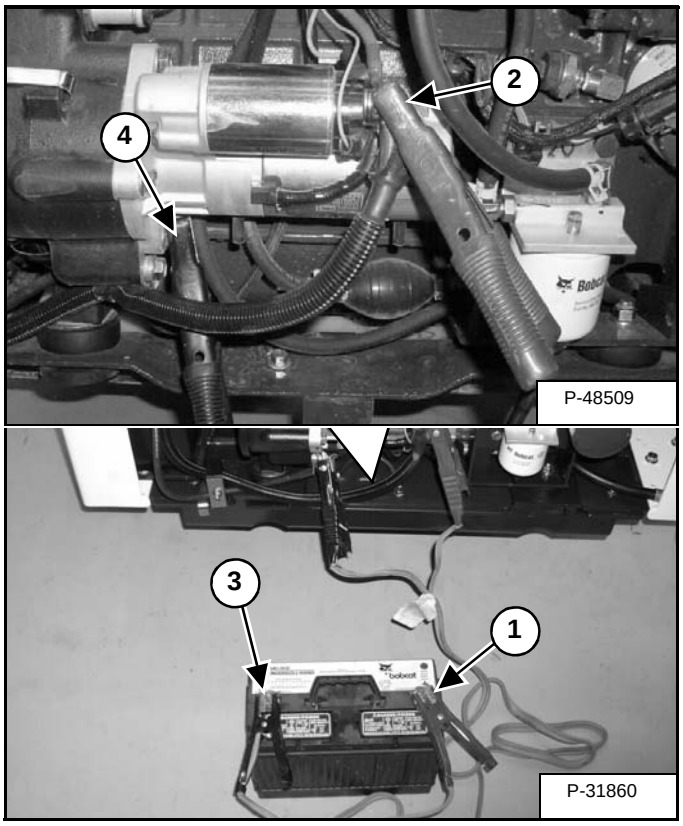
- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

I-2023-1285

If it is necessary to use a booster battery to start the engine, BE CAREFUL! There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

The key switch must be OFF (*Standard Panel*) OR the STOP Button must be pressed (*Deluxe Panel*). The booster battery must be 12 volt.

Figure 60-20-6



Connect the end of the first cable (Item 1) to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[Figure 60-20-6]** to the positive terminal on the loader starter.

Connect the end of the second cable (Item 3) to the negative (-) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[Figure 60-20-6]** to the engine.

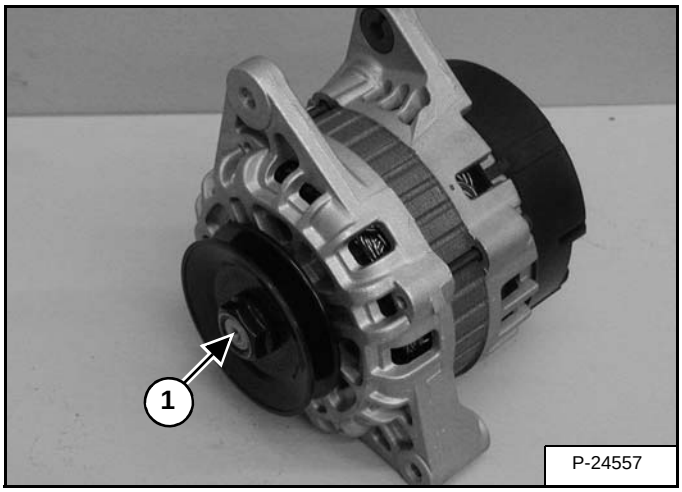
Keep cables away from moving parts. Start the engine.

After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-6]** first.

Remove the cable from the positive terminal (Item 2) **[Figure 60-20-6]**.

Assembly

Figure 60-30-22



Reverse the order of disassembly.

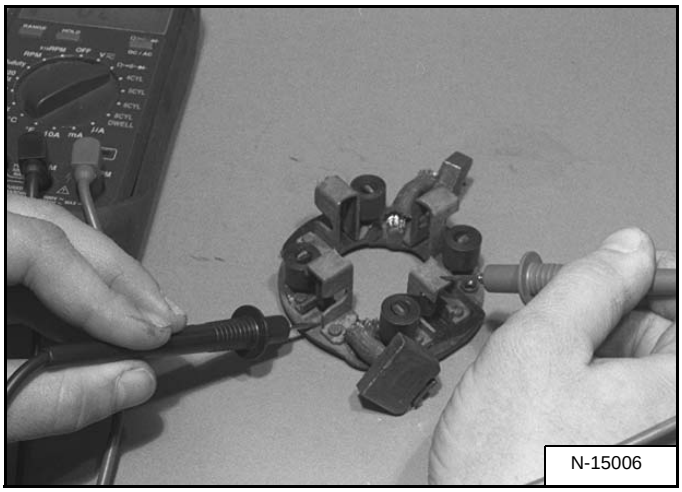
Do not assemble the rear case half.

Place the rotor in soft jaws when tightening the shaft nut (Item 1) **[Figure 60-30-22]**. Tighten to 72 ± 14.5 ft.-lb. (98 ± 20 N•m) torque.

Install the rear case half and the remaining parts.

Inspection and Repair (Cont'd)

Figure 60-40-24



Inspect the brushes for wear and damage.

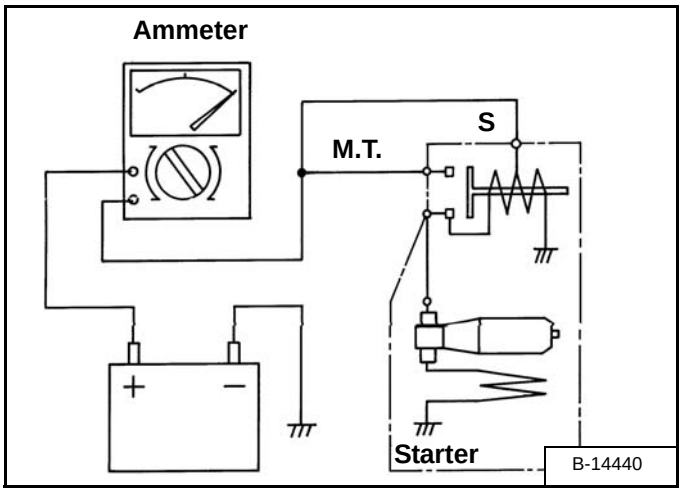
Replace the brush holder and yoke if the brushes need replacement.

Check brush spring, for damage or rust. Replace as needed.

Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[Figure 60-40-24]**. There should be no continuity. If there is continuity, replace or repair.

No Load Test

Figure 60-40-25



The following test should be done after reassembling the starter:

Clamp the starter in a vise. Using a 12 volt battery and ammeter, connect the positive wire of the battery, and the ammeter to the terminal **[Figure 60-40-25]**. Connect the negative wire to the starter body. Using a jumper wire, connect the S terminal to the main terminal.

The starter should show smooth and steady rotation immediately after the pinion is engaged, it should draw less than the specified current.

Service Limit - 1150 Amp. Maximum @ Stall Condition

Clean all parts and apply high temperature grease to the armature bearing, return spring, steel ball, over running clutch, and idler gear rollers.

Removal And Installation

Figure 60-50-11

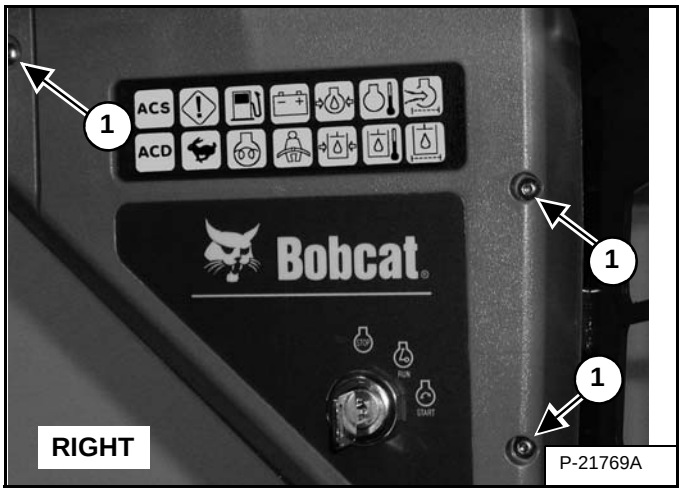
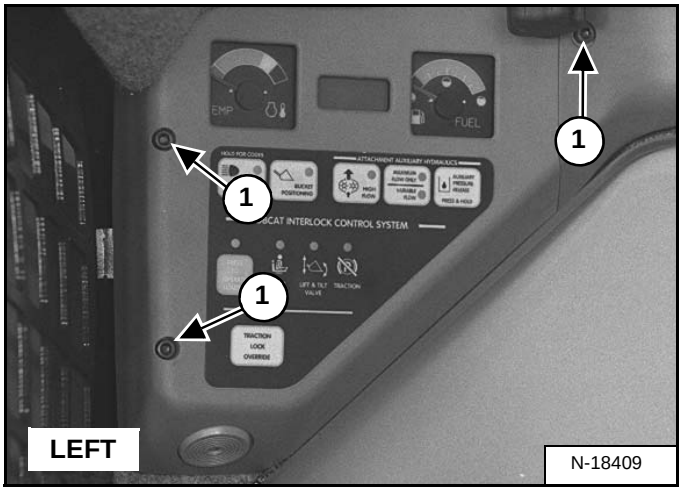


Figure 60-50-12



Remove the front light. (See Front Removal And Installation on Page 60-60-1.)

Remove the three mounting bolts (Item 1) **[Figure 60-50-11]** or **[Figure 60-50-12]**.

