

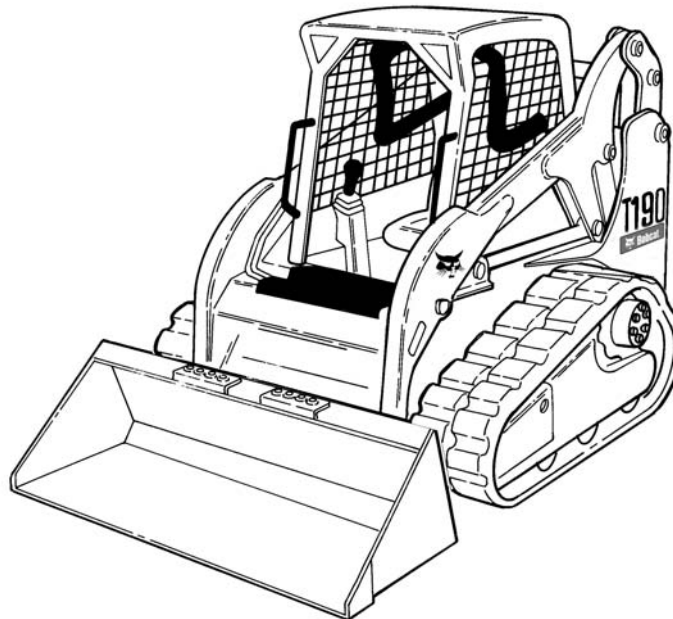


Bobcat®

Service Manual T190 Track Loader

S/N 531611001 - 531659999

S/N 531711001 - 531759999



**EQUIPPED WITH
BOBCAT INTERLOCK
CONTROL SYSTEM (BICS)**



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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

IMPORTANT

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

I-2019-0284



DANGER

The signal word DANGER on the machine and in the manuals indicates a hazardous situation which, if not avoided, will result in death or serious injury.

D-1002-1107



WARNING

The signal word WARNING on the machine and in the manuals indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

W-2044-1107

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

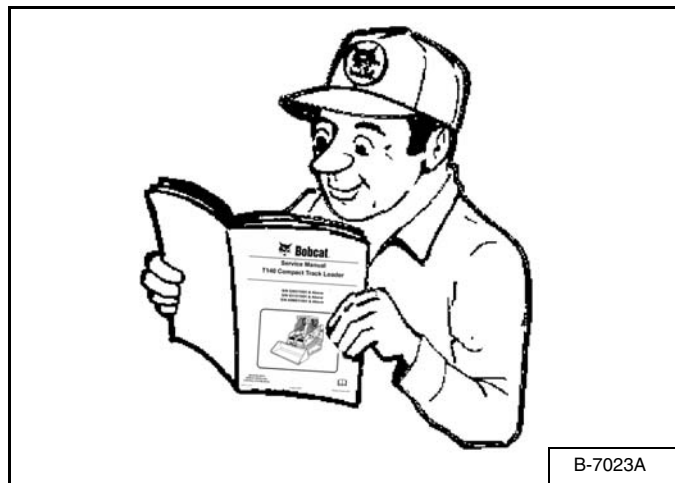
! WARNING

AVOID INJURY OR DEATH

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

W-2003-0807

Figure 10-10-1

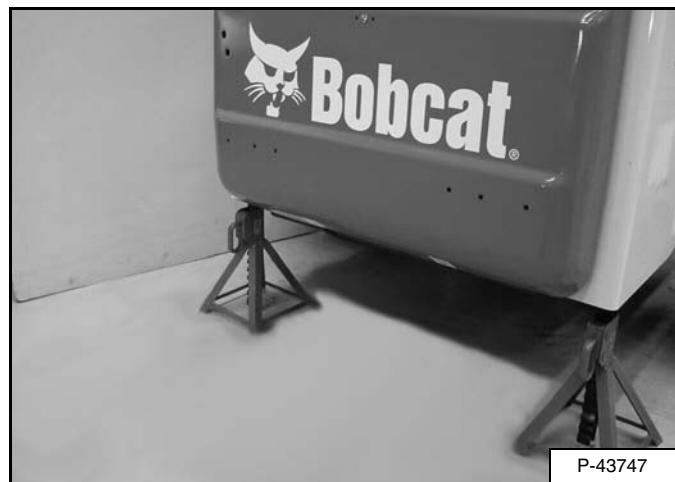


! WARNING

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

W-2017-0286

Figure 10-10-2

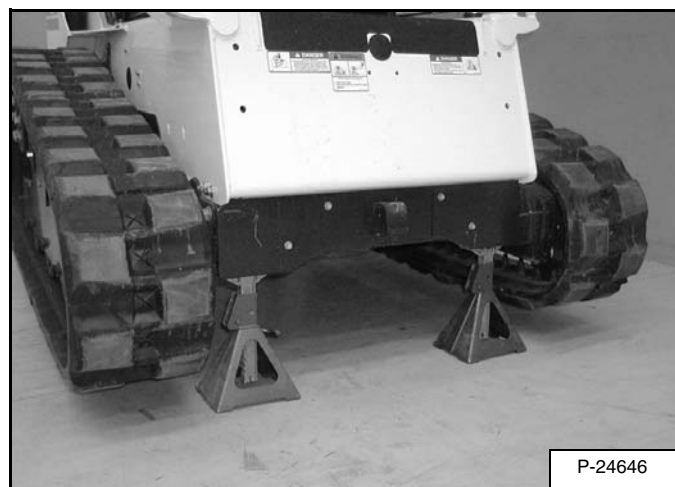


Always park the loader on a level surface.

Put floor jack under the rear of the loader [Figure 10-10-2].

Lift the rear of the loader and install jackstands [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 jackstands under the axle tubes [Figure 10-10-3].

NOTE: Make sure the jackstands do not touch the tracks. Make sure the tracks clear the floor or any obstacles.

TOWING THE LOADER

Procedure

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

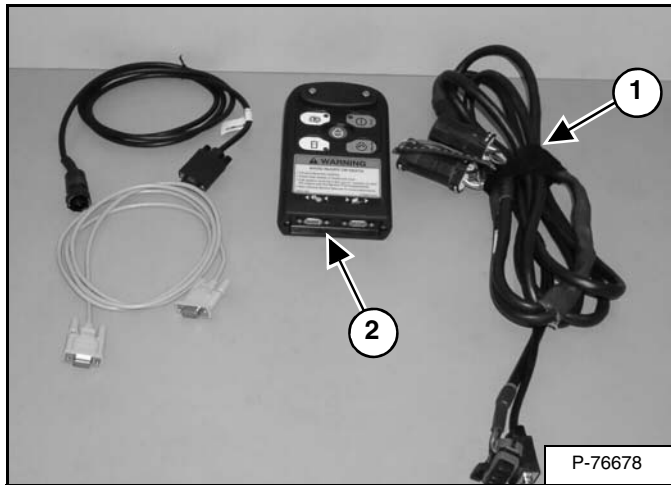
- The loader can be lifted onto a transport vehicle.
- The loader can be skidded a short distance to move for service (EXAMPLE: Move onto a transport vehicle.) without damage to the hydrostatic system. (The tires/tracks will not turn.) There might be slight wear to the tires/tracks when the loader is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

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

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

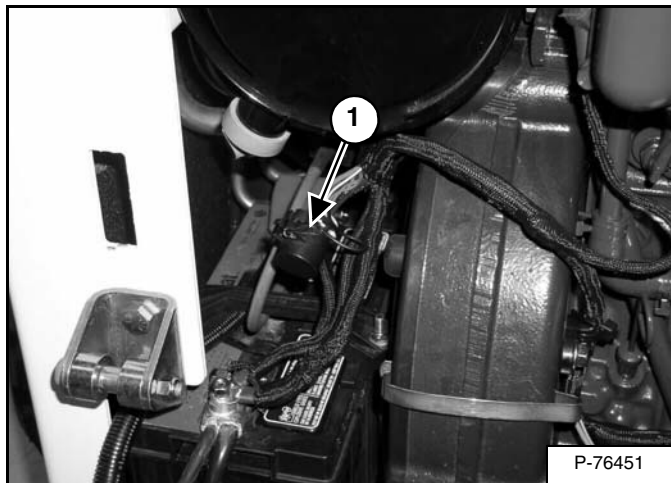
Loader Service Tool Harness - 6689747

Figure 10-61-5



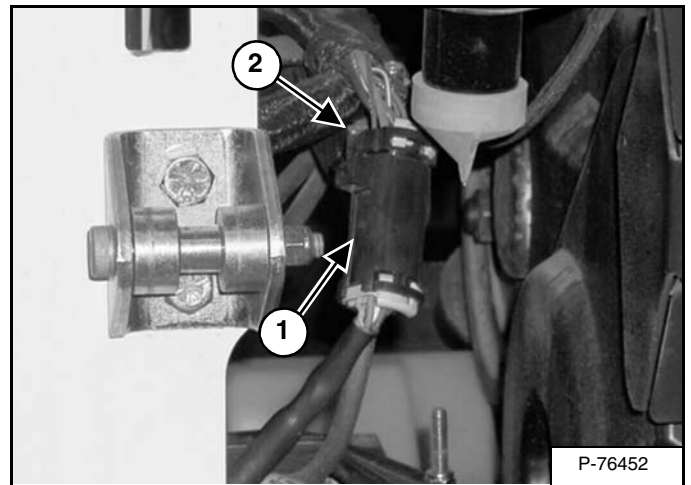
The loader service tool harness (Item 1) [Figure 10-61-5] is used to connect the remote start tool (service tool) (Item 2) [Figure 10-61-5] to the electrical system on the loader.

Figure 10-61-6



Loaders without an attachment control harness, remove the loader harness cap (Item 1) [Figure 10-61-6] and connect the Loader Service Tool Harness from the Remote Start Tool (Service Tool).

Figure 10-61-7



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

When the remote start procedure is completed, replace the loader connector cap (Item 1) [Figure 10-61-6] or reconnect the attachment control harness to the loader harness [Figure 10-61-7].

ENGINE COOLING SYSTEM

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

WARNING

AVOID INJURY OR DEATH

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

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

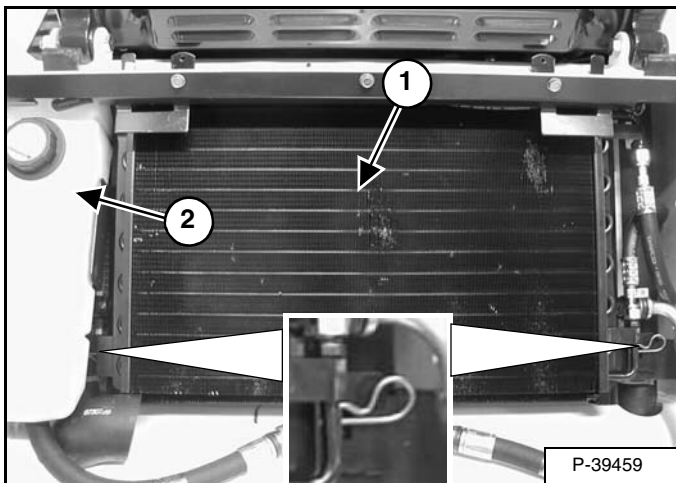
W-2019-0907

Cleaning

Open the rear door. (See REAR DOOR on Page 50-70-1.)

Remove the rear grill. (See REAR GRILL on Page 50-60-1.)

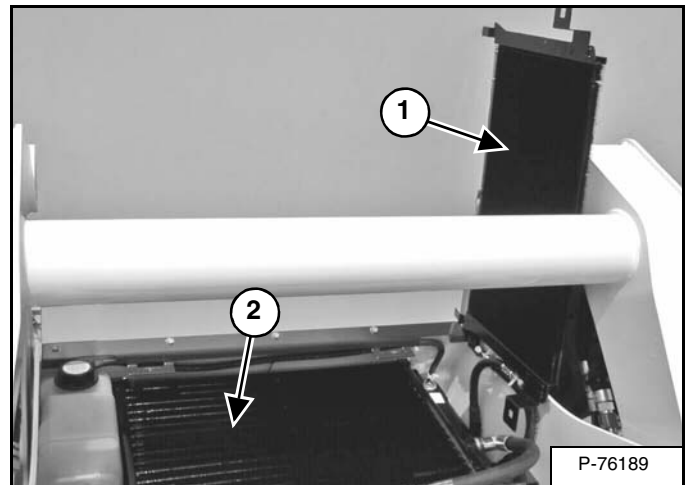
Figure 10-90-1



Use low air pressure or water pressure to clean the top of the air conditioning condenser (Item 1) [Figure 10-90-1], if equipped.

Raise the overflow tank (Item 2) slightly and remove the two fasteners (Inset) [Figure 10-90-1].

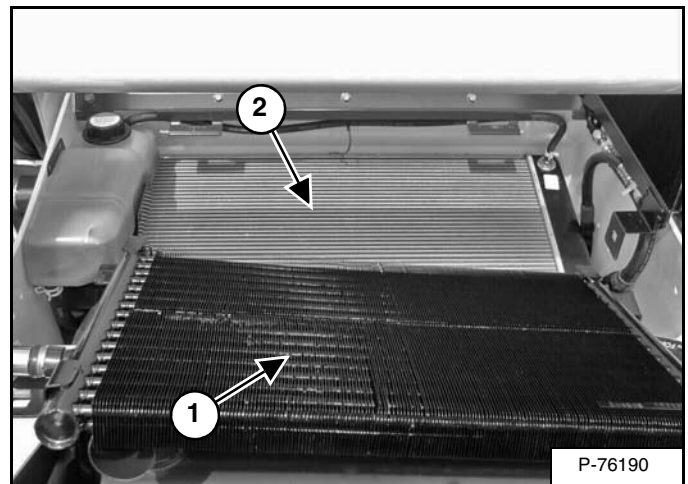
Figure 10-90-2



NOTE: Be careful when raising and lowering the air conditioning condenser so that the air conditioning condenser does not fall on the oil cooler and damage the fins.

Raise the air conditioning condenser (Item 1) and use low air pressure or water pressure to clean the top of the oil cooler (Item 2) [Figure 10-90-2].

Figure 10-90-3



NOTE: Be careful when raising and lowering the oil cooler so that the oil cooler does not fall on the radiator and damage the fins.

Raise the oil cooler (Item 1) and use low air pressure or water pressure to clean the top of the radiator (Item 2) [Figure 10-90-3].

Lower the oil cooler.

Lower the air conditioning condenser, if equipped.

Install the fasteners and lower the overflow tank. Check the cooling system for leaks.

Install the rear grill and close the rear door.

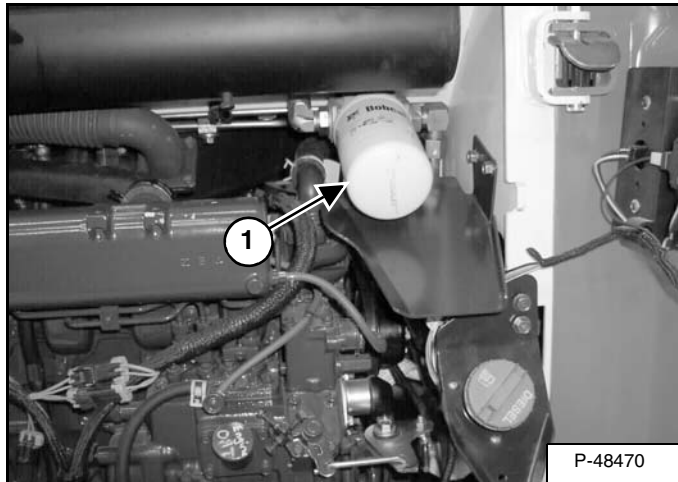
HYDRAULIC / HYDROSTATIC SYSTEM (CONT'D)

Removing And Replacing Hydraulic / Hydrostatic Filter

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

Open the rear door.

Figure 10-120-4



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

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

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

WARNING

AVOID INJURY OR DEATH

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

W-2103-0508

Start the engine and operate the loader hydraulic controls.

WARNING

AVOID INJURY OR DEATH

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or

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

W-2072-0807

Stop the engine and check for leaks at the filter.

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

SPARK ARRESTOR MUFFLER

Cleaning Procedure

Use the correct service interval for cleaning the spark arrestor muffler.

Do not operate the loader with a defective exhaust system.

IMPORTANT

This loader is factory equipped with a U.S.D.A. Forestry Service approved spark arrestor muffler. It is necessary to do maintenance on this spark arrestor muffler to keep it in working condition. The spark arrestor muffler must be serviced by dumping the spark chamber every 100 hours of operation.

If this machine is operated on flammable forest, brush or grass covered land, it must be equipped with a spark arrestor attached to the exhaust system and maintained in working order. Failure to do so will be in violation of California State Law, Section 4442 PRC.

Consult local laws and regulations for spark arrestor requirements

I-2022-0807

! WARNING

Stop engine and allow the muffler to cool before cleaning the spark chamber. Wear safety goggles. Failure to obey can cause serious injury.

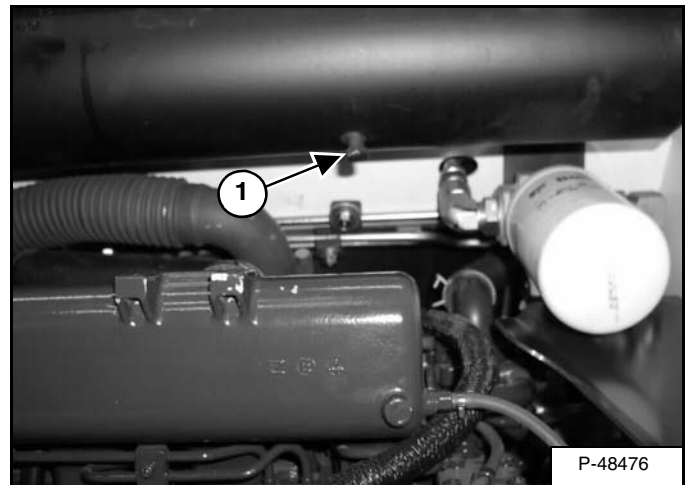
W-2011-1285

! WARNING

When the engine is running during service, the steering levers must be in neutral and the parking brake engaged. Failure to do so can cause injury or death.