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

Figure 60-50-13

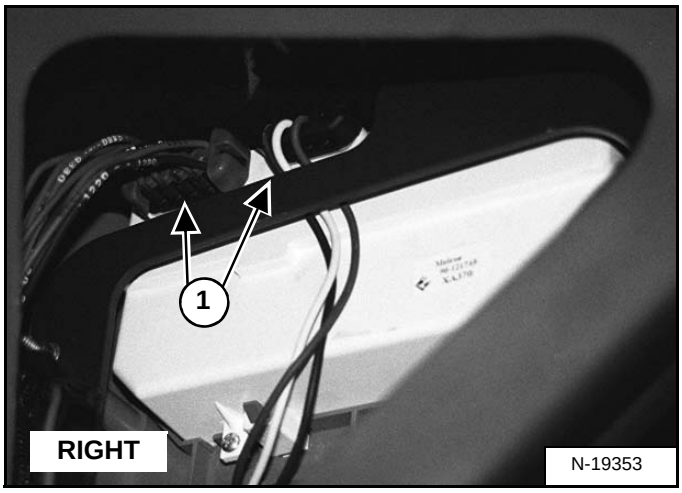
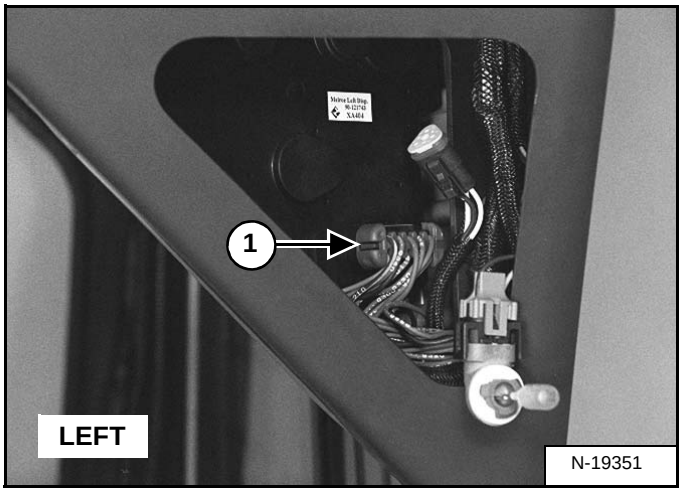


Figure 60-50-14



Pull the left instrument panel down and disconnect the wire harness connectors (Item 1) **[Figure 60-50-13]** or **[Figure 60-50-14]** from the panel.

Remove the panel.

Reverse the removal procedure to install the instrument panel.

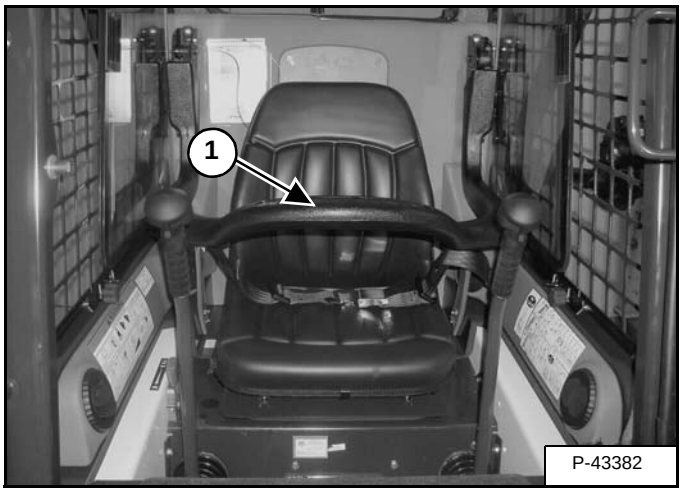
Number Codes List (Cont'd)

CODE		CODE	
25-02	Rear auxiliary relief solenoid error ON	32-61	Handle lock short to ground
25-03	Rear auxiliary relief solenoid error OFF	32-62	Handle lock short to battery
		32-63	Pedal lock short to ground
26-02	Front base solenoid error ON	32-64	Pedal lock short to battery
26-03	Front base solenoid error OFF	32-65	Sensor supply voltage out of range
		32-66	Battery voltage out of range
27-02	Front rod solenoid error ON	32-67	Switch flipped while operating
27-03	Front rod solenoid error OFF	32-68	Lift handle information error
		32-69	Control pattern switch flipped while operating
28-02	Diverter solenoid error ON	32-70	Right drive handle short to ground
28-03	Diverter solenoid error OFF	32-71	Right drive handle short to battery
29-02	High flow solenoid error ON	33-23	Main Controller (Bobcat Controller) not programmed
29-03	High flow solenoid error OFF		
		34-04	Deluxe panel no communication to Bobcat controller
30-28	Controller Memory failure		
		35-02	Two-speed fan error ON
31-28	Interrupted power failure	35-03	Two-speed fan error OFF
32-04	ACS not communicating with Bobcat Controller	36-48	ACD multiple controllers present
32-23	ACS Not calibrated		
32-31	Tilt actuator fault	37-02	Two-speed secondary error ON
32-32	Tilt actuator wiring fault	37-03	Two-speed secondary error OFF
32-33	Tilt handle wiring fault		
32-34	Tilt actuator not in neutral		
32-35	Tilt handle/pedal not in neutral		
32-36	Lift actuator fault		
32-37	Lift actuator wiring fault		
32-38	Lift handle wiring fault		
32-39	Lift actuator not in neutral		
32-40	Lift handle/pedal not in neutral		
32-41	No communication		
32-49	Lift actuator short to ground		
32-50	Tilt actuator short to ground		
32-51	Lift actuator short to battery		
32-52	Tilt actuator short to battery		
32-53	Lift handle/pedal short to ground		
32-54	Tilt handle/pedal short to ground		
32-55	Lift handle/pedal short to battery		
32-56	Tilt handle/pedal short to battery		
32-57	Lift actuator reduced performance		
32-58	Tilt actuator reduced performance		
32-59	Lift actuator wrong direction		
32-60	Tilt actuator wrong direction		

SEAT BAR SENSOR (CONT'D)

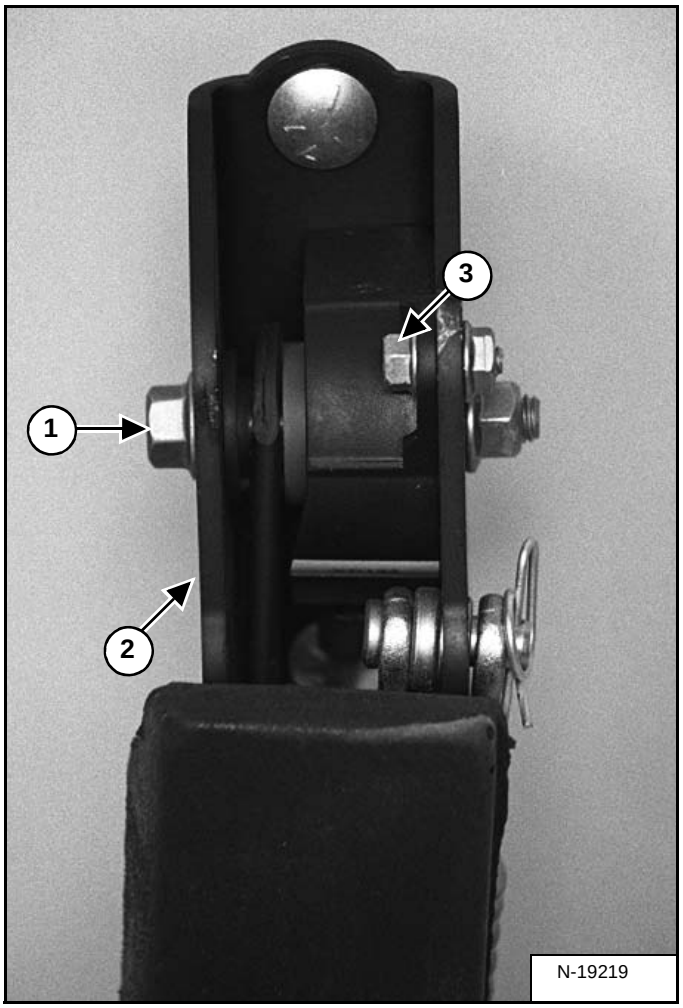
Removal And Installation

Figure 60-100-5



Remove the seat bar (Item 1) **[Figure 60-100-5]** from the loader. (See Removal And Installation on Page 50-10-1.)

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.

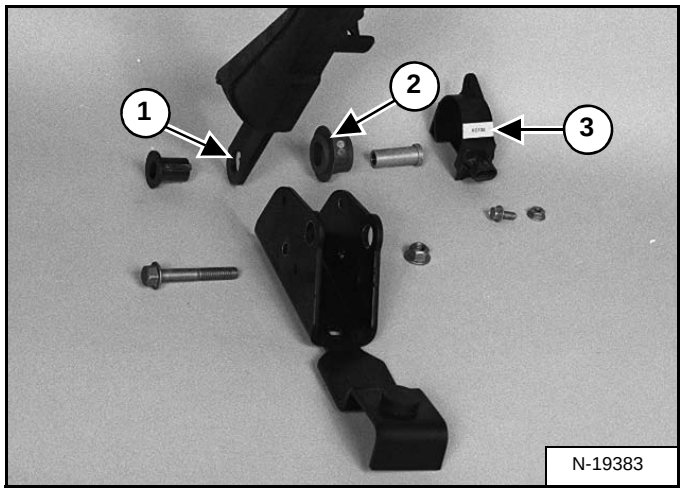
Remove the sensor mounting bolt (Item 3) **[Figure 60-100-6]** and nut.