W-2006-0284

Figure 10-150-1



Stop the engine and open the rear door.

Remove the plug (Item 1) [Figure 10-150-1] from the bottom of the muffler.

Start the engine and run for about 10 seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler.

This will force contaminants out through the cleanout hole.

Stop the engine.

Install and tighten the plug.

Close the rear door.

! WARNING

AVOID INJURY OR DEATH

When an engine is running in an enclosed area, fresh air must be added to avoid concentration of exhaust fumes. If the engine is stationary, vent the exhaust outside. Exhaust fumes contain odorless, invisible gases which can kill without warning.

W-2050-0807

! WARNING

Never use machine in atmosphere with explosive dust or gases or where exhaust can contact flammable material. Failure to obey warnings can cause injury or death.

W-2068-1285

HYDRAULIC SYSTEM (CONT'D)

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**HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH SJC AND HIGH FLOW OPTION
T190 (S/N 531611001 - 531659999)
(S/N 531711001 - 531759999)**

**(PRINTED FEBRUARY 2008)
V-0742legend**

LEGEND

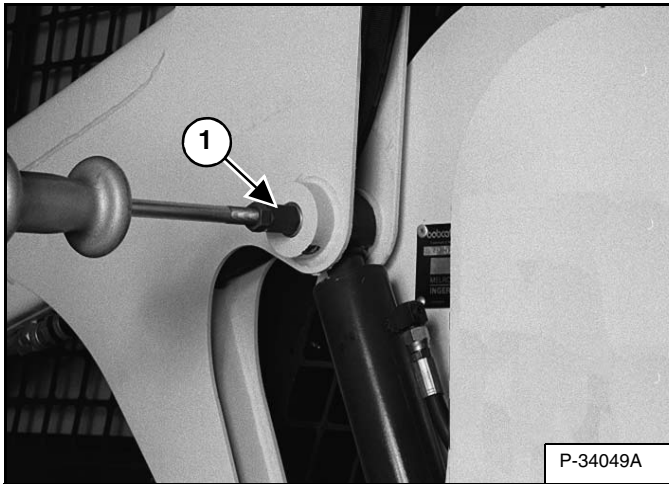
1 RESERVOIR: Capacity 19.2 qt. (18,2 L)	16 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL	33 FILTER - BICS CONTROL VALVE (SCREEN)	50 RELIEF VALVE - 3300 PSI (228 bar)
2 SPRING LOADED FILTER BY-PASS VALVE: 45-55 PSI (3,1-3,8 bar)	17 PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL	34 CHECK VALVE - BUCKET POSITION VALVE	51 DUMP VALVE - (ON/OFF)
3 DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 bar) Normally Closed	18 PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL	35 RESTRICTION	52 CHECK VALVE
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5 RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5075 PSI (350 bar)	20 PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL	37 SHUTTLE RELIEF VALVE (Not Adjustable - Factory Set) 65 PSI (4,5 bar)	54 CHECK VALVE - With 300 PSI (20,7 bar) Spring with 0.016 inch (0,40 mm) orifice
6 RELIEF VALVE - CHARGE INLET: 360 PSI (24,8 bar) at High Engine Idle With 140 degrees F. (60 degrees C.) Fluid	21 PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL	38 FIXED CAPACITY DISPLACEMENT BI-DIRECTIONAL HYDROSTATIC MOTOR	55 SOLENOID ACTIVATED CONTROL VALVE - FORWARD/REVERSE
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9 RELIEF VALVE - MAIN: 3250-3350 PSI (224-231 bar) at Front Quick Couplers	24 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - ROD	41 CHECK VALVE - BICS CONTROL VALVE	58 CHARGE PRESSURE SENSOR
10 PORT RELIEF/ANTICAVITATION VALVE 3500 PSI (241,3 bar)	25 LOAD SHUTTLE VALVE - BLEED OFF	42 RESTRICTION - 0.343 inch (8,7 mm)	59 CHARGE PUMP - 12.8 GPM (48,5 L/min) at High Engine Idle
11 ANTICAVITATION VALVE	26 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO COIL	43 FILTER - Bob-Tach Valve	60 FIXED CAPACITY DISPLACEMENT HYDRAULIC MOTOR
12 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY	27 PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - REAR AUXILIARY	44 PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH	61 ANTICAVITATION VALVE
13 PORT RELIEF/ANTICAVITATION VALVE: (Optional) 3500 PSI (241,3 bar)	28 RESTRICTOR - 0.140 inch (3,6 mm)	45 RESTRICTION - 0.089 inch (2,26 mm)	62 PROPORTIONAL RELIEF VALVE – (Fan Speed Regulator): 1566 - 1784 PSI (108 - 123 bar)
14 LOAD CHECK VALVE	29 RESTRICTOR - 0.031 inch (0,8 mm)	46 RESTRICTION - 0.025 inch (0,6 mm)	63 CHECK VALVE
15 LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP	30 RELIEF VALVE: 3300 PSI (228 bar)	47 RELIEF VALVE - 2000 PSI (137 bar)	64 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE
	31 FILTER - HYDRAULIC (CANISTER)	48 RELIEF VALVE - 1200 PSI (83 bar)	65 HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE
	32 FILTER - CASE DRAIN (SINTERED BRONZE)	49 SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)	

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

CYLINDER (LIFT) (CONT'D)

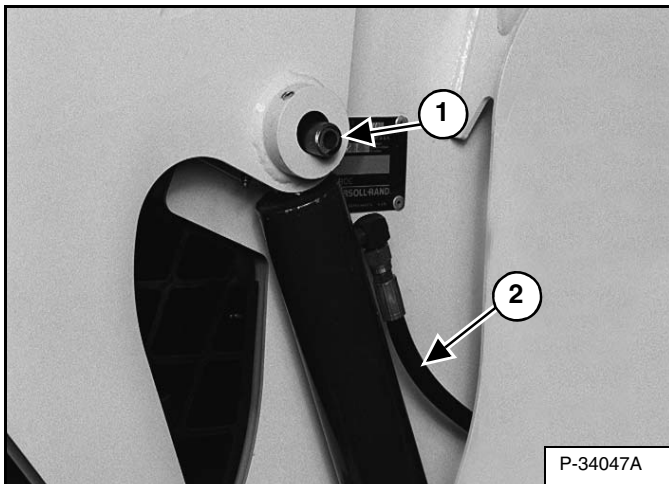
Removal And Installation (Cont'd)

Figure 20-20-6



Use a slide hammer, remove the lift cylinder rod end pivot pin (Item 1) [Figure 20-20-6].

Figure 20-20-7

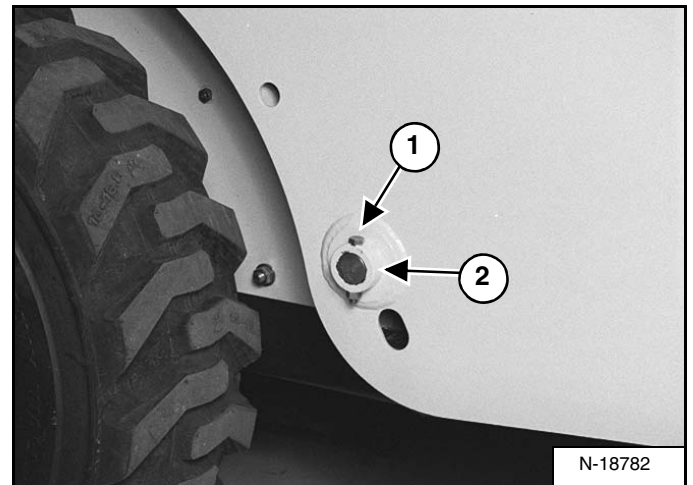


Install a smaller pin (Item 1) [Figure 20-20-7] to hold the cylinder in place.

Disconnect the hose (Item 2) [Figure 20-20-7] from the lift cylinder rod end port.

Install a plug in the hose and tighten.

Figure 20-20-8



Remove the retainer bolt (Item 1) [Figure 20-20-8] and nut from the lift cylinder pivot pin.

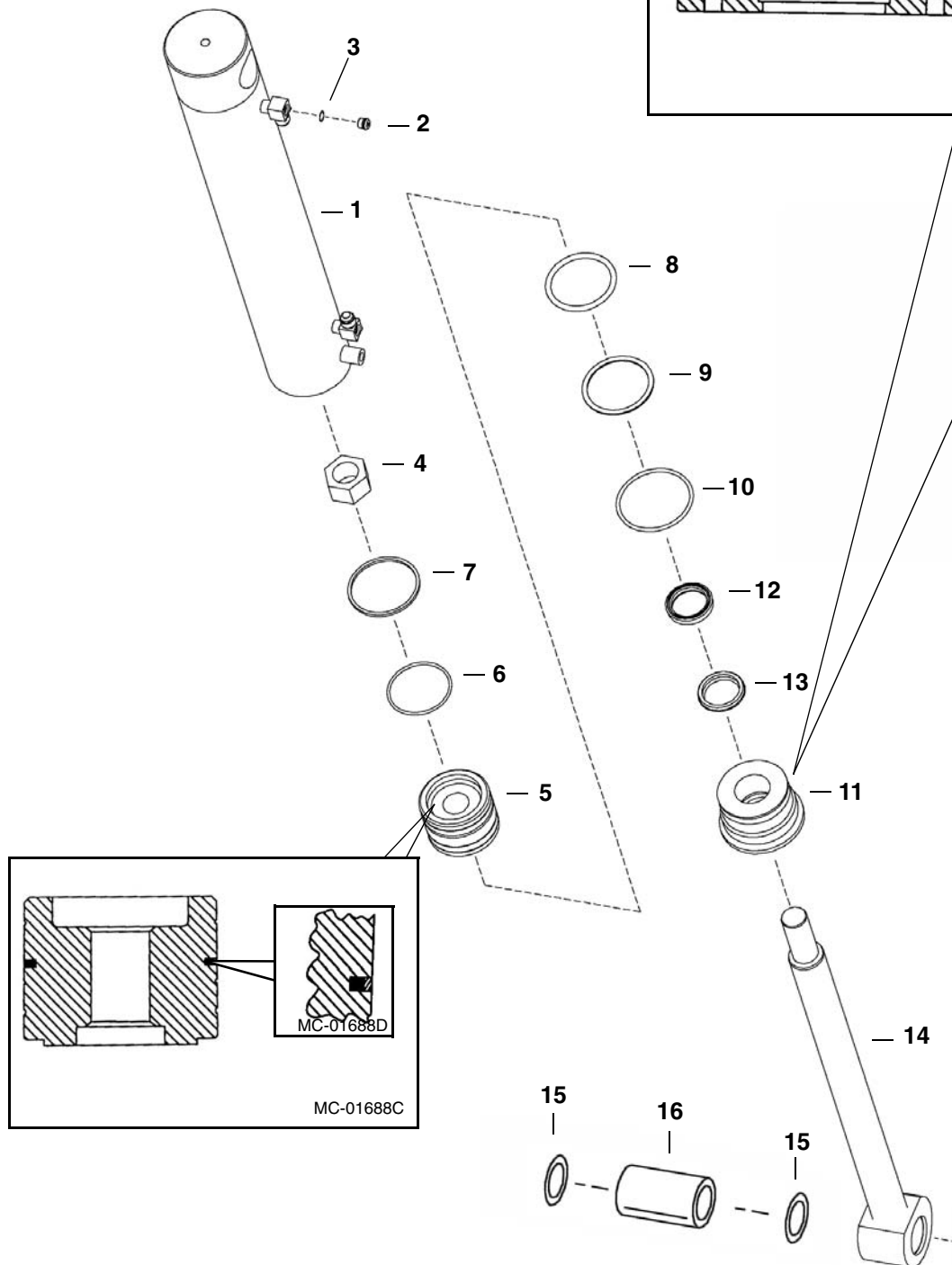
Installation: Tighten the bolt and nut to standard torque.

Use a drift pin and hammer, remove the lift arm pivot pin (Item 2) [Figure 20-20-8].

CYLINDER (TILT) (CONT'D)

Parts Identification

- | | |
|-----------|-------------|
| 1. Case | 9. Washer |
| 2. Plug | 10. O-ring |
| 3. O-ring | 11. Head |
| 4. Nut | 12. Seal |
| 5. Piston | 13. Seal |
| 6. Seal | 14. Rod |
| 7. O-ring | 15. Seal |
| 8. O-ring | 16. Bushing |



MC-01688A

PE-1056A

MAIN RELIEF VALVE

Description

The main relief valve limits the hydraulic system pressure by opening at a certain pressure and allowing the hydraulic oil to flow back to the hydraulic reservoir. (See Hydraulic System on Page SPEC-10-3.)

The main relief valve is adjustable and is located on the hydraulic control valve near the bottom, facing the front of the loader.

Testing

IMPORTANT

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

I-2024-0284

! WARNING

When the engine is running during service, the steering levers must be in neutral and the parking brake engaged. Failure to do so can cause injury or death.

W-2006-0284

! 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

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

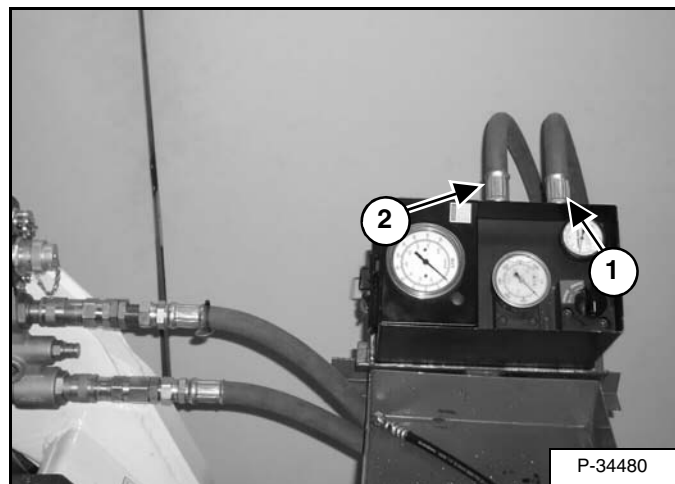
MEL10003 - Hydraulic Tester

MEL10006 - Hydraulic Test Kit

Turn the key switch to the OFF position. To release the hydraulic pressure at the front auxiliary quick couplers push the couplers into the coupler block and hold for three seconds.

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

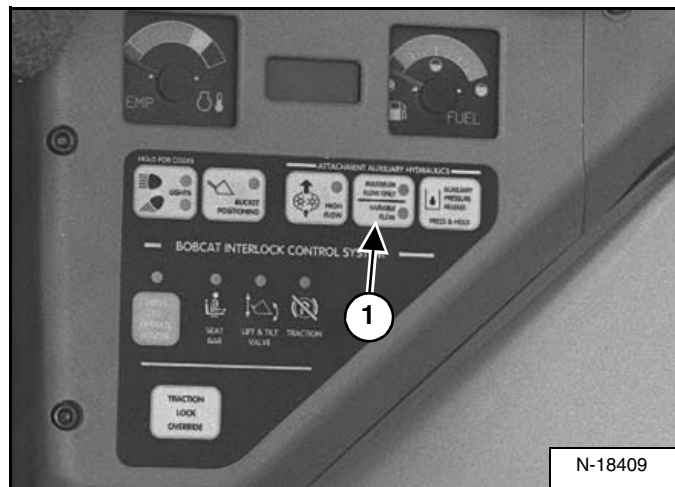
Figure 20-30-1



Connect the IN port (Item 1) [Figure 20-30-1] of the hydraulic tester to the bottom (female) quick coupler on the loader.

Connect the OUT port (Item 2) [Figure 20-30-1] of the hydraulic tester to the top (male) quick coupler on the loader.

Figure 20-30-2



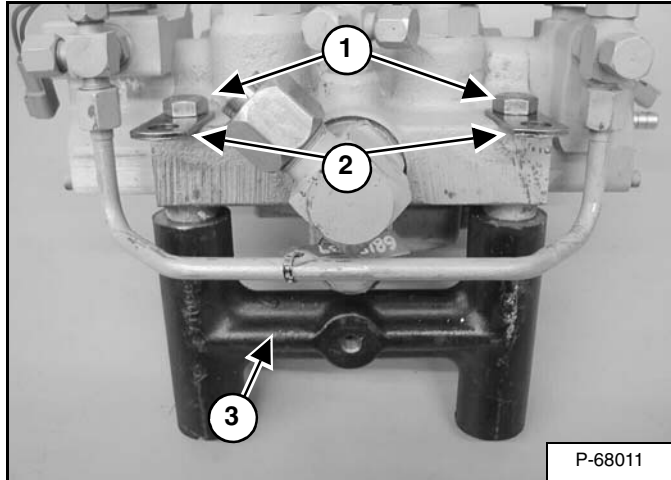
- Press the AUXILIARY HYDRAULICS Button (Item 1) [Figure 20-30-2] Maximum Flow.

HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

Mount Bracket Removal And Installation

Remove the control valve and mount bracket from the loader.