IMPORTANT

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

I-2088-1095

Figure 60-100-7



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

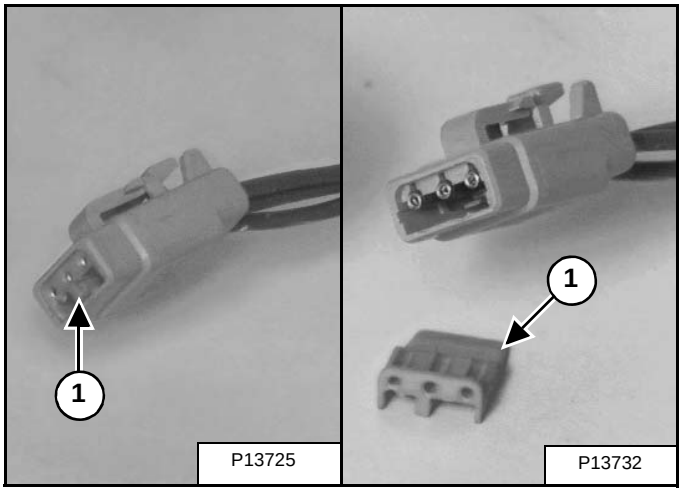
Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[Figure 60-100-7]** of the seat bar.

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

Reverse the removal procedure to install the seat bar sensor.

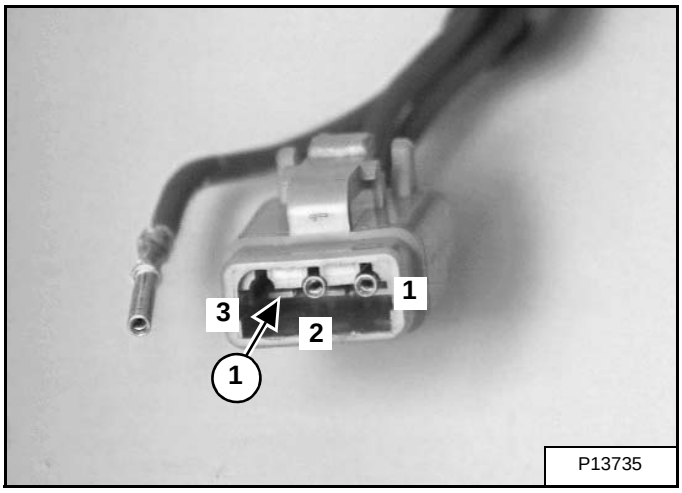
Switch Handle Removal (Cont'd)

Figure 60-120-14



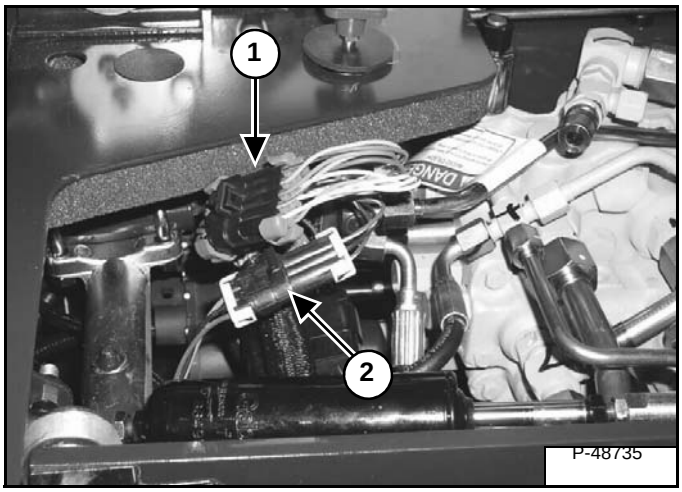
Remove the wedge (Item 1) **[Figure 60-120-14]** from the harness connector (Black) that connects to the handle lock solenoid connector.

Figure 60-120-15



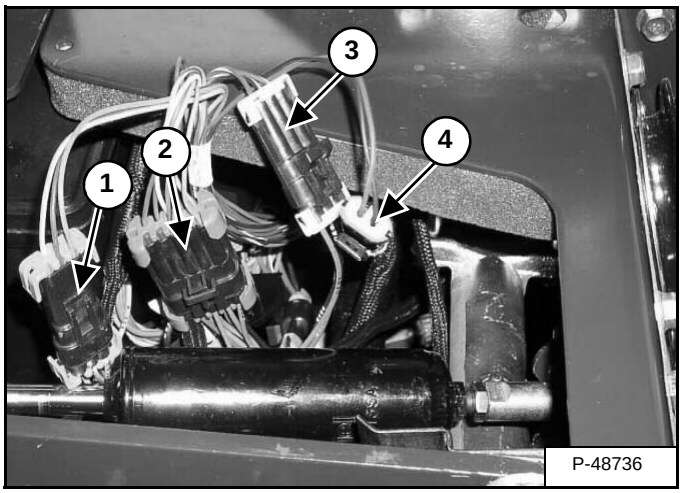
Use a pointed tool, press down on the tab (Item 1) **[Figure 60-120-15]** and pull the wire from the connector.

Figure 60-120-16



Disconnect the right switch handle connectors (Items 1 & 2) **[Figure 60-120-16]** from the loader wiring harness connectors.

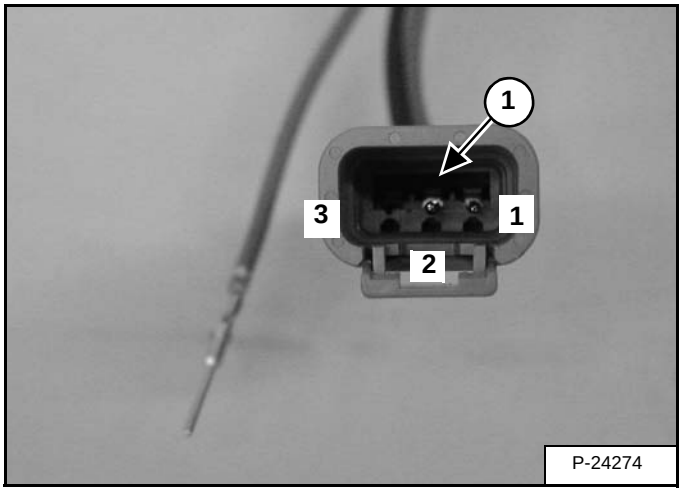
Figure 60-120-17



Disconnect the left switch handle connectors (Items 1, 2, 3 & 4) **[Figure 60-120-17]** from the loader wiring harness connectors.

Foot Sensor Connector (Cont'd)

Figure 60-120-49



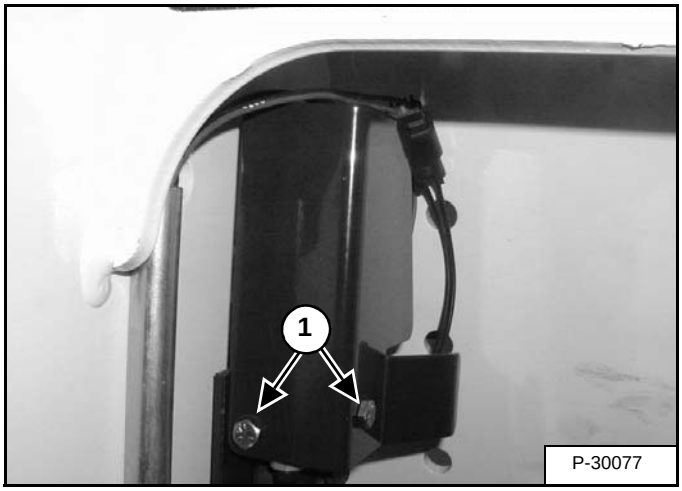
With a pointed tool, lift the tab (Item 1) **[Figure 60-120-49]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-120-49]**:

1 - Terminal - Red
2 - Terminal - Black
3 - Terminal - Green

Foot Lock Solenoid Removal And Installation

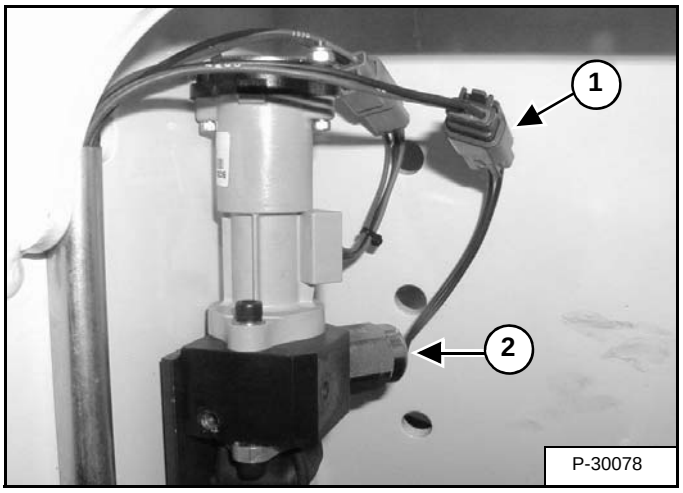
Figure 60-120-50



Remove the two bolts (Item 1) **[Figure 60-120-50]** from the foot sensor shield.

Installation: Tighten the bolts to 80-90 in.-lb. (9,0-10,2 N•m) torque.

Figure 60-120-51

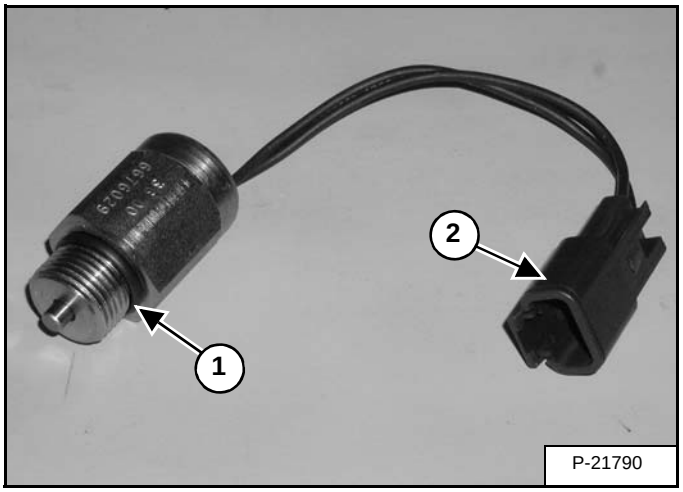


Disconnect the foot lock solenoid connector (Item 1) **[Figure 60-120-51]** from the harness.

Remove foot lock solenoid (Item 2) **[Figure 60-120-51]**.

Installation: Apply a drop of oil on the solenoid threads and tighten the solenoid to 35-40 ft.-lb. (47-54 N•m) lubed torque.

Figure 60-120-52



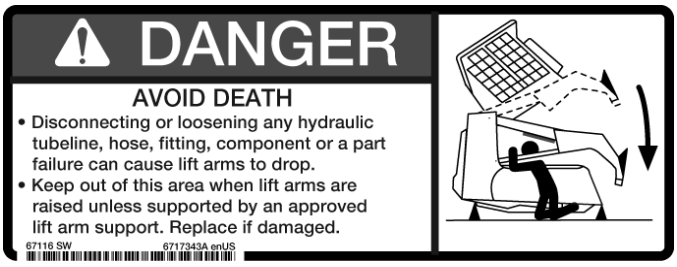
Check the O-ring (Item 1) **[Figure 60-120-52]** for damage. Replace as necessary.

Foot Lock Solenoid Connector

The wire connector (Item 2) **[Figure 60-120-52]** can be removed from the solenoid wires, use the following procedure.

ENGINE SPEED CONTROL

Removal And Installation



WARNING

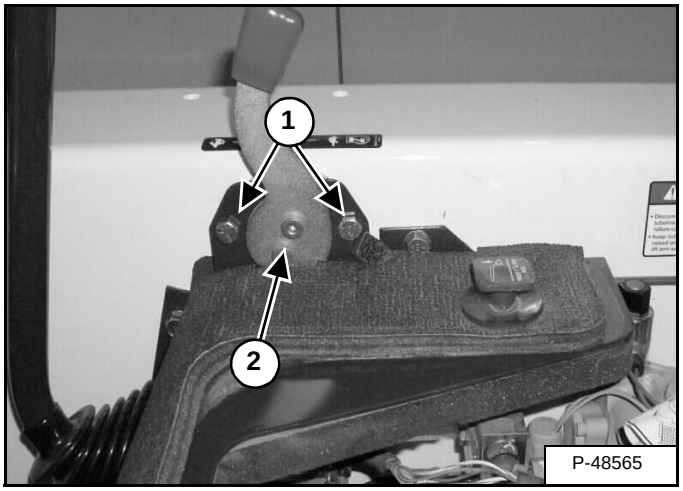
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

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

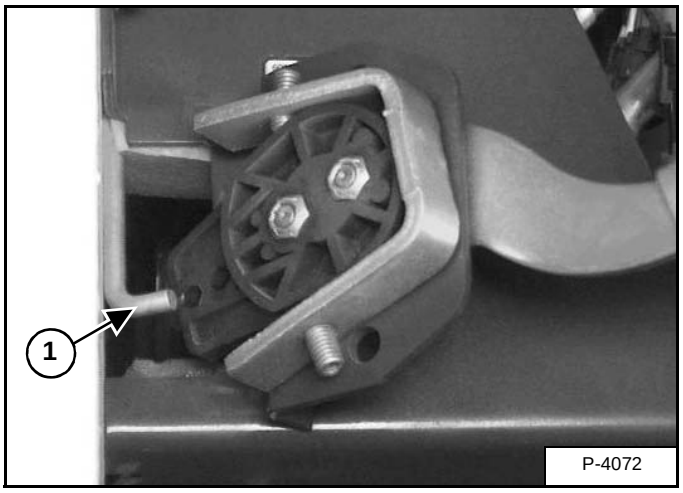
Figure 70-20-1



Remove the two mounting bolts (Item 1) **[Figure 70-20-1]** and nuts from the speed control mounting bracket.

Installation: Tighten the mounting bolts and nuts evenly until the speed control lever moves back and forth at a comfortable tension.

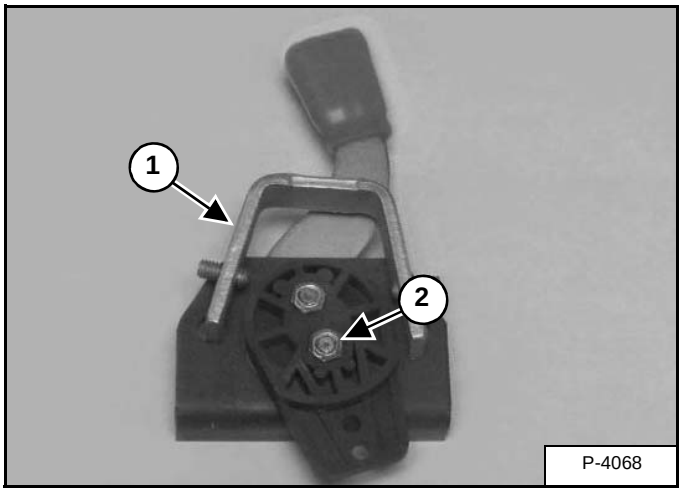
Figure 70-20-2



Pull the speed control away from the loader frame and disconnect the speed control rod (Item 1) **[Figure 70-20-2]** from the control.

Installation: Be sure to install the control rod in the bottom hole of the speed control.

Figure 70-20-3



Installation: Install the stop bracket (Item 1) **[Figure 70-20-3]** in the same location. It is necessary for the front and rear stop on the bracket to be located correctly.

Reverse the removal procedure to install the engine speed control.

Disassembly

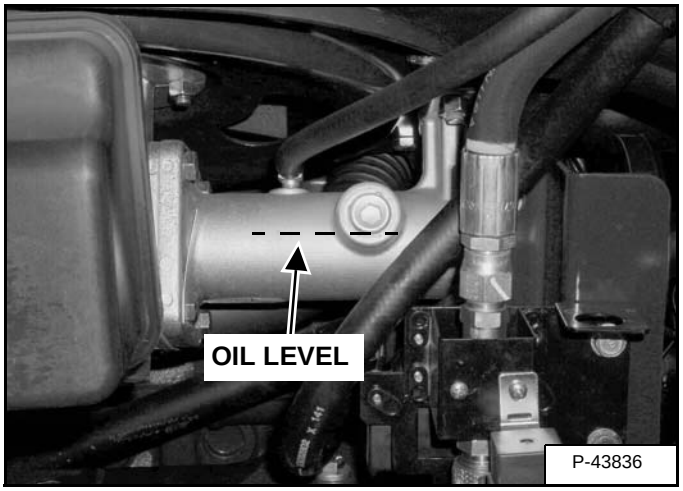
Loosen the two control lever mounting bolts (Item 2) **[Figure 70-20-1]** and remove the mounting nuts (Item 2) **[Figure 70-20-3]**.

Assembly: Do not lubricate the engine speed control.

Replace any worn or damaged parts if necessary.

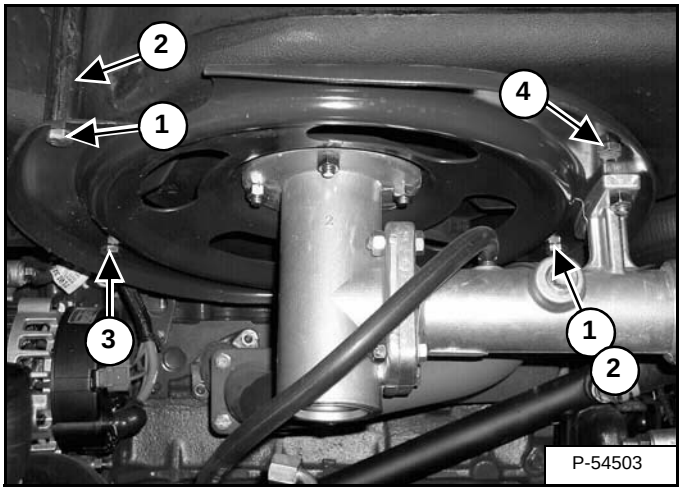
Gearbox/Blower Housing Removal And Installation (Cont'd)

Figure 70-60-8



NOTE: When checking the fan gearbox oil level, be sure the level does not go above the top of the shaft in the gearbox [Figure 70-60-8]. Use a light colored 90W gear lube if the level is low.

Figure 70-60-9

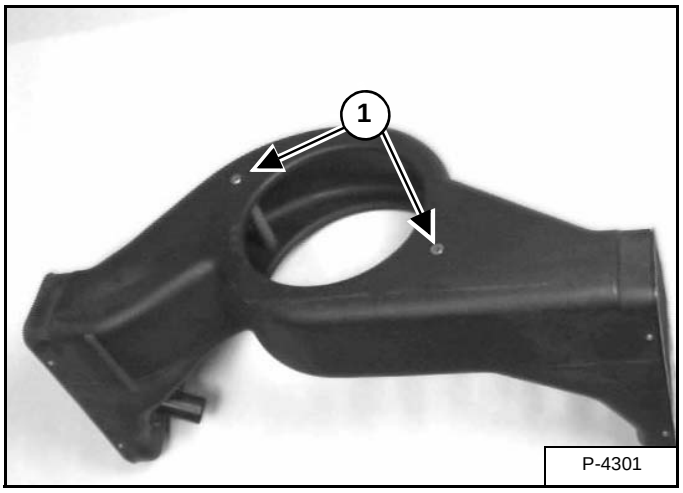


Remove the two mounting bolts (Item 1) and the two spacer tubes (Item 2) **[Figure 70-60-9]** from the blower fan.

Remove the rear mounting bolt (Item 3) **[Figure 70-60-9]**.