Figure 20-40-19

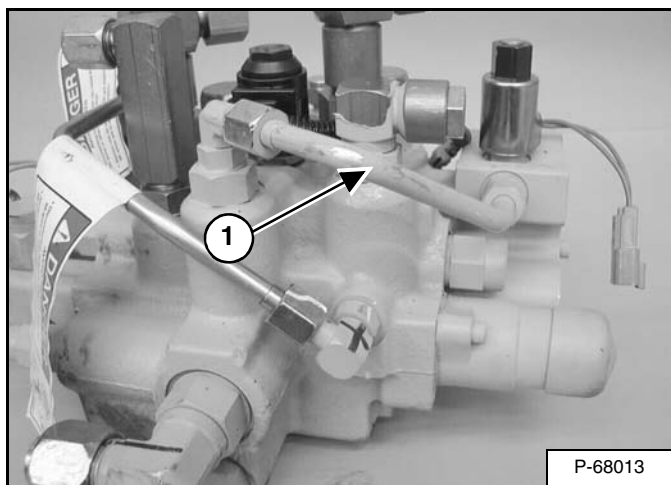


Remove the two mount bolts (Item 1) and lift eyes (Item 2) [Figure 20-40-19] from the hydraulic control valve.

Remove the mount bracket (Item 3) [Figure 20-40-19] from the hydraulic control valve.

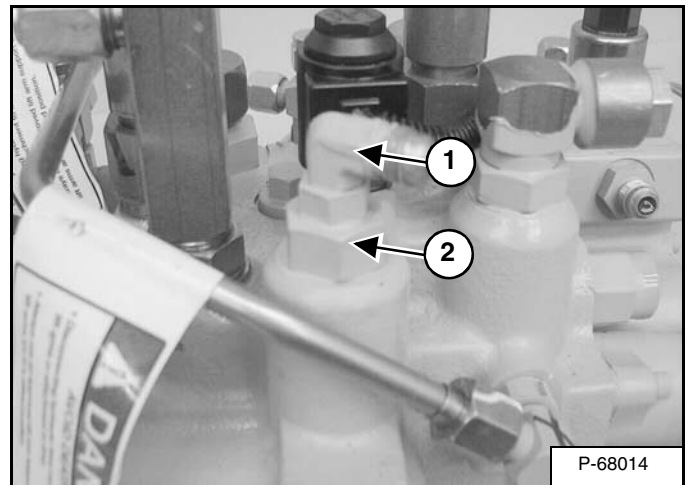
Lift Load Check Valve Removal And Installation

Figure 20-40-20



Remove the tubeline (Item 1) [Figure 20-40-20] from the control valve.

Figure 20-40-21

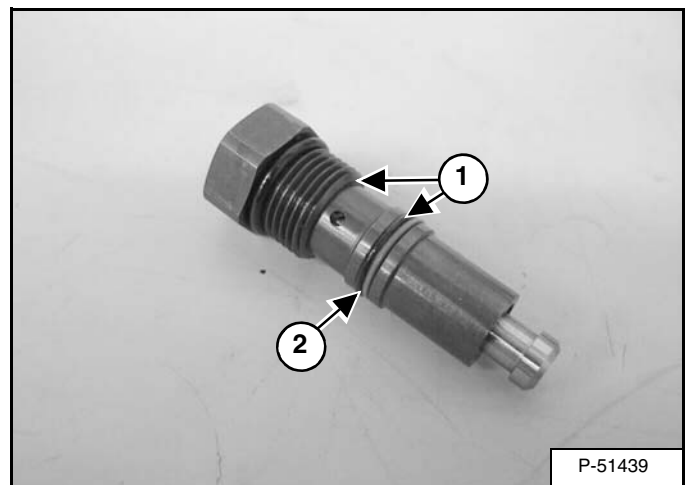


Remove the fitting (Item 1) [Figure 20-40-21] from the check valve.

Remove the lift load check valve (Item 2) [Figure 20-40-21].

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

Figure 20-40-22

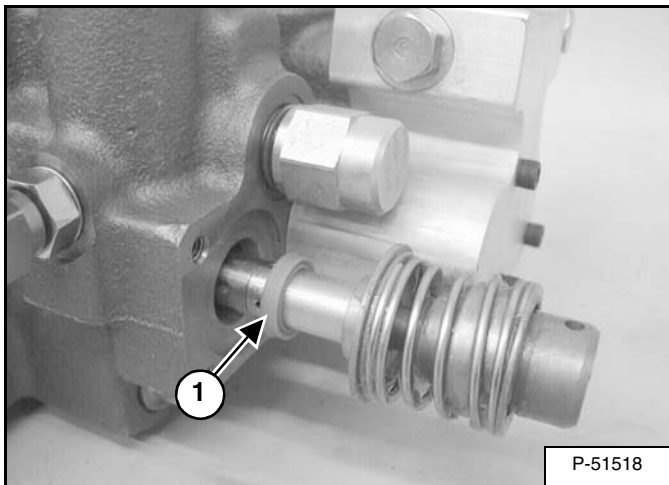


Remove and install new O-rings (Item 1) and back-up ring (Item 2) [Figure 20-40-22].

HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

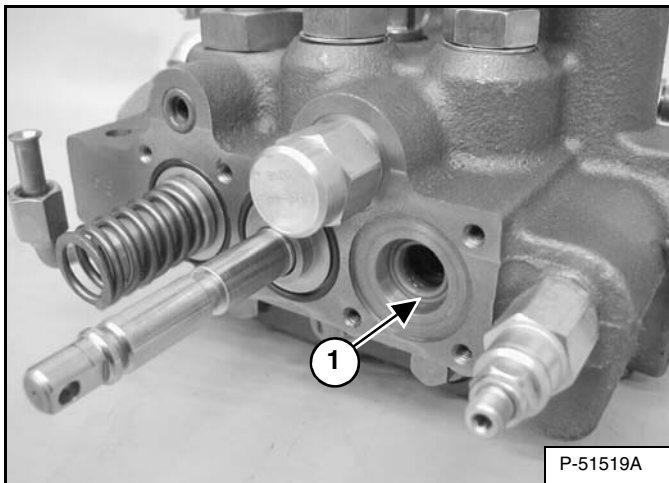
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-56



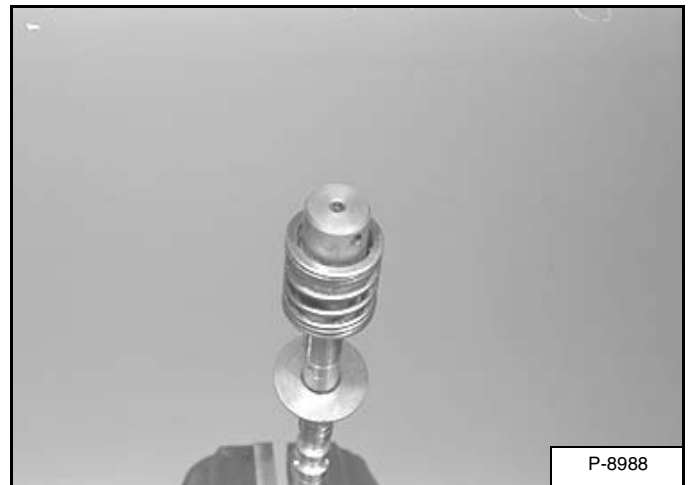
Remove the lift spool assembly and seal (Item 1) [Figure 20-40-56] from the control valve.

Figure 20-40-57



Remove the lift spool seal (Item 1) [Figure 20-40-57] from the linkage end of the valve.

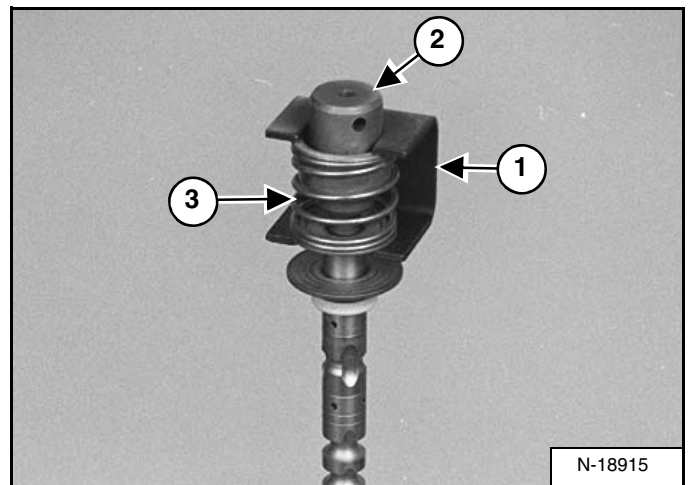
Figure 20-40-58



Clamp the linkage end of the spool in a vise [Figure 20-40-58].

NOTE: Protect spool before clamping in vise.

Figure 20-40-59



Install the spring tool (Item 1) [Figure 20-40-59] over the centering spring.

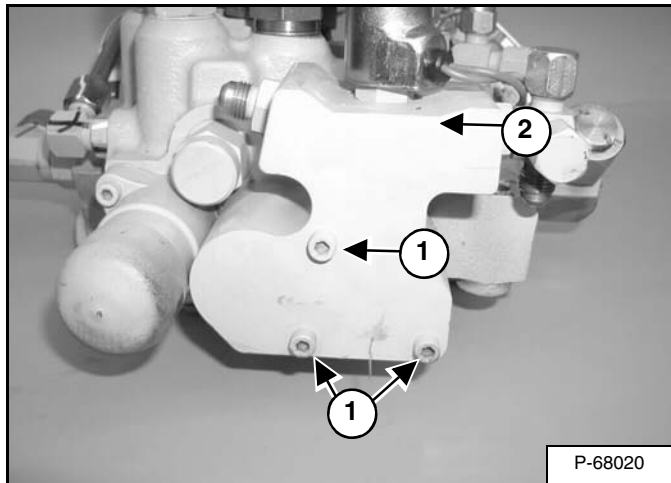
NOTE: Be careful when removing the detent adapter (Item 2) [Figure 20-40-59] from the centering spring, as it is under spring pressure.

NOTE: The centering spring (Item 3) [Figure 20-40-59] is white on all medium frame loaders.

HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

Auxiliary Spool Removal And Installation

Figure 20-40-95

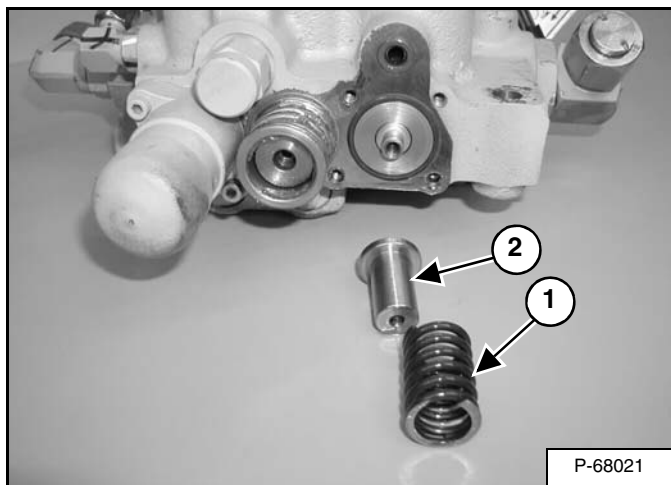


Remove the three screws (Item 1) [Figure 20-40-95] from the spool centering block.

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

Remove the spool centering block (Item 2) [Figure 20-40-95] from the control valve.

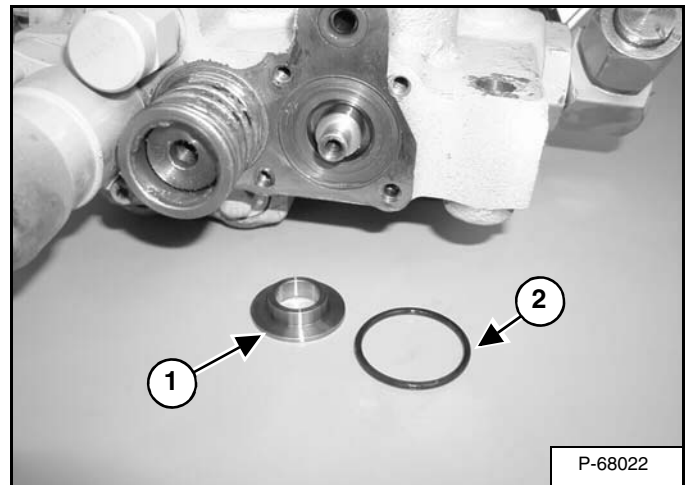
Figure 20-40-96



Remove the spring (Item 1) and center spring retainer (Item 2) [Figure 20-40-96] from the auxiliary spool.

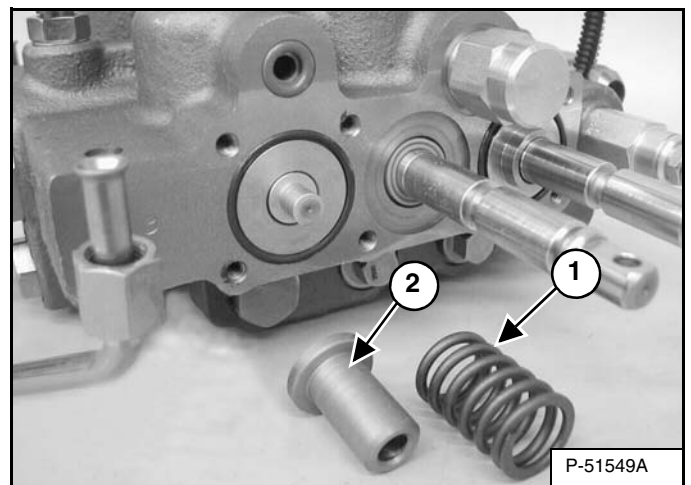
NOTE: If the centering spring retainer (Item 2) [Figure 20-40-96] must be replaced, replace the retainer on the opposite end also.

Figure 20-40-97



Remove the spacer (Item 1) and O-ring (Item 2) [Figure 20-40-97] from the auxiliary spool.

Figure 20-40-98



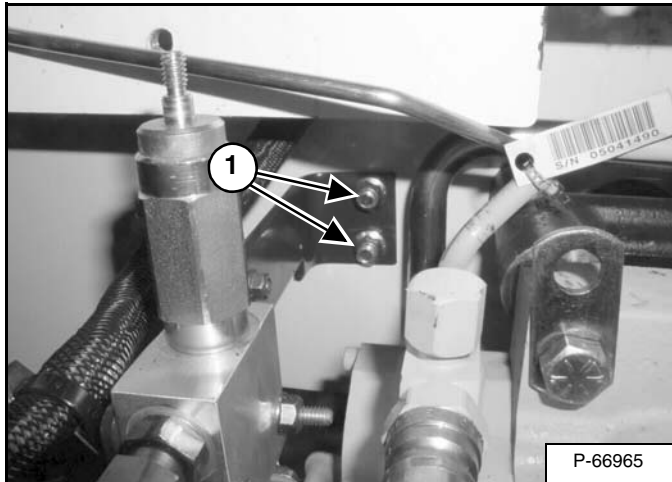
Remove the spring (Item 1) and center spring retainer (Item 2) [Figure 20-40-98] from the auxiliary spool.

NOTE: If the centering spring retainer (Item 2) [Figure 20-40-98] must be replaced, replace the retainer on the opposite end also.

HYDRAULIC CONTROL VALVE (ACS) OR (SJC) (CONT'D)

Removal And Installation (Cont'd)

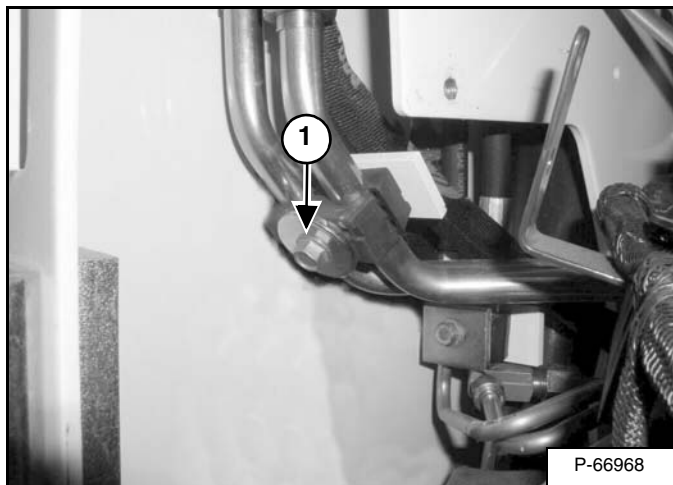
Figure 20-41-6



Remove the two lift arm bypass valve bracket mounting bolts (Item 1) [Figure 20-41-6].

Remove the lift arm bypass valve and mounting bracket.

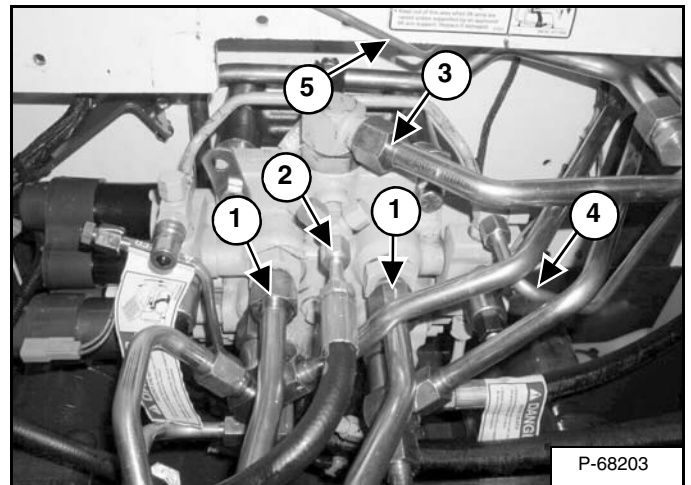
Figure 20-41-7



Remove tubeline clamp screw (Item 1) [Figure 20-41-7] from the auxiliary tubelines in the left rear upright.

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

Figure 20-41-8



Remove and cap both tubelines (Item 1) [Figure 20-41-8] from the auxiliary section of the control valve.

Disconnect and cap the drain hose (Item 2) [Figure 20-41-8] from the control valve.

Remove and cap the outlet tubeline (Item 3) [Figure 20-41-8] from the control valve to the hydraulic oil cooler.