Remove the front mounting bolt (Item 4) **[Figure 70-60-9]**.

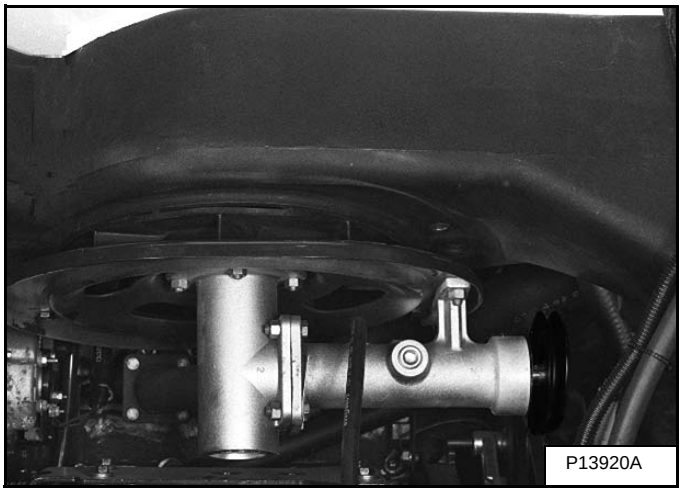
Figure 70-60-10



NOTE: Mounting bolts (Items 3 & 4) [Figure 70-60-9] use wave washer (Item 1) [Figure 70-60-10] to prevent tubes and bolts from falling out of the housing during installation.

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

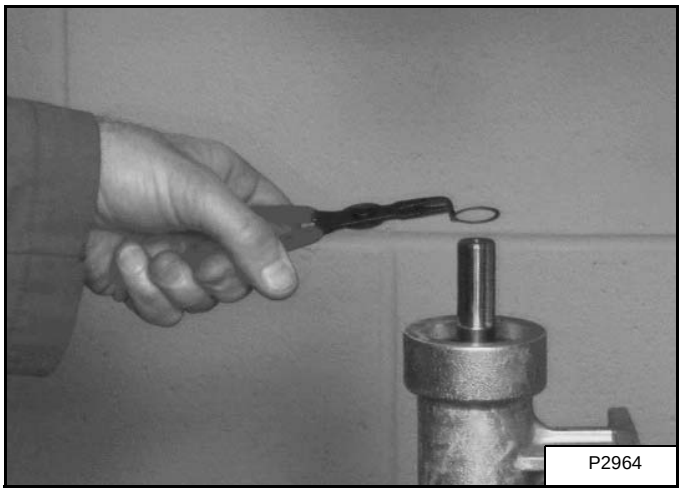
Figure 70-60-11



Lower the blower fan from the housing until it rests on the steering linkage plate **[Figure 70-60-11]**.

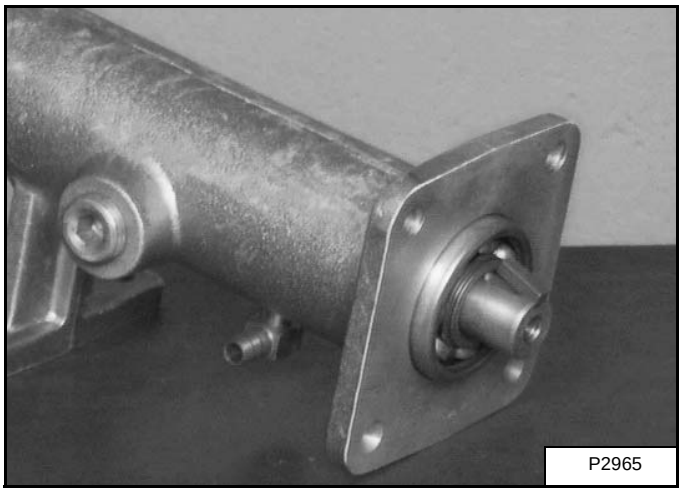
Gearbox Assembly (Cont'd)

Figure 70-60-40



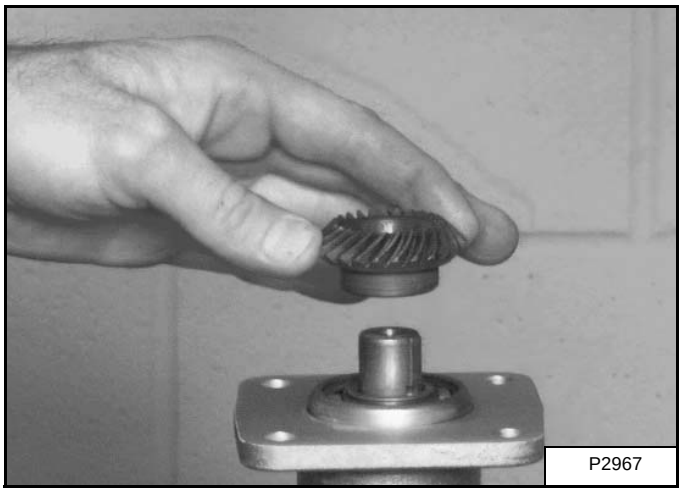
Install the small snap ring in the groove above the shims **[Figure 70-60-40]**.

Figure 70-60-41



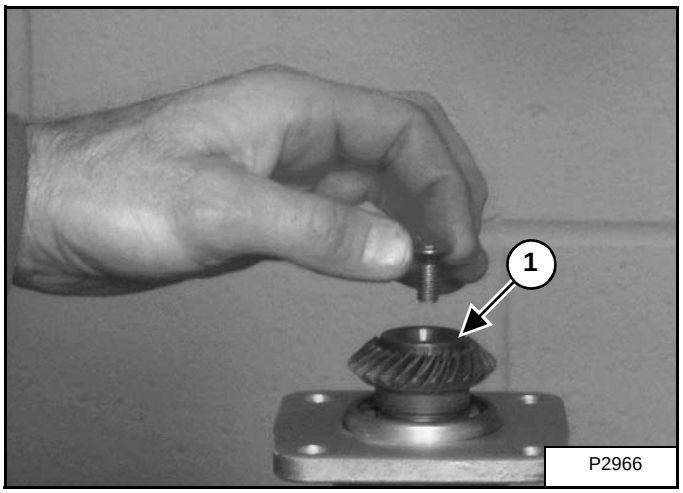
Install the gear key in the flange end of the shaft **[Figure 70-60-41]**.

Figure 70-60-42



Align the key and gear. While supporting the bearing on the other end, press the gear on the shaft until it seats against the bearing **[Figure 70-60-42]**.

Figure 70-60-43



Install the washer (Item 1) **[Figure 70-60-43]**.

Put liquid threadlocker (Loctite™ 242) on the screw threads. Install and tighten the screw **[Figure 70-60-43]**.

Glow Plugs Removal And Installation (Cont'd)

Figure 70-70-8

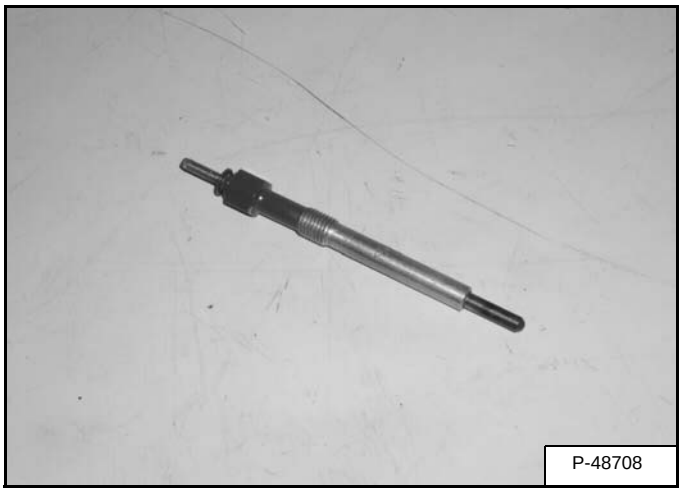
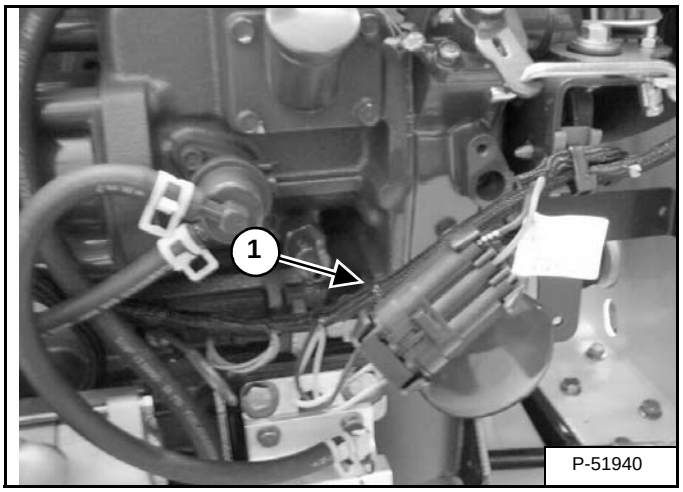


Photo **[Figure 70-70-8]** shows the glow plug assembly removed from the engine. Inspect the glow plugs and replace when necessary.

Fuel Shutoff Solenoid, Checking

Figure 70-70-9

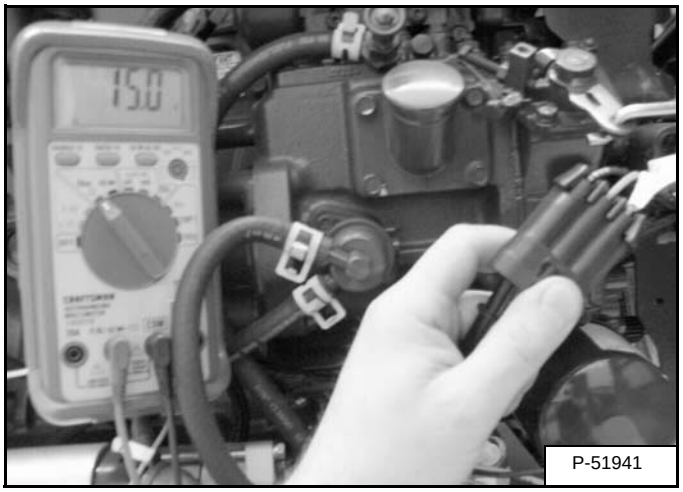


Stop the engine and open the rear door **[Figure 70-70-9]**.

Disconnect the connector (Item 1) **[Figure 70-70-9]** from the fuel shutoff solenoid.

Use an ohmmeter to check the fuel shutoff solenoid.

Figure 70-70-10



The reading between electrical connector terminal C and terminal A must be approximately 15.6 ohms **[Figure 70-70-10]**.

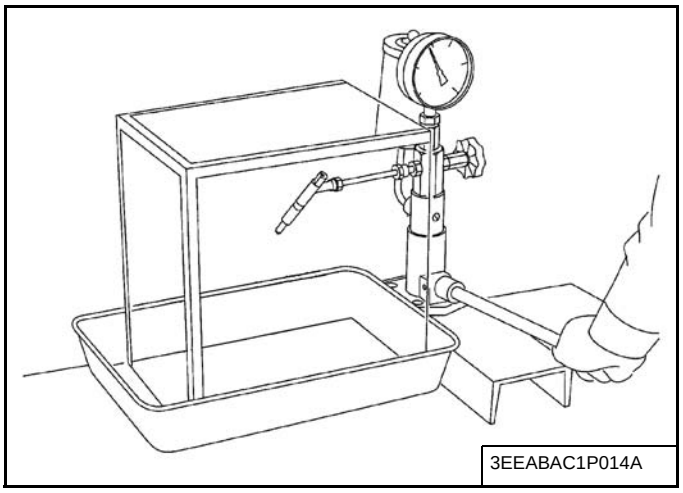
The reading between electrical connector terminal C and terminal B must be approximately .35-.40 ohms.

Valve Seat Tightness

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-38



Set the injection nozzle to a nozzle tester.

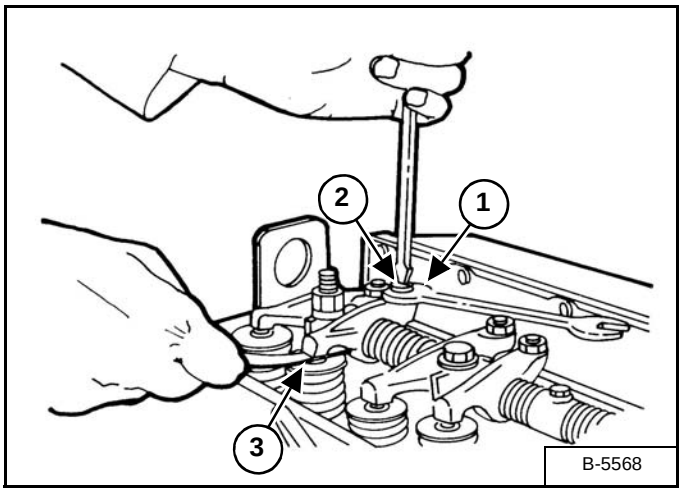
Raise the fuel pressure, and keep at 167 bar (170 kgf/cm², 2418 PSI) for 10 seconds.

If any fuel leak is found, replace the injection nozzle assembly.

Valve seat tightness	Factory spec.	No fuel leak at 167 bar 170 kgf/cm² 2418 PSI

Valve Clearance Adjustment

Figure 70-70-39



Adjust the valve clearance as follows:

Loosen the lock nut (Item 1) **[Figure 70-70-39]**.

Turn the adjustment screw (Item 2) **[Figure 70-70-39]** until the correct clearance is obtained.

NOTE: The clearance is measured between the rocker arm and valve stem tip (Item 3) [Figure 70-70-39].

FLYWHEEL AND HOUSING

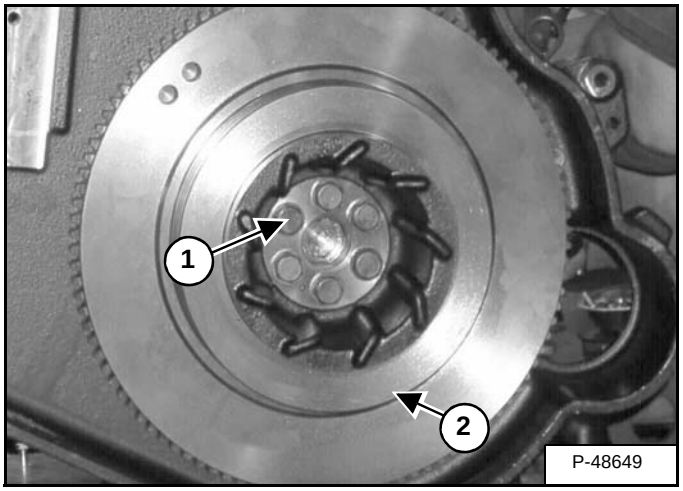
Flywheel Removal And Installation

Remove the drive belt shield. (See Shield Removal And Installation on Page 30-50-1.)

Remove the drive belt. (See Drive Belt Replacement on Page 30-50-3.)

Remove the drive belt tension pulley. (See Tensioner Pulley Removal And Installation on Page 30-50-4.)

Figure 70-90-1



Remove the six mounting bolts (Item 1) from the engine flywheel (Item 2) **[Figure 70-90-1]**.

Installation: Apply engine oil to the threads and seats before tightening. Tighten to 72-80 ft.-lb. (98-108 N•m) torque.

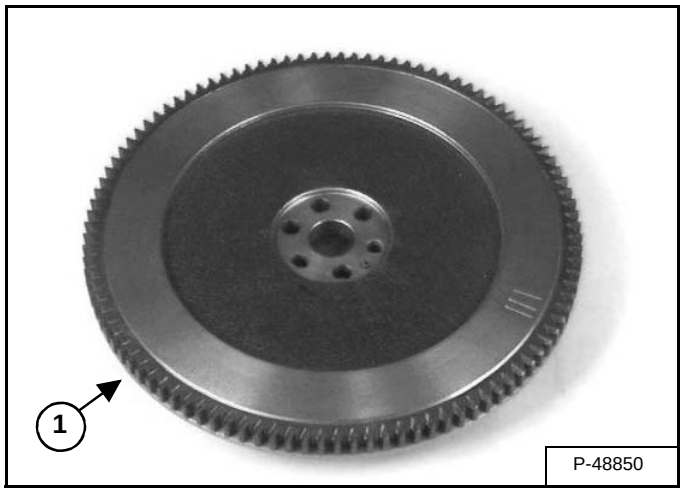
Remove the flywheel from the engine.

Installation: Be sure to align the hole in the flywheel with the pin located on the crankshaft.

Reverse the removal procedure to install the flywheel.

Ring Gear Removal And Installation

Figure 70-90-2



The ring gear (Item 1) **[Figure 70-90-2]** on the flywheel is an interference fit. Heat the ring gear enough to expand the gear. Hit the ring gear evenly around the gear to remove it from the flywheel.

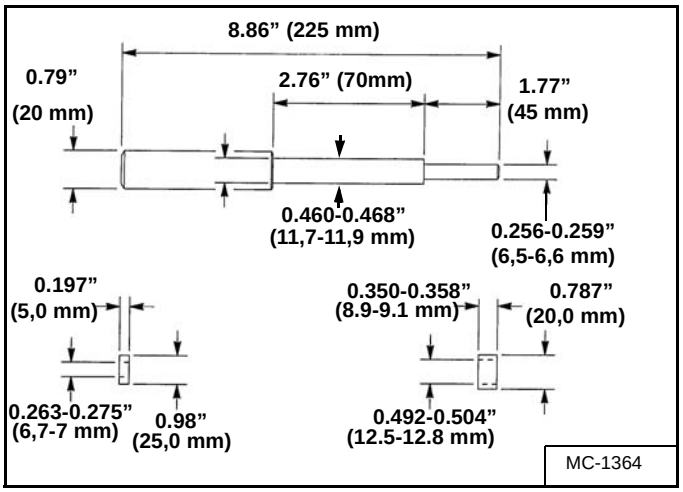
Clean the outer surface of the flywheel thoroughly so the new ring gear will fit smoothly onto the flywheel.

Clean the new ring gear and heat it to a temperature of 450°-500° F. (232°-260° C.)

Fit the ring on the flywheel and be sure the gear is seated correctly.

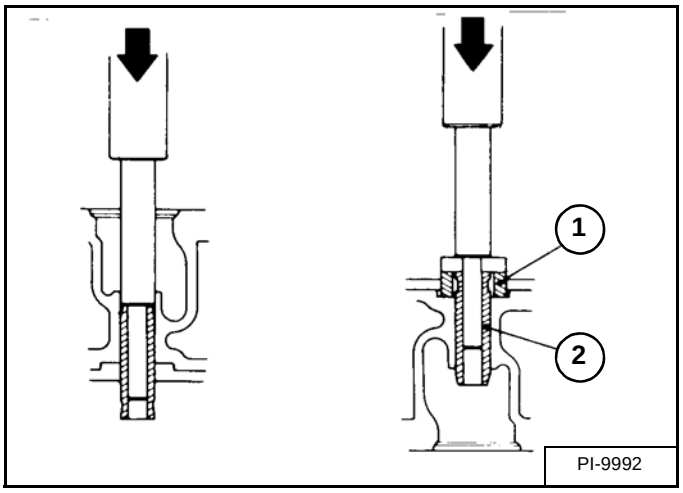
Valve Guide Checking (Cont'd)

Figure 70-100-21



To remove and replace the valve guide, make the driver tool as shown in figure **[Figure 70-100-21]**.