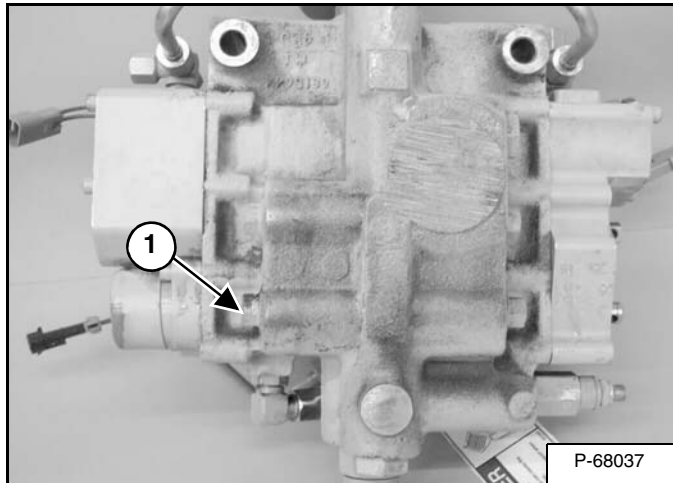
Remove and cap the charge tubeline (Item 4) [Figure 20-41-8] from the control valve to the charge filter.

Remove the throttle rod (Item 5) [Figure 20-41-8] from the engine, then pull the throttle rod out of the loader from the rear.

HYDRAULIC CONTROL VALVE (ACS) OR (SJC) (CONT'D)

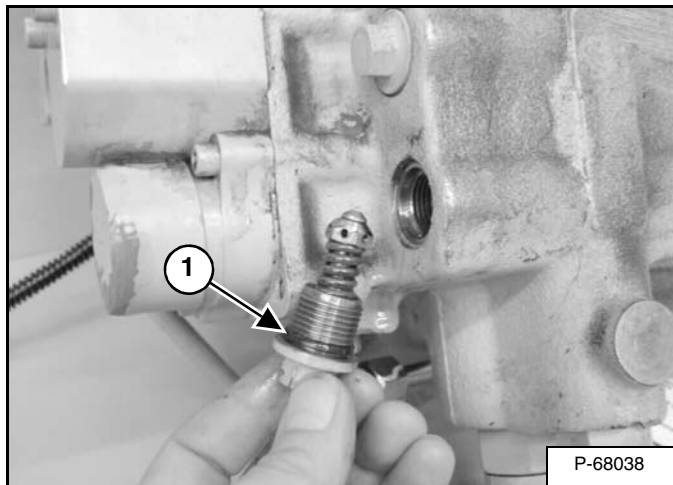
Port Relief/Anti-Cavitation Valve Removal And Installation (Lift, Base End)

Figure 20-41-37



Loosen the lift circuit port relief/anti cavitation valve (Item 1) [Figure 20-41-37].

Figure 20-41-38

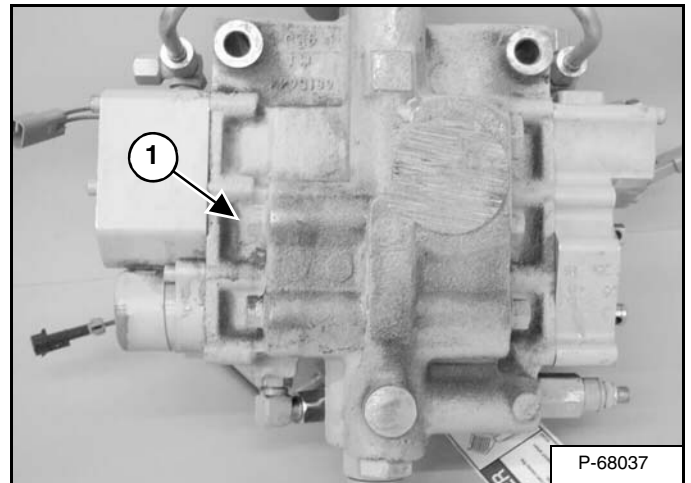


Replace the O-ring (Item 1) [Figure 20-41-38] before installation.

Installation: Lightly lubricate with oil and tighten to 38 - 45 ft.-lb. (52 - 61 N•m) torque.

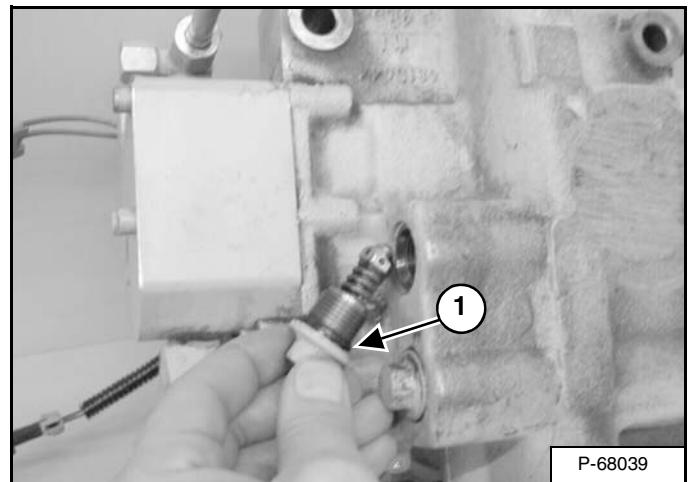
Port Relief/Anti-Cavitation Valve Removal And Installation (Tilt, Base End)

Figure 20-41-39



Remove the tilt port relief/anti cavitation valve (Item 1) [Figure 20-41-39] from the base end of the tilt section.

Figure 20-41-40



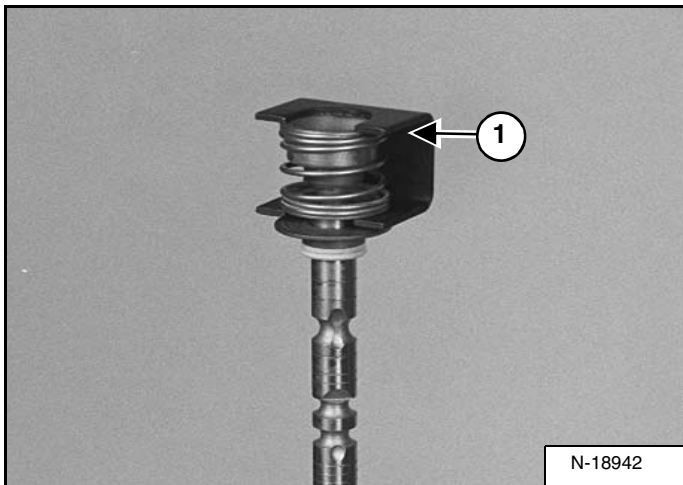
Replace the O-ring (Item 1) [Figure 20-41-40] before installation.

Installation: Lightly lubricate with oil and tighten to 38 - 45 ft.-lb. (52 - 61 N•m) torque.

HYDRAULIC CONTROL VALVE (ACS) OR (SJC) (CONT'D)

Tilt Spool Removal And Installation (Cont'd)

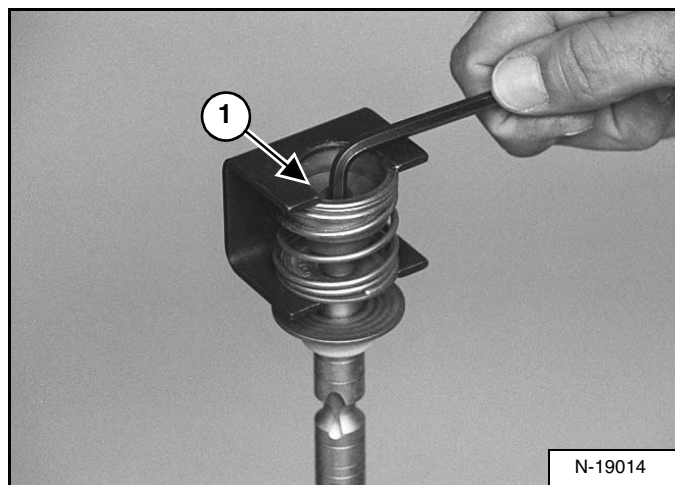
Figure 20-41-76



Put the linkage end of the spool in the vice [Figure 20-41-76].

Install the spring tool (Item 1) [Figure 20-41-76] over the centering spring.

Figure 20-41-77

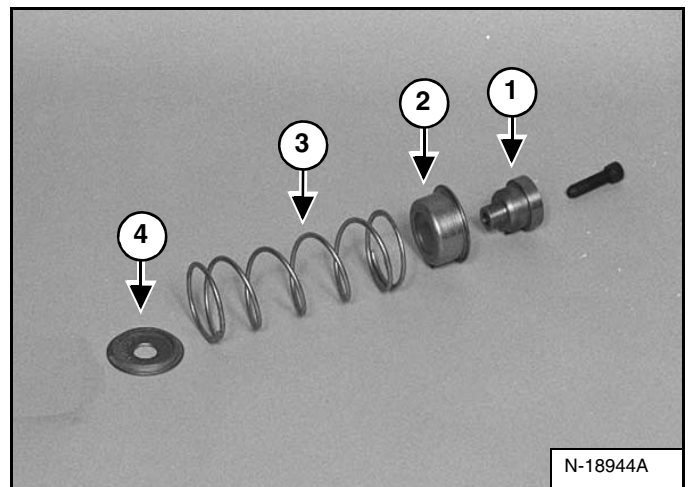


Remove the bolt (Item 1) [Figure 20-41-77] holding the centering spring to the spool.

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

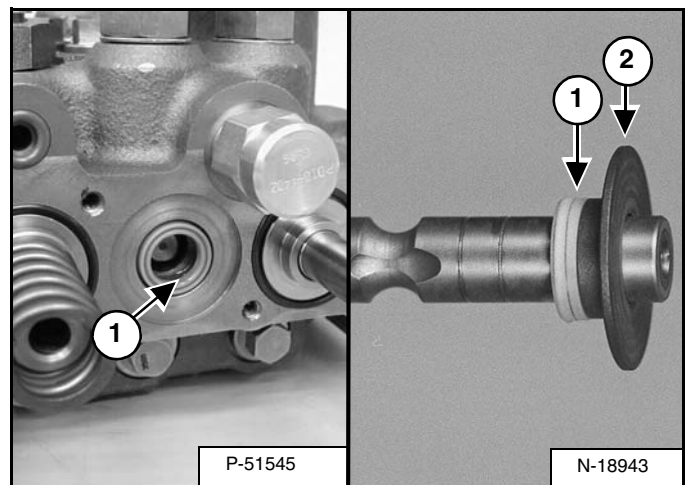
Remove spring tool from the spring assembly.

Figure 20-41-78



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) [Figure 20-41-78].

Figure 20-41-79



Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) [Figure 20-41-79].

Installation: Always use a new spool seal.

LIFT ARM BYPASS CONTROL VALVE

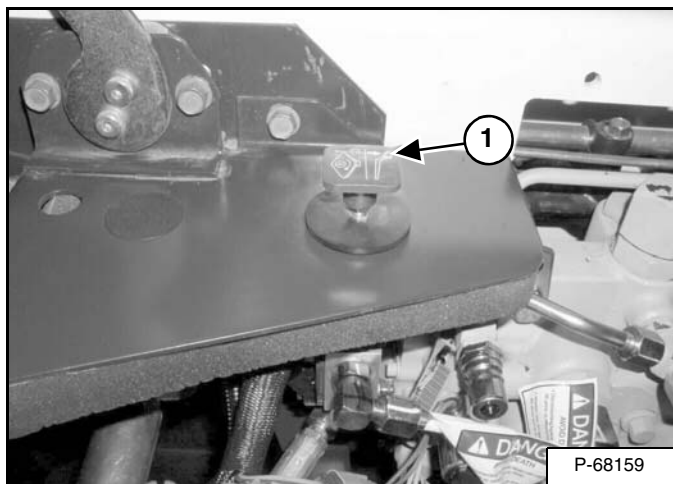
Description

The lift arm bypass control valve is located on the right side of the machine close to the engine speed control.

The lift arm bypass control valve is manually operated by pulling up on the valve knob (Item 1) [Figure 20-50-1] and turning the knob clockwise a 1/4 turn. The valve releases the hydraulic fluid from the base end of the lift cylinder(s) which allows the lift arm to slowly come down to the transport position.

Testing

Figure 20-50-1



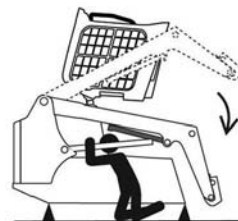
Raise the lift arms 6 feet (2 m) off the ground. Stop the engine. Turn the Lift Arm Bypass Control Knob (Item 1) [Figure 20-50-1] clockwise 1/4 turn. Then pull up and hold the Lift Arm Bypass Control Knob until the lift arms slowly lower.

The knob should return to its original position.

Removal and Installation



DANGER



P-90328

AVOID DEATH

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

D-1009-0409



WARNING

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

W-2059-0598

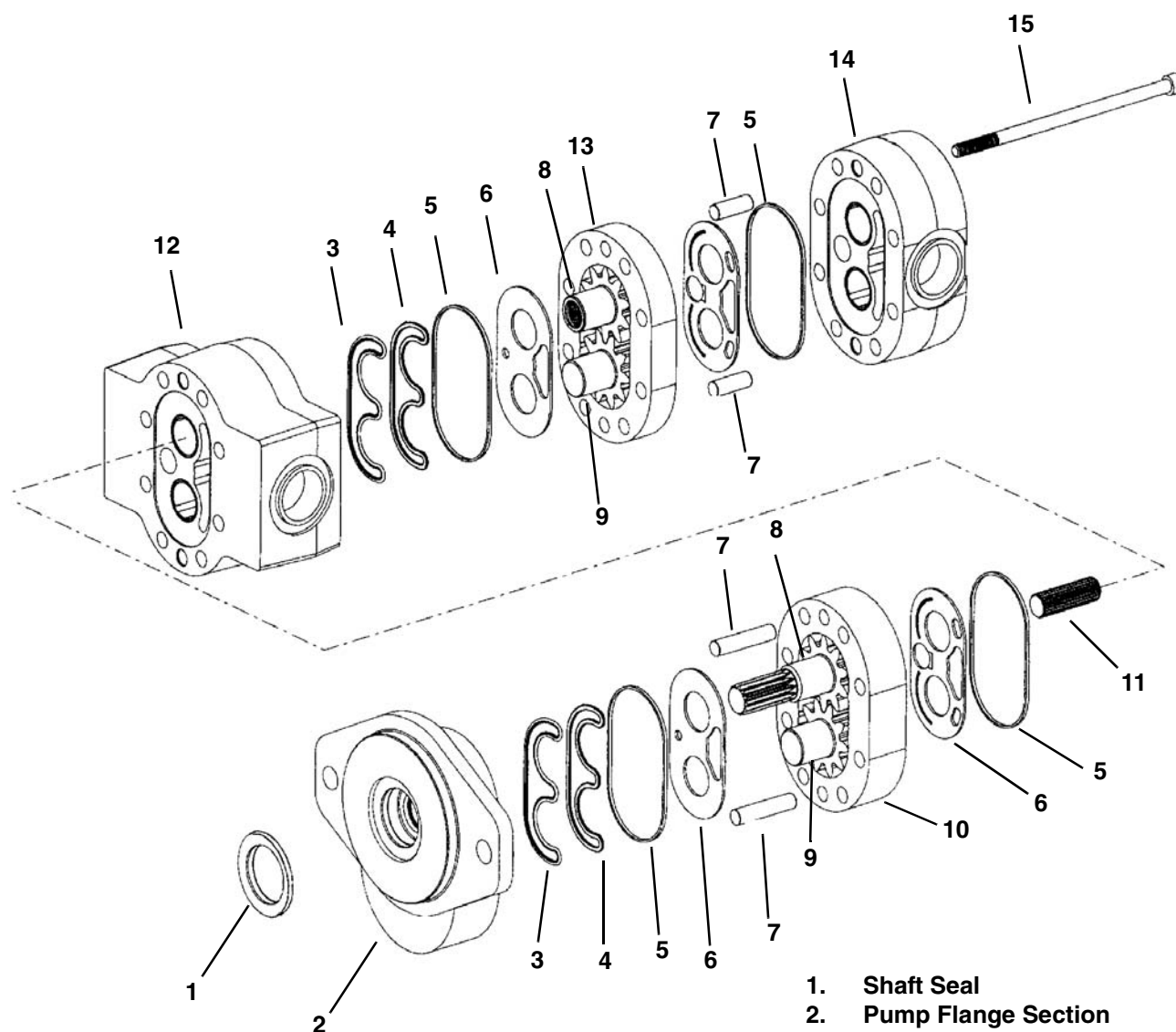
Install jack stands under the rear corners of the loader.

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

Raise the operator cab. (See Raising on Page 10-30-2.)

HYDRAULIC PUMP (STANDARD) (CONT'D)

Parts Identification



1. Shaft Seal
2. Pump Flange Section
3. Pre-Load Seal
4. Load Seal
5. O-ring
6. Wear Plate
7. Pins
8. Drive Gear
9. Idler Gear
10. Auxiliary Pump Section
11. Spline Shaft
12. Pump Center Section
13. Charge Pump Section
14. Pump End Section
15. Bolt (8)

B-21259A

HYDRAULIC PUMP (STANDARD) (HIGH FLOW)

Description

The hydraulic gear pump is attached to the end of the hydrostatic pumps and is located on the right side of the loader between the hydraulic control valve and the engine.

The hydraulic gear pump is a combination of gear pumps that provide hydraulic flow to several hydraulic systems.

The hydraulic gear pump has a dedicated charge pump. This supplies flow to the hydraulic fan motor and charge pressure to the hydrostatic pump.

The high flow hydraulic pump has an additional pump section that provides an additional amount of flow that is controlled by an external valve. The valve is switched from a button on the panel in the cab.

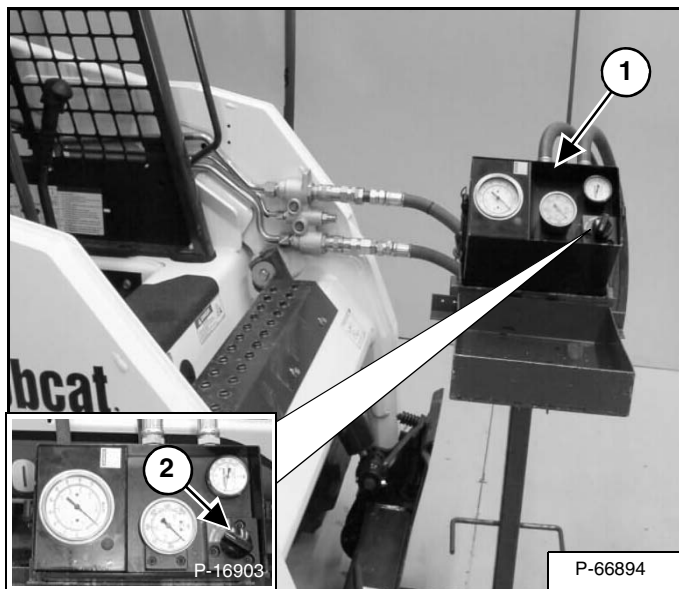
A seal kit is available to service the hydraulic pump. If any of the main components of the pump are damaged, the entire pump must be replaced.

Pump Test at Quick Couplers

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

MEL10003 - In-Line Hydraulic Tester
MEL10006 - Flow Meter Fitting Kit

Figure 20-61-47



NOTE: When testing the hydraulic flow of a machine, hoses must be at least 3/4 in. in diameter and connected directly to the hydraulic tester without using any type of “quick coupler” on the connection to the tester. Also make sure your hydraulic tester is capable of at least 50 GPM.

Install a hydraulic tester (Item 1) [Figure 20-61-47] onto the front auxiliary quick couplers.

This procedure will require a operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Front Auxiliary button. Engage the front auxiliary with the trigger on the right handle. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to full RPM*.

Warm the fluid to 140° F (60° C) by turning the restrictor control clockwise on the tester so it reads about a 1000 PSI (69 bar).

NOTE: DO NOT EXCEED 3300 PSI.

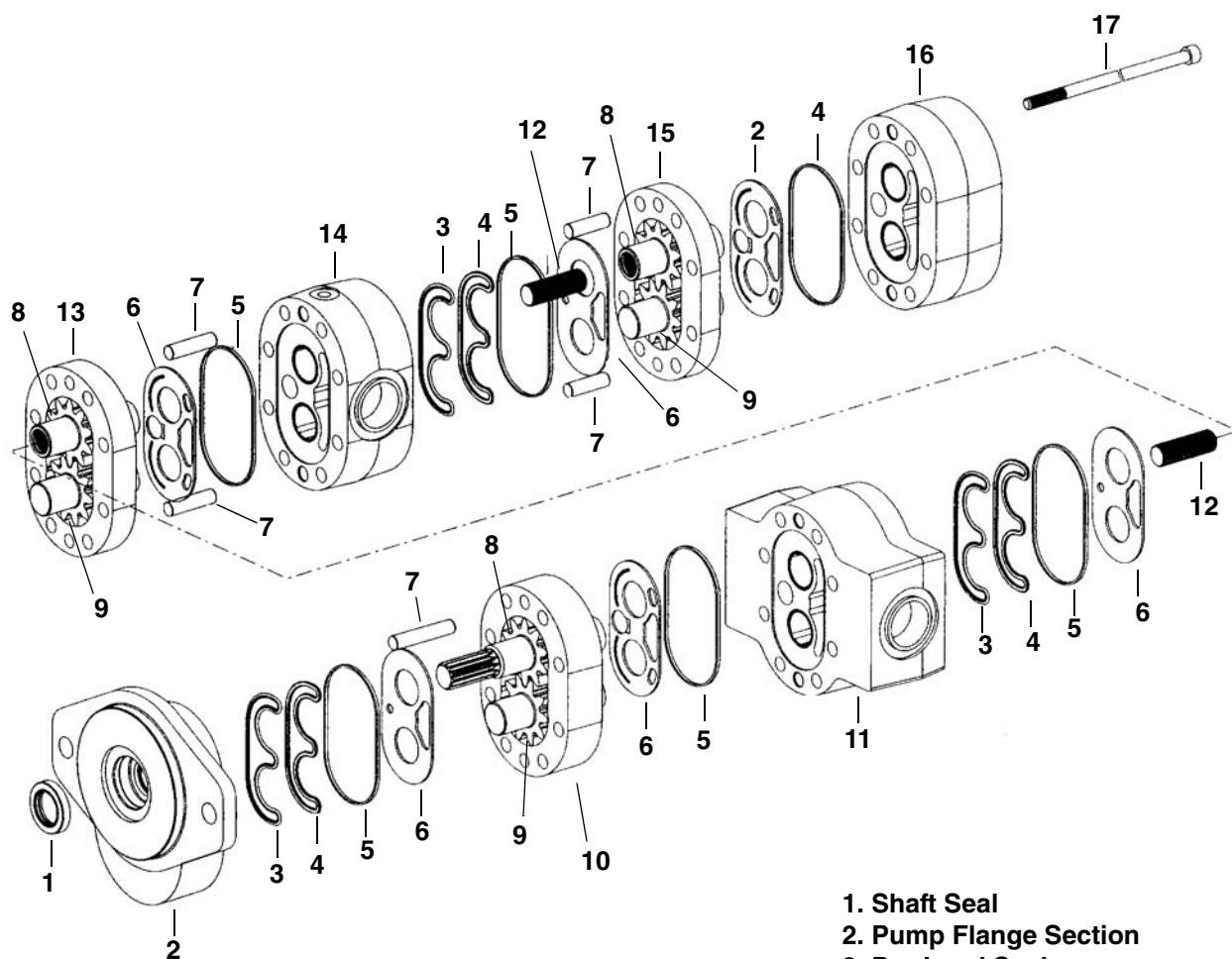
Turn the restrictor control (Item 2) [Figure 20-61-47] on the tester counterclockwise to obtain free flow, the flow should be approximately 16 - 17 GPM. Start turning the restrictor clockwise, causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 2800 PSI. At approximately 2800 PSI the flow should start decreasing rapidly until the pressure reaches 3250 - 3300 PSI. At 3250 - 3300 PSI the flow should be at 0 GPM. Turn the restrictor (Item 2) [Figure 20-61-47] counterclockwise to free flow. Shut the front auxiliary hydraulics off.

If flow and pressure specs are not obtained, go to Direct Pump Testing. (See Direct Pump Test (Standard Section) on Page 20-61-2.)

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

HYDRAULIC PUMP (STANDARD) (HIGH FLOW) (CONT'D)

Parts Identification



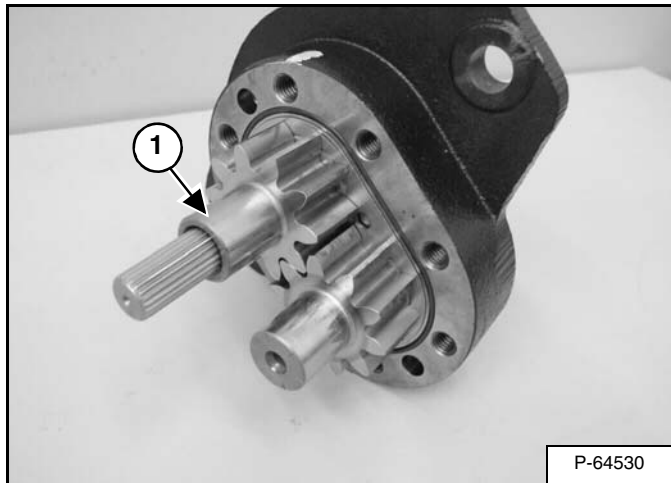
1. Shaft Seal
2. Pump Flange Section
3. Pre-Load Seal
4. Load Seal
5. O-Ring
6. Valve Plate
7. Pin
8. Drive Gear
9. Idler Gear
10. Auxiliary Pump Section
11. Auxiliary Center Section
12. Splined Shaft
13. Charge Pump Section
14. Charge Center Section
15. High Flow Pump Section
16. High Flow End Section
17. Bolt

B-18248

HYDRAULIC PUMP (STANDARD) (HIGH FLOW) (CONT'D)

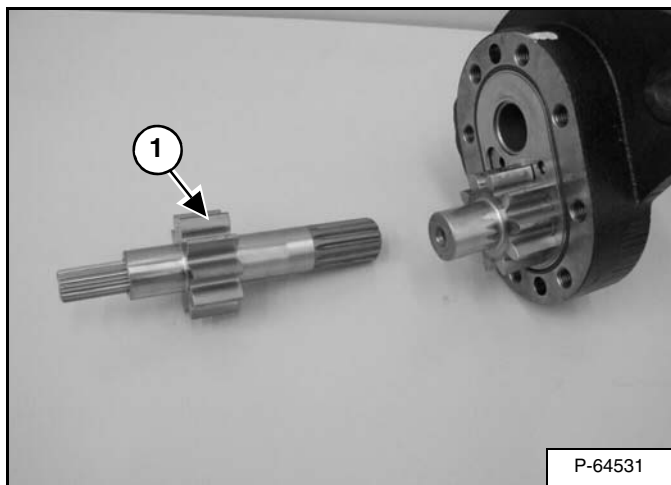
Disassembly And Assembly (Cont'd)

Figure 20-61-101



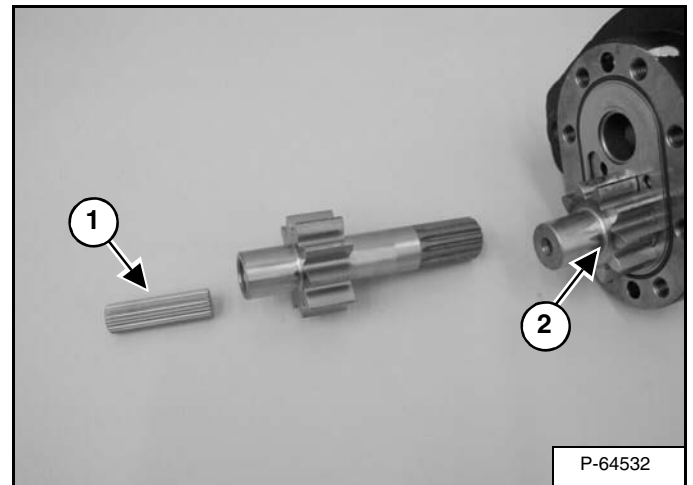
Remove the drive gear (Item 1) [Figure 20-61-101] from the pump flange section.

Figure 20-61-102



NOTE: Inspect the drive gear (Item 1) [Figure 20-61-102]. If excessive wear or damage is visible, the pump must be replaced.

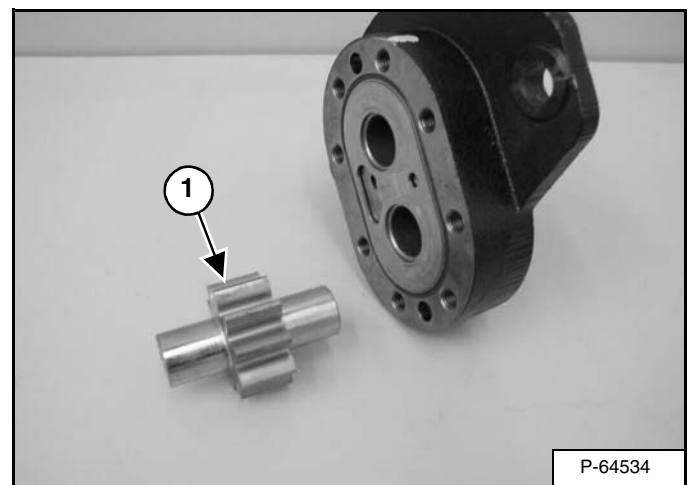
Figure 20-61-103



Remove the spline shaft (Item 1) [Figure 20-61-103] from the end of the drive gear.

Remove the idler gear (Item 2) [Figure 20-61-103].

Figure 20-61-104



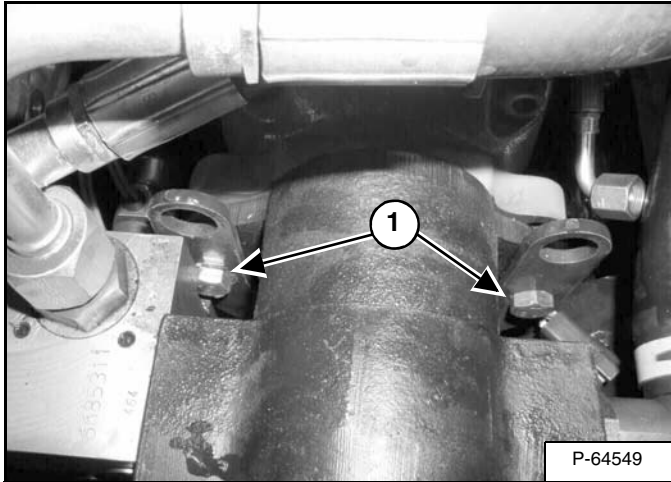
Remove the idler gear (Item 1) [Figure 20-61-104] from the pump flange section.

NOTE: Inspect the idler gear (Item 1) [Figure 20-61-104]. If excessive wear or damage is visible, the pump must be replaced.

HYDRAULIC PUMP (SJC) (CONT'D)

Removal And Installation (Cont'd)

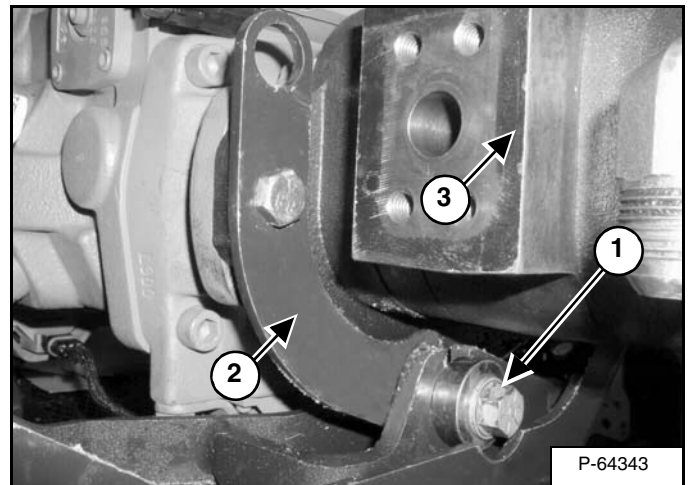
Figure 20-70-11



Remove the two mounting bolts (Item 1) [Figure 20-70-11] from the hydraulic pump.

Installation: Tighten the mounting bolts to 55 - 60 ft.-lb. (75 - 85 N•m) torque.

Figure 20-70-12



Remove the bracket mounting bolt (Item 1) from the pump mounting bracket (Item 2) [Figure 20-70-12].

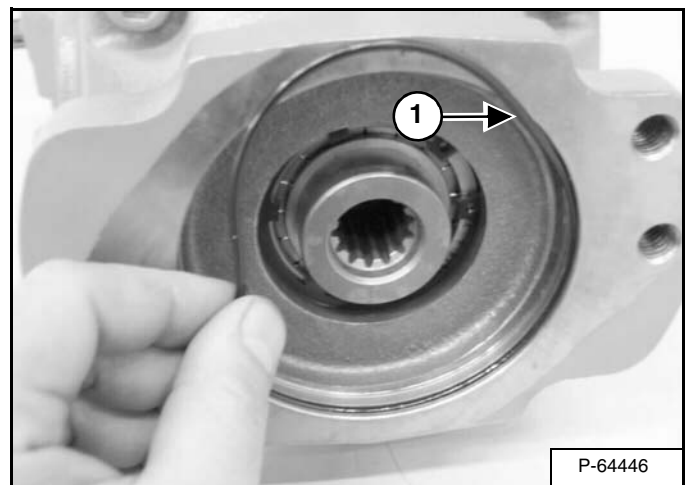
Note: The mounting bolt is a special purpose bolt. Only replace with original Bobcat Parts.

Installation: Apply a medium strength threadlocker to mounting bolt and tighten to 90 - 100 ft.-lb. (122 - 136 N•m) torque.

Remove the mounting bracket (Item 2) [Figure 20-70-12].

Remove the hydraulic pump (Item 3) [Figure 20-70-12] from the hydrostatic pump.

Figure 20-70-13



Replace the O-ring (Item 1) [Figure 20-70-13] in the hydrostatic pump.

Reverse the removal procedure to install the hydraulic pump.