Figure 70-100-22



Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-100-22]**.

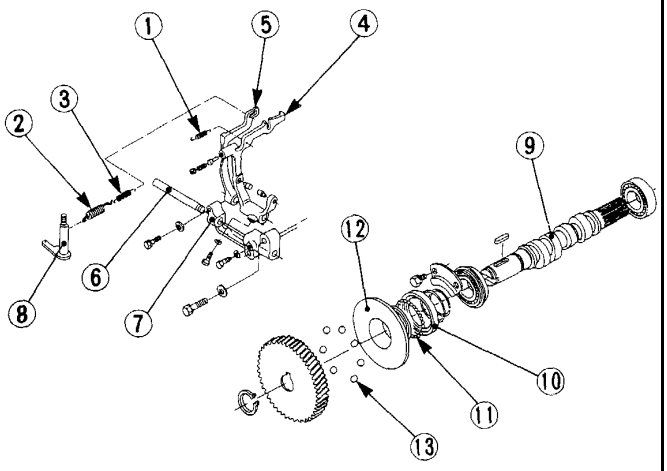
Put oil on the outside diameter of the new valve guide. Press the new valve guide into the cylinder head from the top side. Use the special driver tools (Items 1 & 2) **[Figure 70-100-22]**, press the new guide until the tool contacts the cylinder head.

Ream the valve guide to the correct specifications.

Fuel Camshaft Governor

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load.

Figure 70-100-52



1. Start Spring
2. Governor Spring
3. Governor Spring
4. Fork Lever
5. Fork Lever
6. Fork Lever Shaft
7. Fork Lever Holder
8. Governor Lever
9. Fuel Camshaft
10. Governor Ball Case
11. Steel Balls
12. Governor Sleeve
13. Steel Ball

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Disassemble and assemble the governor and fuel camshaft as shown in figure **[Figure 70-100-52]**.

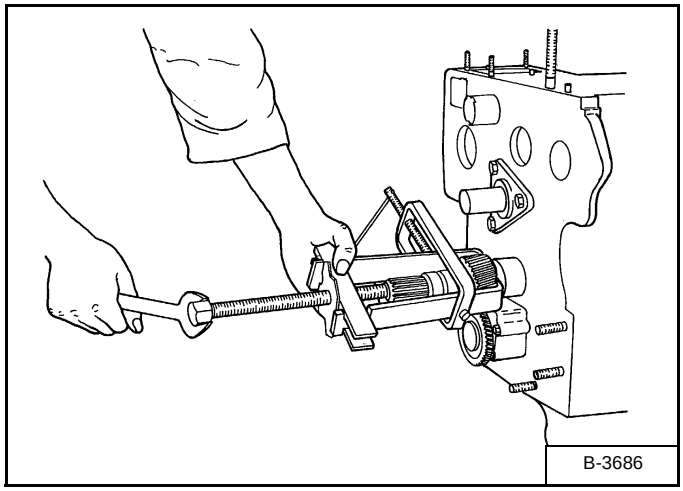
Check all the parts for wear or damage and replace as needed.

Crankshaft Gear Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-100-10.)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-100-13.)

Figure 70-100-53



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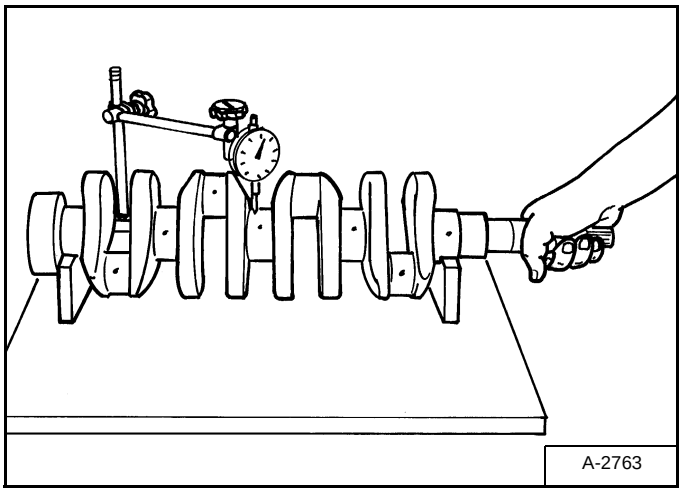
Remove the crankshaft gear with a puller **[Figure 70-100-53]**.

Remove the crankshaft key.

Crankshaft And Bearings, Servicing

Figure 70-100-82



Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-100-82]**.

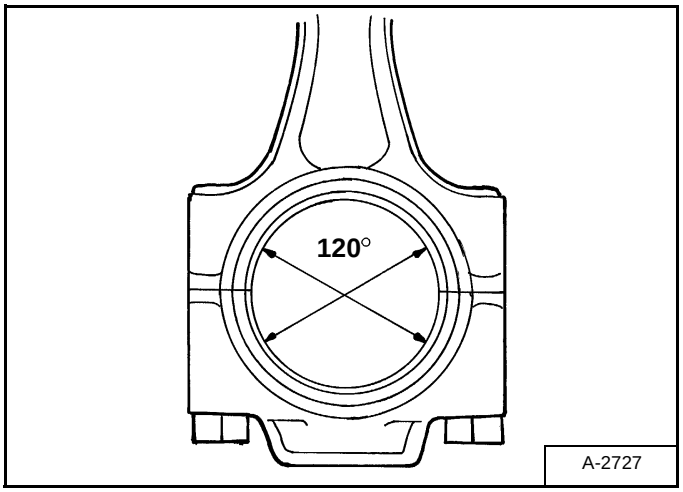
Turn the crankshaft at a slow rate to obtain the misalignment (one half of the alignment measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0.00079 inch (0,02 mm)

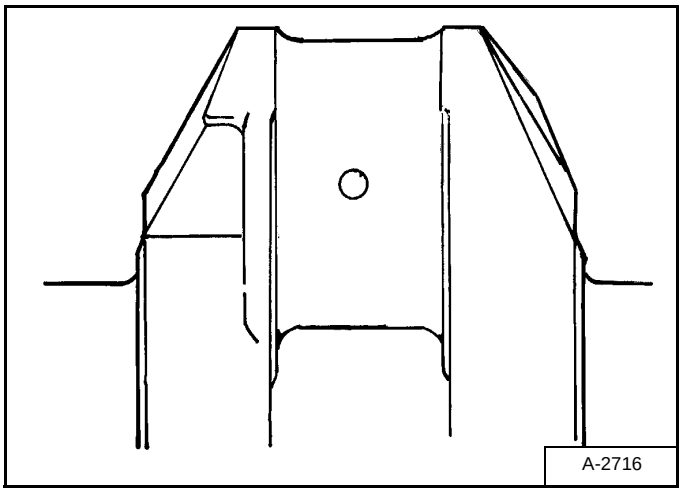
Tighten the connecting rod bolts to 33-36 ft.-lb. (45-49 N•m) torque.

Figure 70-100-83



Measure the crankpin bearing I.D. **[Figure 70-100-83]**.

Figure 70-100-84



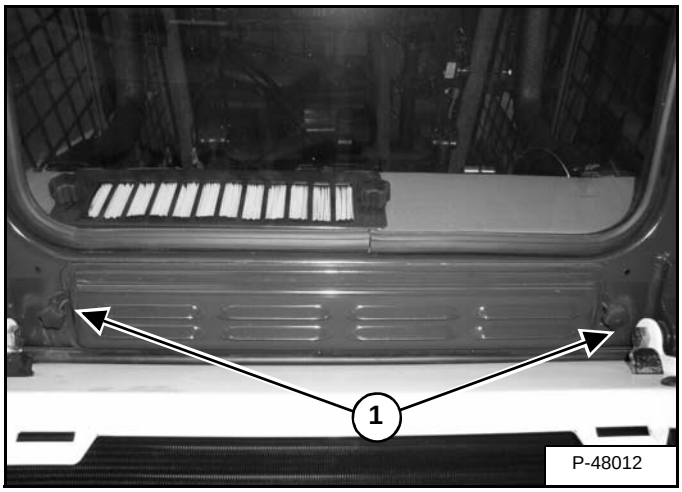
Measure the crankpin O.D. **[Figure 70-100-84]**.

Calculate the oil clearance.

Crankpin Bearing I.D.	1.8504-1.8522 inch (47,000-47,046 mm)
Crankpin O.D.	1.8488-1.849 inch (49,96-46,98 mm)
Oil Clearance	0.00098-0.00343 inch (0,025-0,087 mm)
Allowable limit	0.0079 inch (0,2 mm)

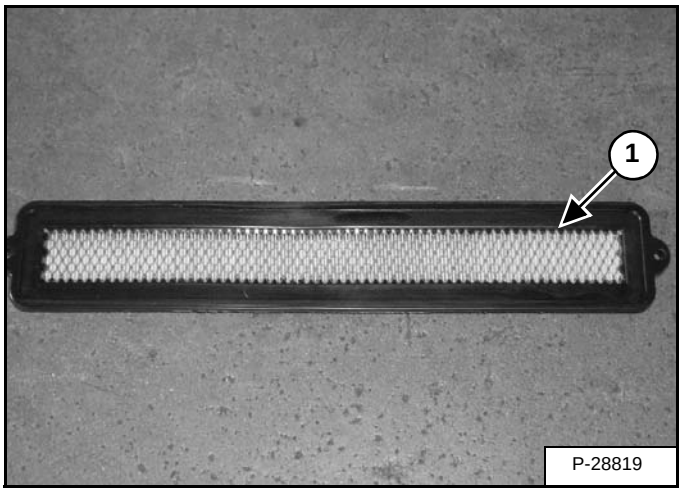
Filter Elements Removal And Installation

Figure 80-20-1



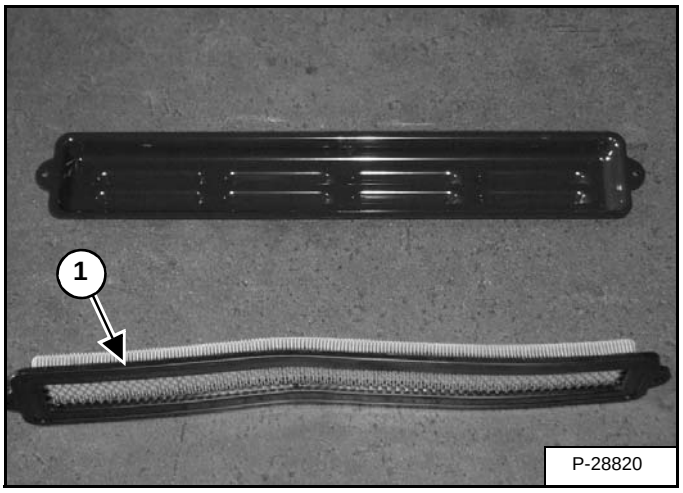
Remove the two mount bolts (Item 1) **[Figure 80-20-1]** from the fresh air filter cover at the rear of the loader cab.