HYDRAULIC PUMP (SJC) (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-70-43

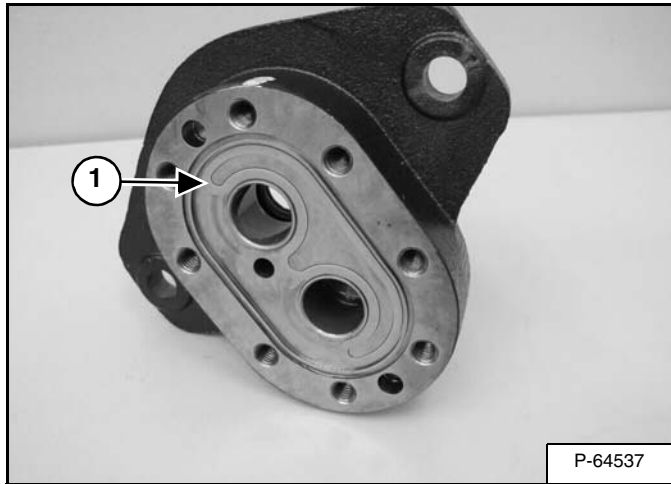
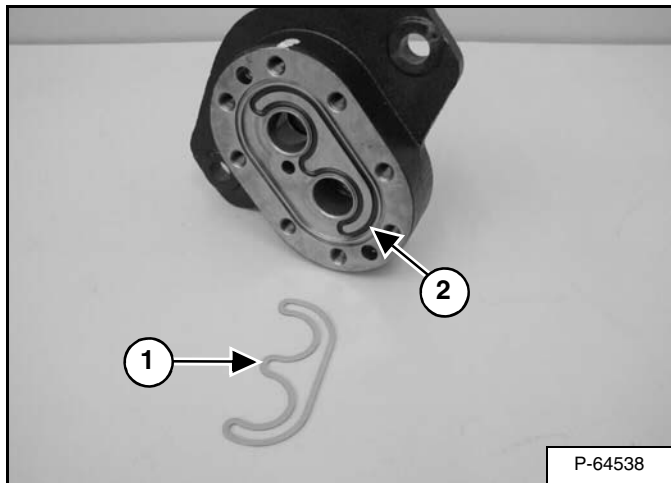


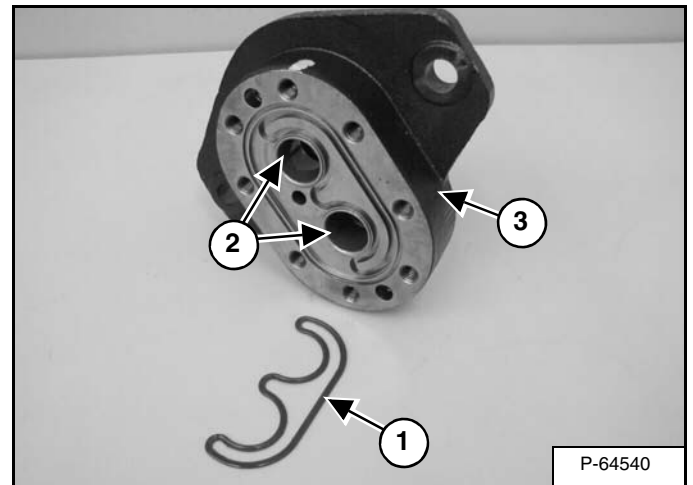
Figure 20-70-44



Remove the load seal (Item 1) [Figure 20-70-43] & [Figure 20-70-44]. Inspect for damage and replace as needed.

Remove the pre-load seal (Item 2) [Figure 20-70-44].

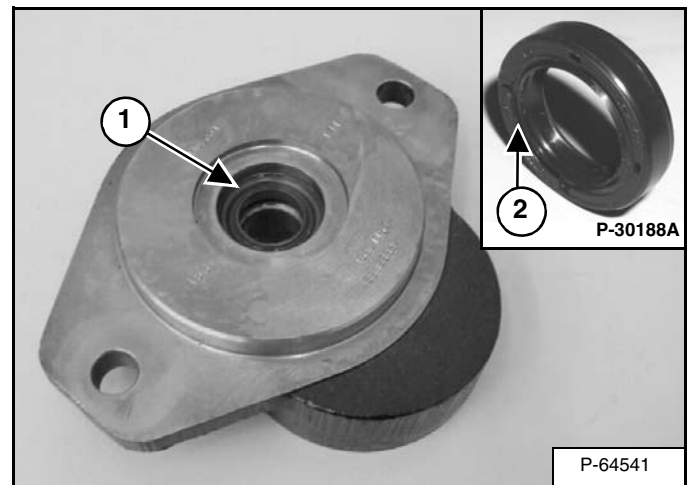
Figure 20-70-45



Inspect the pre-load seal (Item 1) [Figure 20-70-45] for damage and replace as needed.

NOTE: Inspect the pump flange section (Item 2) and bushings (Item 3) [Figure 20-70-45]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-70-46



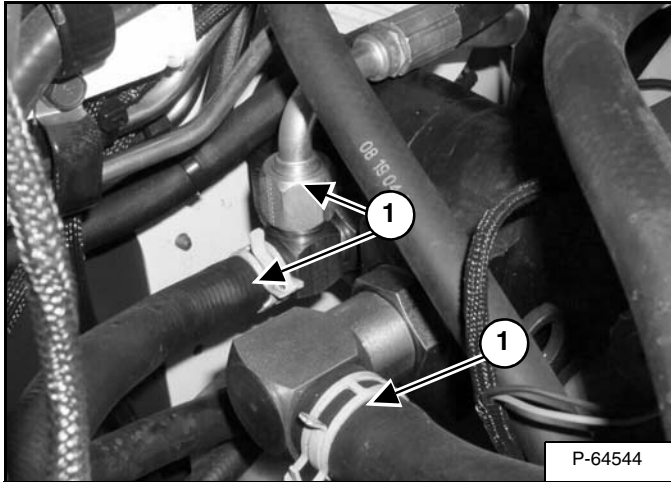
Remove the shaft seal (Item 1) [Figure 20-70-46] from the pump flange section.

Installation: The shaft seal flush surface (Item 2) [Figure 20-70-46] must be facing out away from the pump.

HYDRAULIC PUMP (SJC) (HIGH FLOW) (CONT'D)

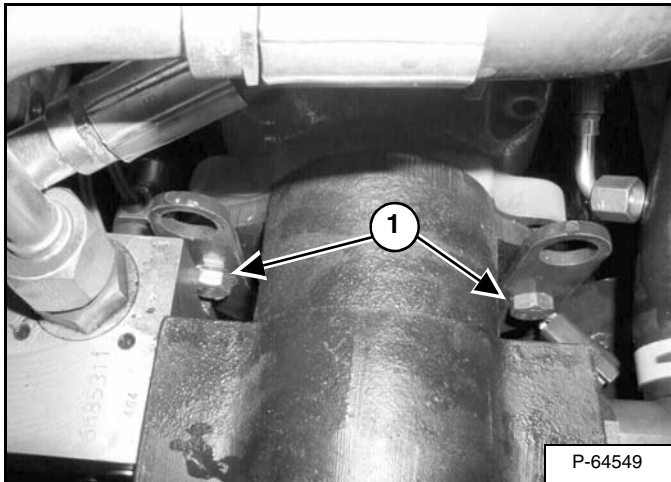
Removal And Installation (Cont'd)

Figure 20-71-15



Disconnect and cap the inlet hoses (Item 1) [Figure 20-71-15] from the front of the hydraulic pump.

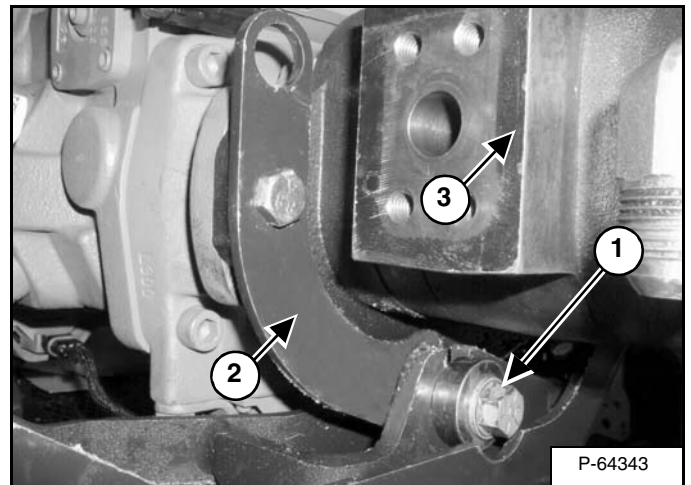
Figure 20-71-16



Remove the two mounting bolts (Item 1) [Figure 20-71-16] from the hydraulic pump.

Installation: Tighten the mounting bolts to 55 - 60 ft.-lb. (75 - 85 N•m) torque.

Figure 20-71-17



Remove the bracket mounting bolt (Item 1) from the pump mounting bracket (Item 2) [Figure 20-71-17].

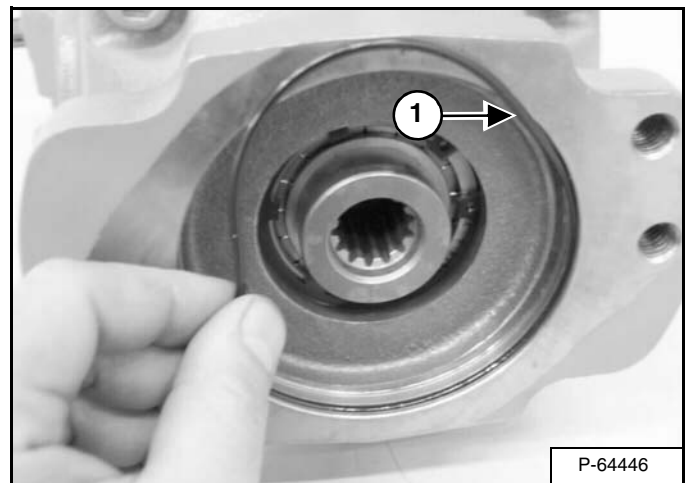
NOTE: The mounting bolt is a special purpose bolt. Only replace with original Bobcat Parts.

Installation: Apply a medium strength threadlocker to mounting bolt and tighten to 90 - 100 ft.-lb. (122 - 136 N•m) torque.

Remove the mounting bracket (Item 2) [Figure 20-71-17].

Remove the hydraulic pump (Item 3) [Figure 20-71-17] from the hydrostatic pump.

Figure 20-71-18



Replace the O-ring (Item 1) [Figure 20-71-18] in the hydrostatic pump.

Reverse the removal procedure to install the hydraulic pump.

HYDRAULIC PUMP (SJC) (HIGH FLOW) (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-71-48

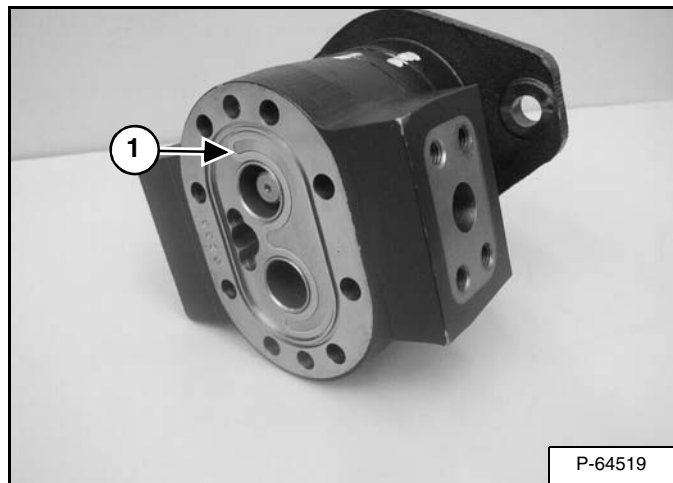
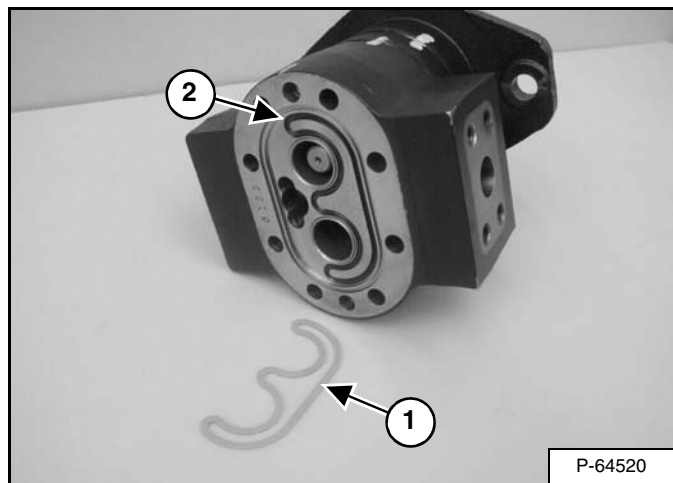


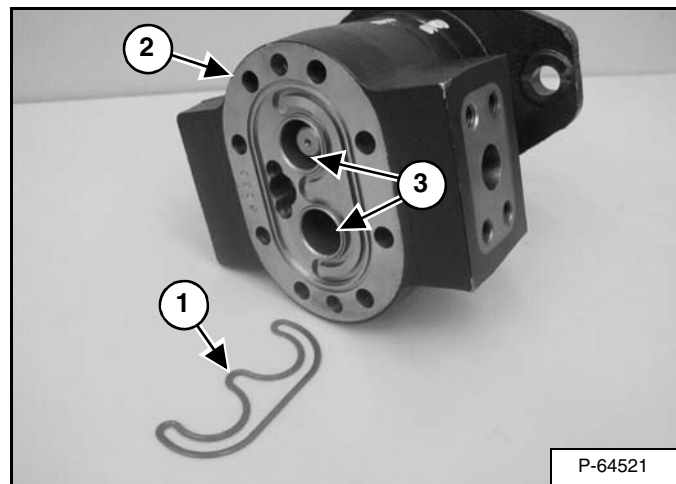
Figure 20-71-49



Remove the load seal (Item 1) [Figure 20-71-48] & [Figure 20-71-49]. Inspect for damage and replace as needed.

Remove the pre-load seal (Item 2) [Figure 20-71-49].

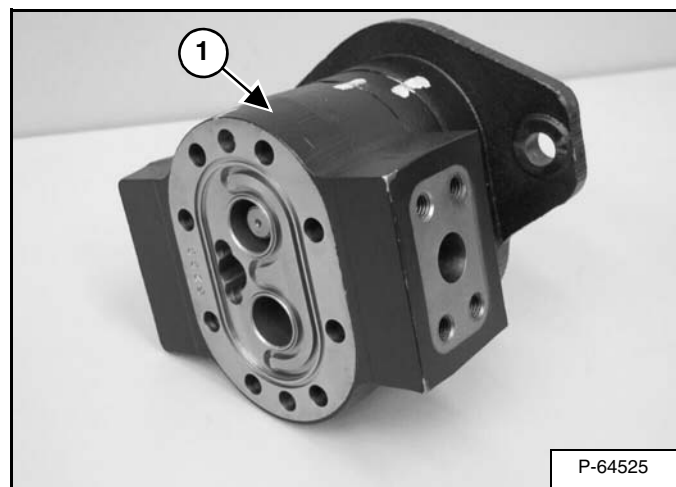
Figure 20-71-50



Inspect the pre-load seal (Item 1) [Figure 20-71-50] for damage and replace as needed.

NOTE: Inspect the auxiliary center section (Item 2) and bushings (Item 3) [Figure 20-71-50]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-71-51



Remove the auxiliary center section (Item 1) [Figure 20-71-51].

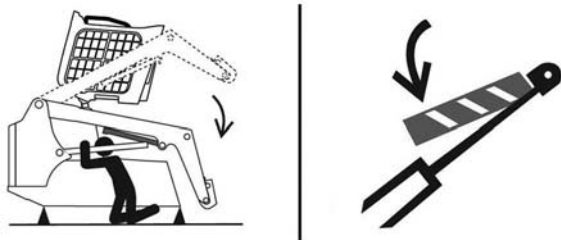
HYDRAULIC FLUID RESERVOIR

Description

The hydraulic fluid reservoir is a storage container for the loaders hydraulic/hydrostatic fluid. The reservoir contains a vented fill cap with a fluid screen to prevent contaminants from entering the reservoir while adding fluid.

The hydraulic fluid reservoir is located below the operators cab on the left side of the loader.

Removal And Installation



P-90328

AVOID DEATH

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

D-1009-0409



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

W-2059-0598

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

Raise the operator cab. (See Raising on Page 10-30-2.)

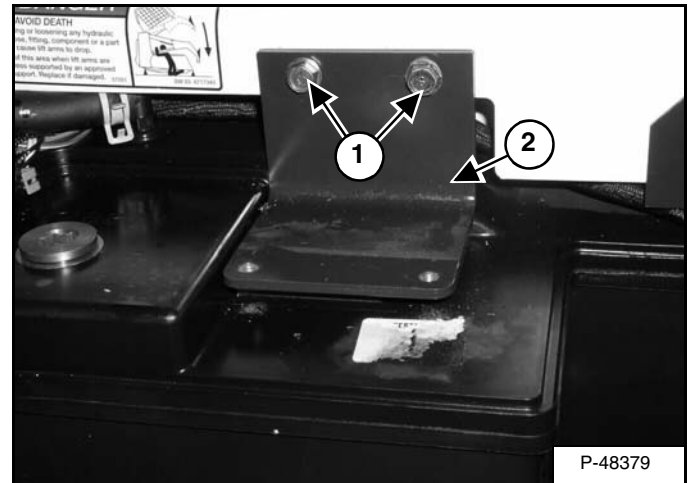
Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the crossbar linkage. (See Linkage Removal And Installation on Page 50-90-2.)

Drain the hydraulic fluid reservoir. (See Removing And Replacing Case Drain Filters on Page 10-120-4.)

Remove bucket position valve if equipped. (See Removal And Installation on Page 20-110-3.)

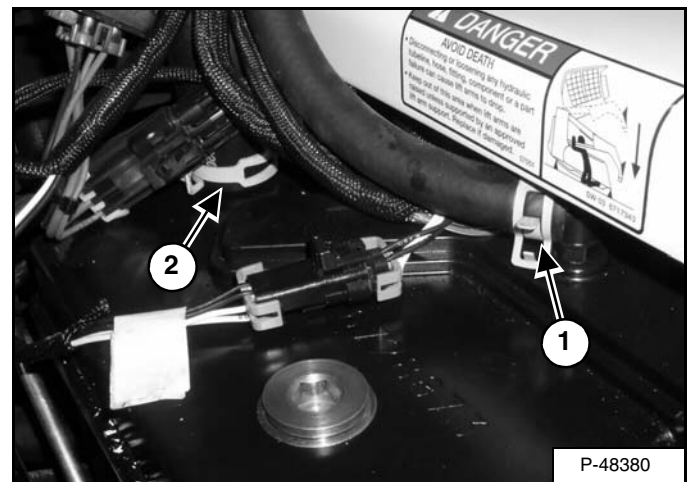
Figure 20-90-1



P-48379

Remove the two bolts (Item 1) and the reservoir bracket (Item 2) [Figure 20-90-1].

Figure 20-90-2



P-48380

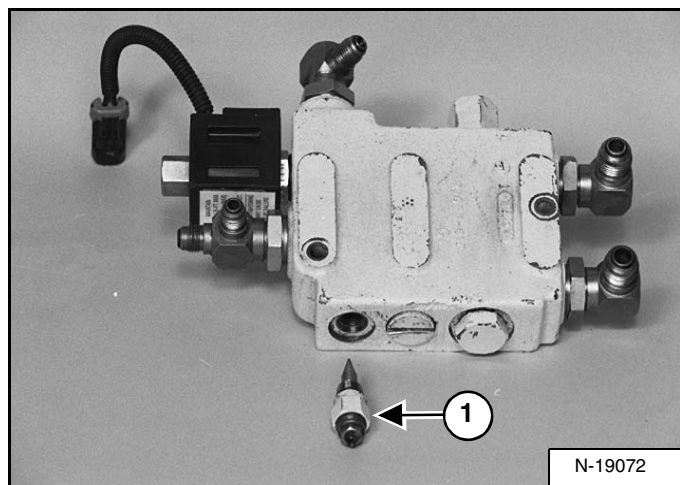
Disconnect the reservoir vent hose (Item 1) [Figure 20-90-2] from the hydraulic reservoir.

Disconnect the hydraulic fill hose (Item 2) [Figure 20-90-2] from the hydraulic fluid reservoir.

BUCKET POSITION VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-110-13

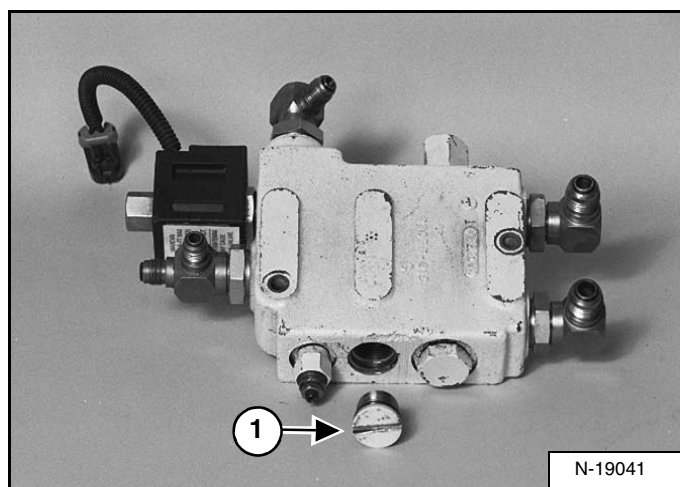


Remove the flow adjustment valve and O-ring (Item 1) [Figure 20-110-13].

Installation: Tighten the flow adjustment valve to 15 - 30 ft.-lb. (20,3 - 40,7 N•m) torque.

NOTE: Always install new O-rings before any parts are installed into the valve. Check the parts for wear or damage and replace as needed.

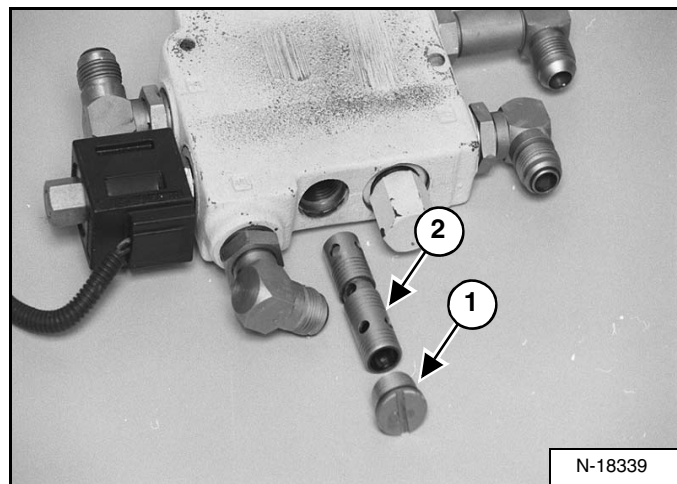
Figure 20-110-14



Remove the plug (Item 1) [Figure 20-110-14].

Assembly: Tighten the plug to 56 - 64 ft.-lb. (75,9 - 86,8 N•m) torque.

Figure 20-110-15

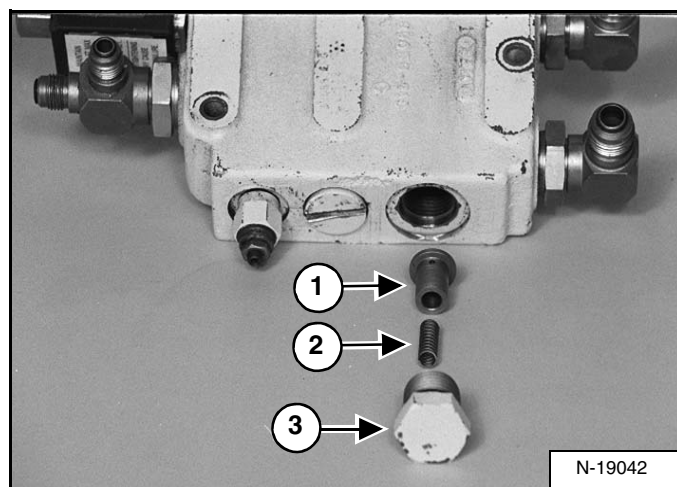


Remove the plug (Item 1), and flow control spool (Item 2) [Figure 20-110-15].

Assembly: Tighten the plug to 56 - 64 ft.-lb. (75,9 - 86,8 N•m) torque.

Check the flow control spool for wear, check the O-ring on the plug and replace as needed.

Figure 20-110-16



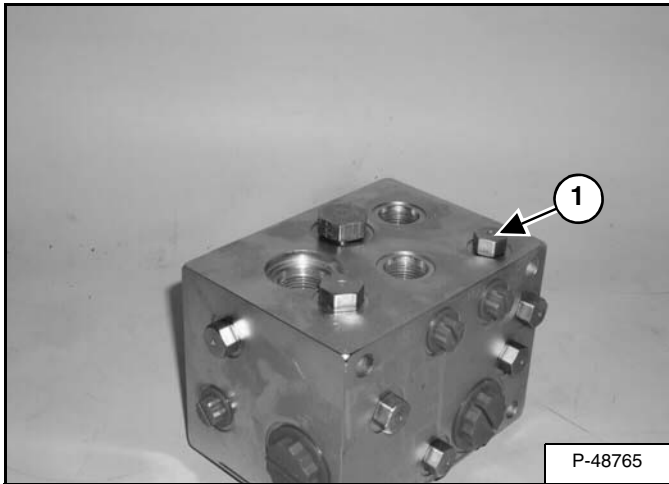
Remove the tilt cylinder check valve (item 1) spring (Item 2) and plug (Item 3) [Figure 20-110-16]. Check for wear, check the O-ring and replace as needed.

Assembly: Tighten the plug to 56 - 64 ft.-lb. (75,9 - 86,8 N•m) torque.

REAR AUXILIARY DIVERTER VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

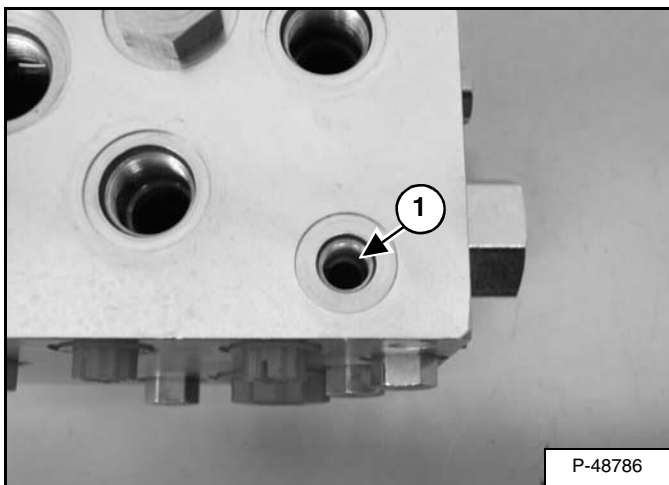
Figure 20-120-28



Remove the #4 SAE hex head plug (Item 1) [Figure 20-120-28].

Assembly: Tighten the plug to 10 ft.-lb. (13,6 N•m) torque.

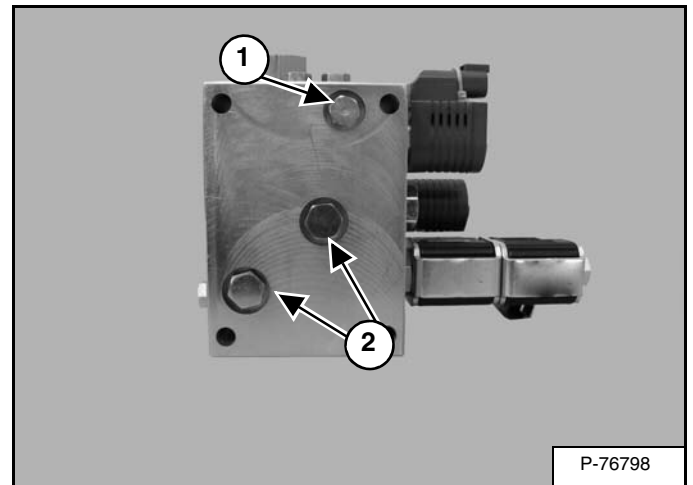
Figure 20-120-29



Remove the orifice (Item 1) [Figure 20-120-29] and inspect for dirt and debris.

Assembly: Tighten the orifice to 3.3 ft.-lb. (4,5 N•m) torque.

Figure 20-120-30

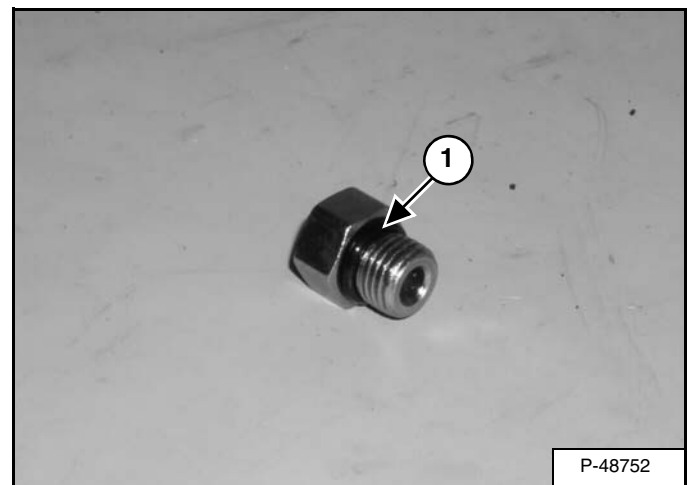


Remove the #4 SAE hex head plug (Item 1) and the #6 SAE hex head plugs (Item 2) [Figure 20-120-30].

Assembly: Tighten the #4 SAE hex head plug to 10 ft.-lb. (13,6 N•m) torque.

Assembly: Tighten the #6 SAE hex head plugs to 14 ft.-lb. (19 N•m) torque.

Figure 20-120-31



Inspect O-ring (Item 1) [Figure 20-120-31].

Assembly: Put oil on O-ring.

HIGH FLOW VALVE

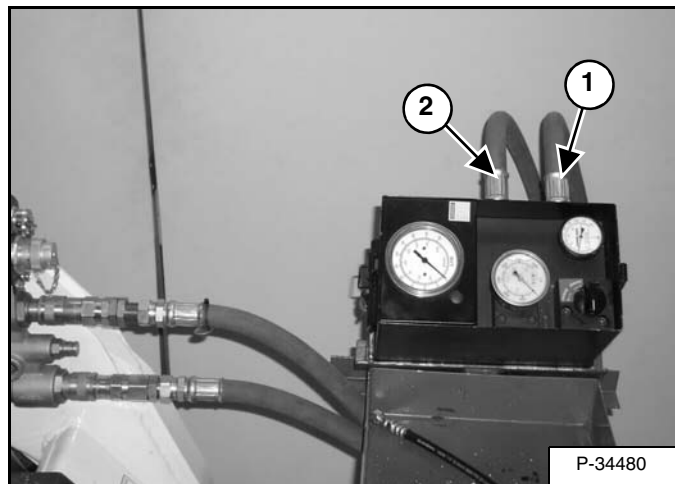
Description

The high flow valve is an optional valve with a 12 volt solenoid that diverts flow from a dedicated high flow section on the gear pump.

The valve is plumbed in series with the female coupler side on the front auxiliary circuit.

High Flow Relief Valve Testing

Figure 20-150-1



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

MEL10003 - Hydraulic Tester

MEL10006 - Hydraulic Test Kit

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

NOTE: Check the Main Relief Valve See MAIN RELIEF VALVE on Page 20-30-1 for proper flow and pressure before checking the High Flow Relief Valve.

Connect the IN port of the hydraulic tester to the female quick coupler (Item 1) [Figure 20-150-1] on the loader.

Connect the OUT port of the hydraulic tester to the male quick coupler (Item 2) [Figure 20-150-1] on the loader.

IMPORTANT

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

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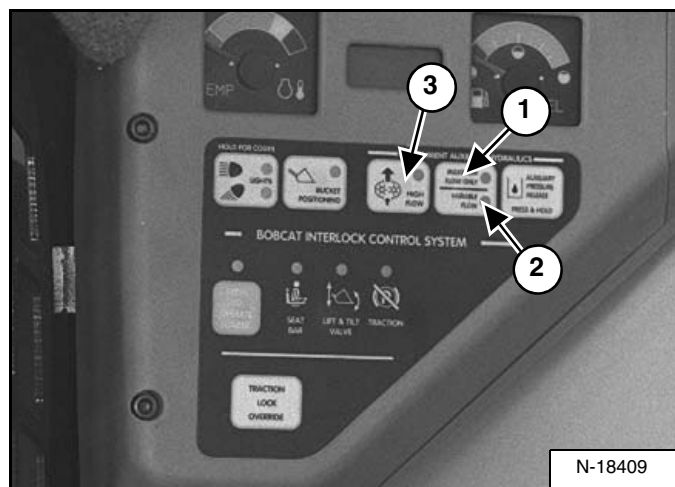


WARNING

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 20-150-2



Start the engine and run at low idle RPM. Push the flow switch (Item 1) once (on the instrument panel) to engage the front auxiliary hydraulics variable flow, the light (Item 2) will come ON [Figure 20-150-2].

Push the high flow switch (Item 3) [Figure 20-150-2] and the High Flow light will come ON.

HYDROSTATIC SYSTEM INFORMATION

Troubleshooting

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



WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

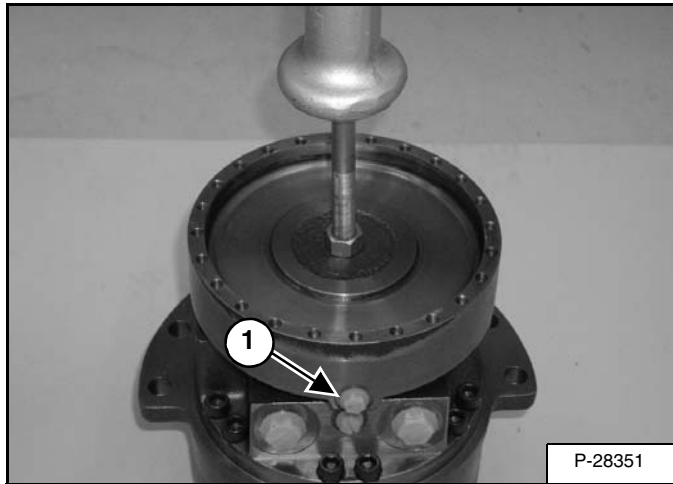
PROBLEM	CAUSE
No drive on one side, in one direction.	1, 2
No drive on one side in both directions.	2, 3, 4
The loader does not move in a straight line.	2, 3, 4, 5, 9
The hydrostatic system is overheating.	6,7,8

KEY TO CORRECT THE CAUSE
1. The hydrostatic pump replenishing valves not seating.
2. The steering linkage needs adjustment.
3. The hydrostatic pump has damage.
4. The hydrostatic motor has damage.
5. Track tension is too tight, on one side.
6. The hydrostatic fluid is not at the correct level.
7. The oil cooler has a restriction.
8. The loader is not being operated at the correct RPM.
9. The hydrostatic pump is not properly calibrated, and/or incorrect steering drift compensation setting.

HYDROSTATIC MOTOR (CONT'D)

Disassembly And Assembly (Cont'd)

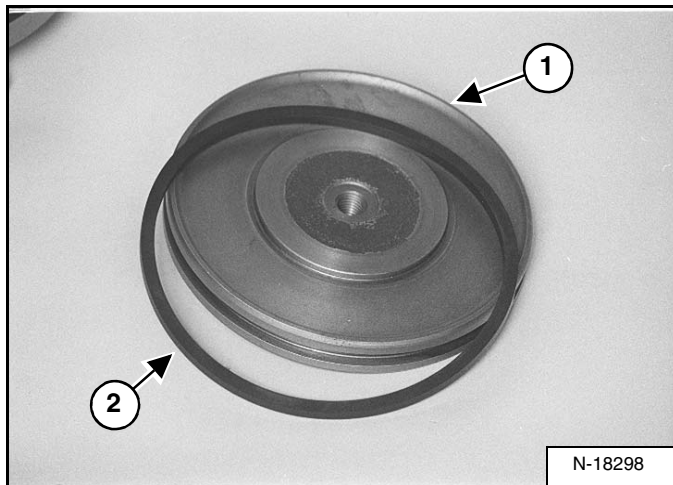
Figure 30-20-12



Remove the piston from the brake housing [Figure 30-20-12].