Figure 80-20-2



Remove the filter cover and filter (Item 1) **[Figure 80-20-2]** from the loader.

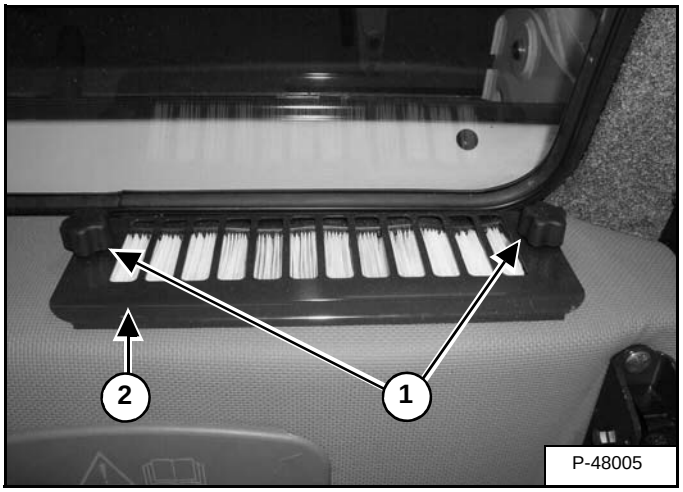
Figure 80-20-3



Remove the filter (Item 1) **[Figure 80-20-3]** from the cover.

The fresh air filter must be cleaned sometimes as often as twice a day, depending on the operating environment. The filter can be cleaned by removing and shaking it. A small amount of air pressure can be used to clean the filter. However the fresh air filter should be changed at least 2-4 times per year in normal conditions. In extremely dusty conditions the fresh air filter may need to be changed weekly.

Figure 80-20-4



Remove the two retaining knobs (Item 1) **[Figure 80-20-4]** from the recirculating air filter cover, at the back of the cab.

Remove the retaining cover (Item 2) **[Figure 80-20-4]** from the loader cab.

SYSTEM TROUBLESHOOTING CHART

Blower Motor Does Not Operate

POSSIBLE CAUSE	INSPECTION	SOLUTION
1. Blown Fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2. Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3. Fan motor malfuntion.	Check the lead wires from the motor with a circuit tester.	Replace Motor.
4. Resistor malfuntion.	Check resistor using a circuit tester.	Replace Resistor.
5. Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

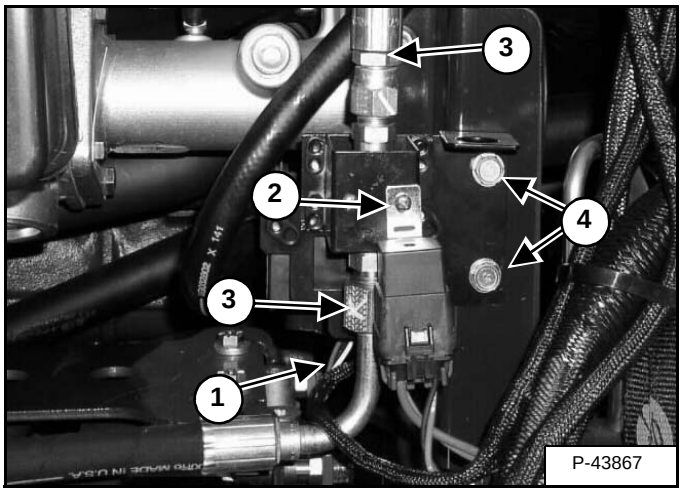
Blower motor operators normally, but air flow is insufficient

POSSIBLE CAUSE	INSPECTION	SOLUTION
1. Air leak.	Check to make sure air hoses are properly hooked to Louvers, and air ducts.	Repair or adjust.

HEATER VALVE

Removal and Installation

Figure 80-80-1



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

Remove the relay mounting screw (Item 2) **[Figure 80-80-1]** from the heater valve. Remove the relay, and replace the screw.

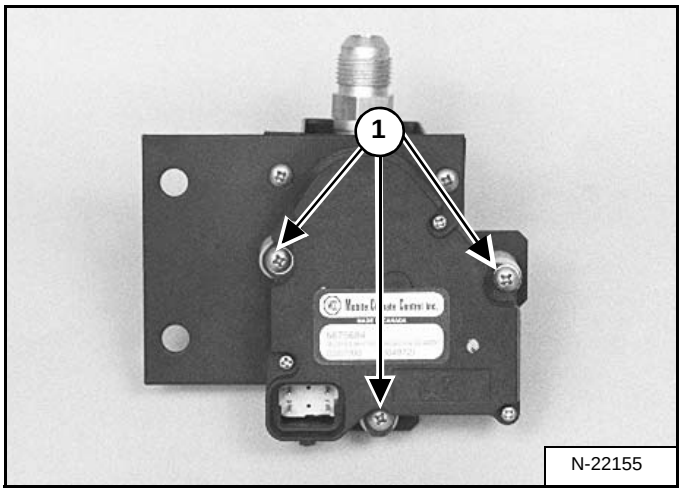
Remove the two coolant hoses (Item 3) **[Figure 80-80-1]** from the heater valve.

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

Remove the two mount bolts (Item 4) **[Figure 80-80-1]** from the heater valve mount bracket.

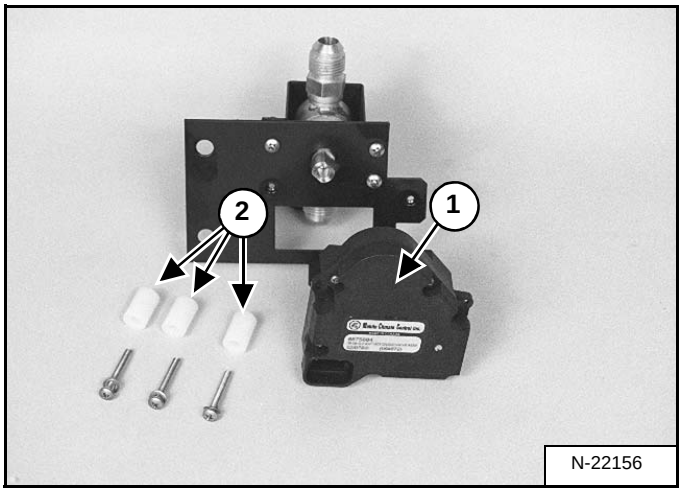
Remove the heater valve and mount bracket from the loader.

Figure 80-80-2



Remove the three mount bolts (Item 1) **[Figure 80-80-2]** from the heater valve actuator.

Figure 80-80-3



Remove the actuator (Item 1) and the three mounting spacers (Item 2) **[Figure 80-80-3]** from the heater valve mount plate.

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

Cylinders

Cylinder Bore I.D.	3.4252-3.4261 (87,00-87,022)
Allowable Limit	+0.0059 (+0,15)

Piston Rings

Ring Gap (Top Ring)	0.0079-0.0138 (0,20-0,35)
Limit Permitted	0.0492 (1,25)
Ring Gap (2nd Ring)	0.0138-0.0197 (0,35-0,50)
Limit Permitted	0.0492 (1,25)
Ring Gap (Oil Ring)	0.079-0.0157 (0,20-0,40)
Limit Permitted	0.0492 (1,25)
Side Clearance of Ring Groove:	
Top Ring	0.0037-0.0047 (0,093-0,12)
Second Ring	0.0037-0.0047 (0,094-0,12)
Oil Ring	0.0008-0.002 (0,02-0,052)

Pistons

Piston Pin Bore	0.9843-0.9848 (25,0-25.013)
Limit Permitted	0.9862 (25,05)

Connecting Rod

Piston Pin O.D.	0.9843-0.9847 (25,002-25,011)
Small End Bushing I.D.	0.9852-0.9858 (25,025-25,04)
Clearance Between Piston Pin & Small End Bushing	0.0006-0.0015 (0,014-0,038)
Allowable Limit	0.0059 (0,15)
Connecting Rod Alignment Allowable Limit	0.002 (0,05)

Oil Pump

Oil Pressure Rated RPM	43-64 PSI (3-4,4 bar)
Limit Permitted	36 PSI (2,5 bar)
Idle Speed	14 PSI (1 bar)
Limit Permitted	7 PSI (0,5 bar)
Clearance Between Inner Rotor & Outer Rotor	0.0012-0.0055 (0,03-0,14)
Outer Rotor & Pump Body	0.0043-0.0075 (0,11-0,19)
End Clearance Between Inner Rotor & Cover	0.0041-0.0059 (0,105-0,15)
Limit Permitted	0.0079 (0,20)