NOTE: The use of air pressure through the brake line connection (Item 1) [Figure 30-20-12] will aid in piston removal.

Figure 30-20-13

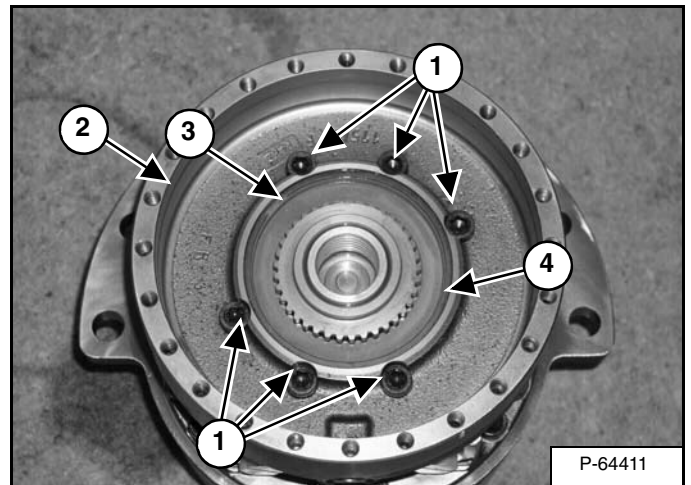


Check the brake piston (Item 1) [Figure 30-20-13] for damage including the surface that contacts the brake shaft.

Replace the seal (Item 2) [Figure 30-20-13].

Assembly: Apply oil to the seal (Item 2) [Figure 30-20-13] for added protection when installing the brake piston.

Figure 30-20-14



Remove the six mounting bolts (Item 1) [Figure 30-20-14] from the brake housing.

Remove the brake housing (Item 2) [Figure 30-20-14] from the rear housing.

Remove snap ring (Item 3) [Figure 30-20-14].

Remove inner piston seal (Item 4) [Figure 30-20-14].

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

Assembly: Use the alignment pins and reference marks to install the brake housing on the rear housing.

Assembly: Install new washers on the brake housing mount bolts (Item 1) [Figure 30-20-14].

Assembly: Apply Loctite® #243 or equivalent threadlocker to the bolts and install bolts and washers into the rear housing. Start each bolt by hand, tighten opposite bolts to maintain squareness.

Assembly: Tighten bolts to 52 - 57 ft.-lb. (70 - 77 N•m) torque.

CHARGE PRESSURE

Description

Charge pressure is a supply of oil to the hydrostatic pumps. Charge pressure is regulated by a charge relief valve located inside the hydrostatic pump. Charge pressure is used to replenish hydrostatic fluid removed from the drive circuit, pump and motor “internal leakage” and from the hydrostatic motors shuttle (flushing) valve.

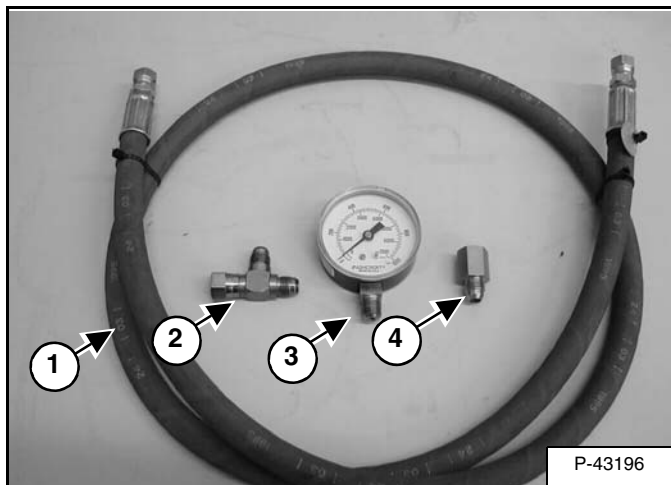
Charge pressure is obtained from the standard section on the hydraulic gear pump.

Charge pressure is also used to operate other hydraulic functions, such as shifting the auxiliary spool in the main hydraulic control valve.

The charge pressure sender is located on the charge filter housing mounted next to the blower housing. Charge pressure alarm settings are pre-programmed into the main controller and are based on loader type and options installed.

Testing

Figure 30-30-1



The tools needed to check charge pressure, hydraulic hose (Item 1), T fitting (P/N 13K-5) (Item 2), Hydraulic gauge (1000 PSI) (Item 3) and adapter fitting (P/N 93F-5) (Item 4) [Figure 30-30-1].

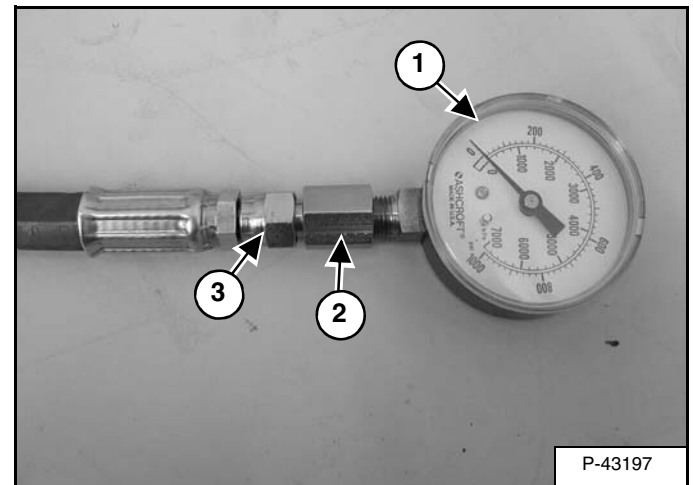
WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm

support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Figure 30-30-2



Connect the gauge (Item 1), to the adapter fitting (P/N 93F5) (Item 2) [Figure 30-30-2].

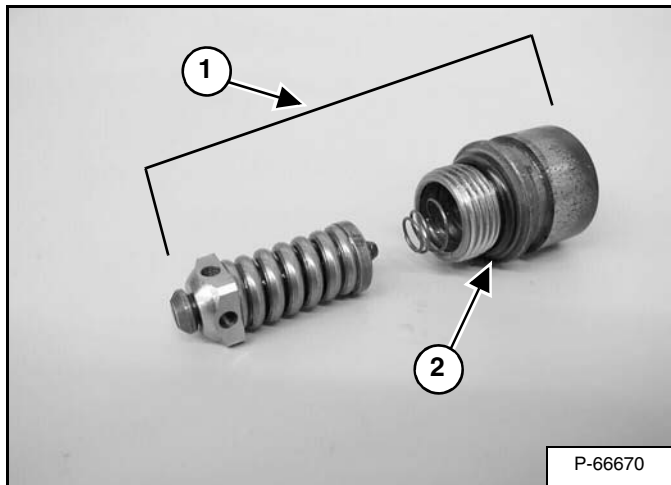
Connect the hydraulic hose (Item 3) [Figure 30-30-2] to the adapter fitting. Tighten all connections.

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

Place the loader on jackstands. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 30-40-2



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

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

Check for damage and replace as needed.

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

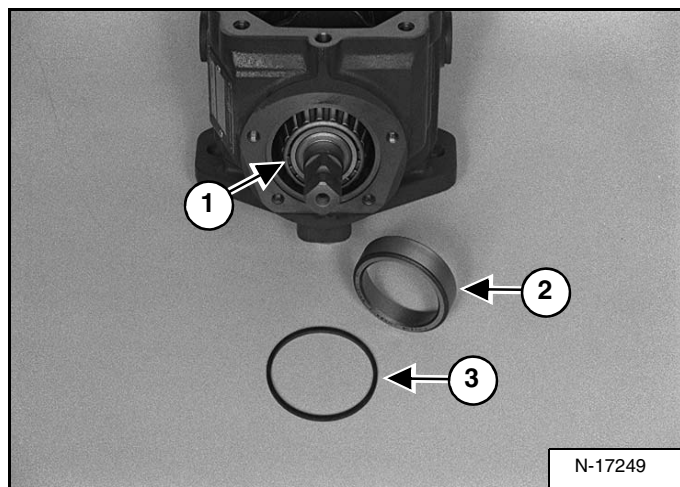
If the replenishing/high pressure relief valve must be replaced, it must be replaced as a complete unit.

The pressure setting for a new replenishing/high pressure relief valve is 5000 PSI (345 bar).

HYDROSTATIC PUMP (CONT'D)

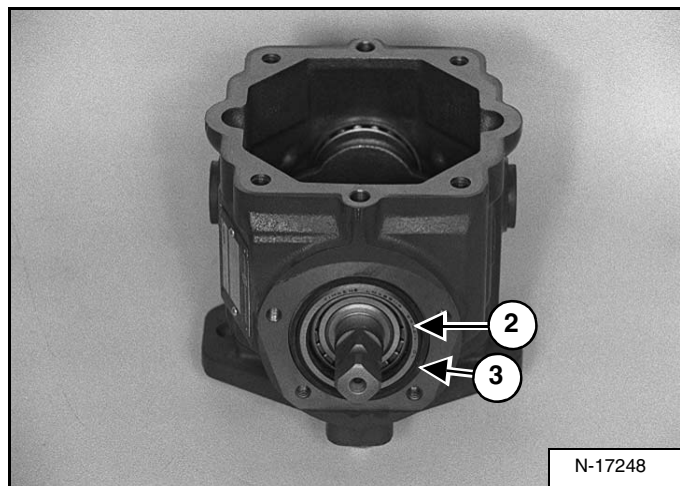
Assembly (Cont'd)

Figure 30-40-29



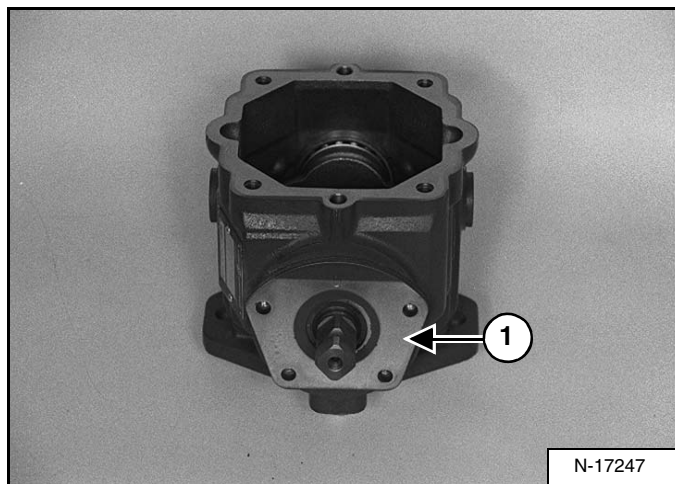
Install the tapered bearing (Item 1) [Figure 30-40-29] on the swash plate shaft.

Figure 30-40-30



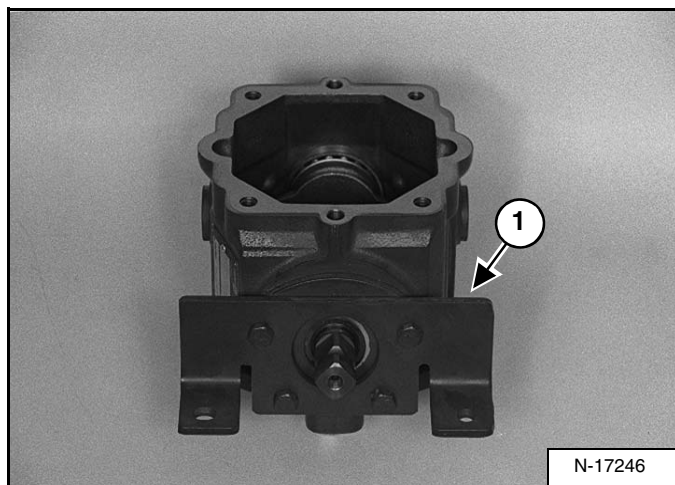
Install the bearing race (Item 2) and O-ring (Item 3) as shown in [Figure 30-40-29] & [Figure 30-40-30].

Figure 30-40-31



Install the upper trunnion seal (Item 1) [Figure 30-40-31] and cover.

Figure 30-40-32



Install the linkage bracket (Item 1) [Figure 30-40-32] and the four mounting bolts and tighten to 18 - 22 ft.-lb. (24 - 30 N•m) torque.

HYDROSTATIC PUMP (SJC) (CONT'D)

Removal And Installation (Cont'd)

Figure 30-41-12

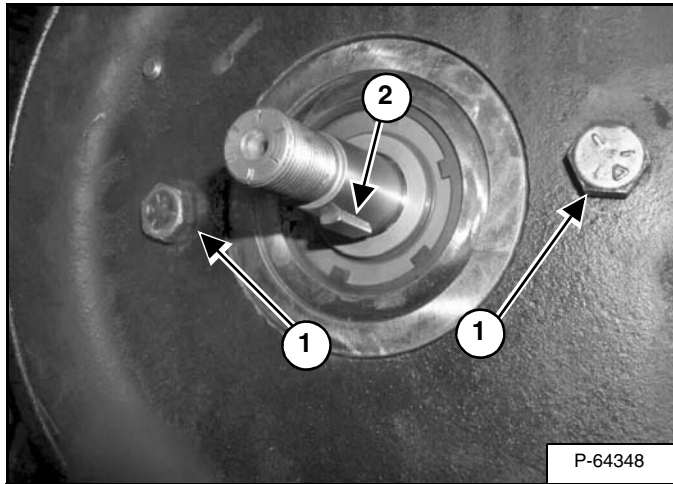
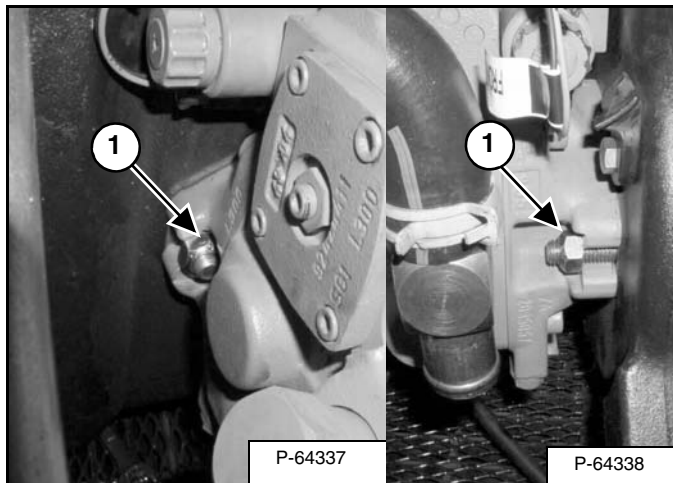


Figure 30-41-13

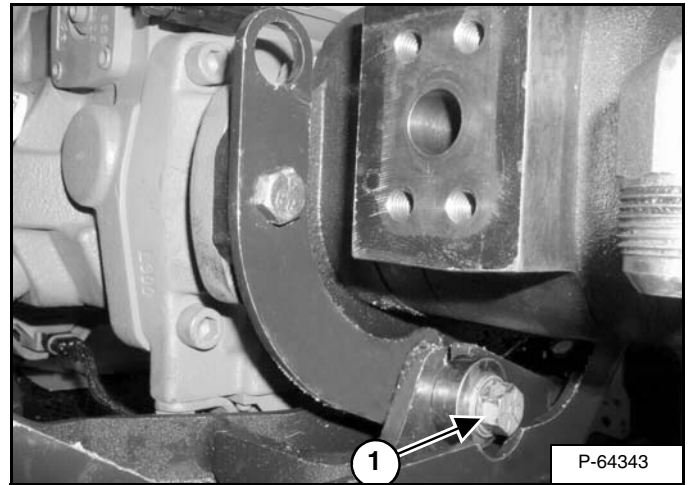


Remove the two mounting bolts (Item 1) [Figure 30-41-12] and nuts (Item 1) [Figure 30-41-13].

Installation: Tighten the mounting bolts and nuts to 65 - 70 ft.-lb. (88 - 95 N•m) torque.

Make sure the key (Item 2) [Figure 30-41-12] is installed.

Figure 30-41-14



Remove the mounting bolt (Item 1) [Figure 30-41-14] at the hydraulic pump mounting bracket.

Installation: Tighten mounting bolt to 90 - 100 ft.-lb. (125 - 135 N•m)

NOTE: The mounting bolt is a special purpose bolt. Only replace with original Bobcat Parts.

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

BEFORE START UP: Fill the hydrostatic pump with hydraulic oil. This will remove trapped air in the hydrostatic pumps before start up. (See Hydrostatic Pump Start Up on Page 30-41-6.)

HYDROSTATIC PUMP (SJC) (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 30-41-37

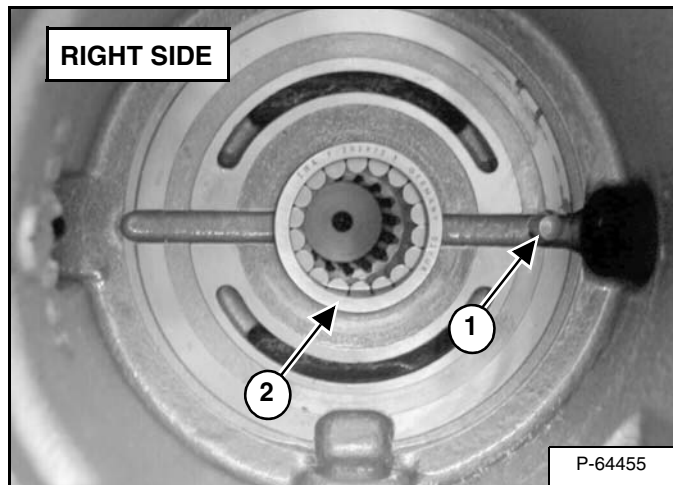


Figure 30-41-38

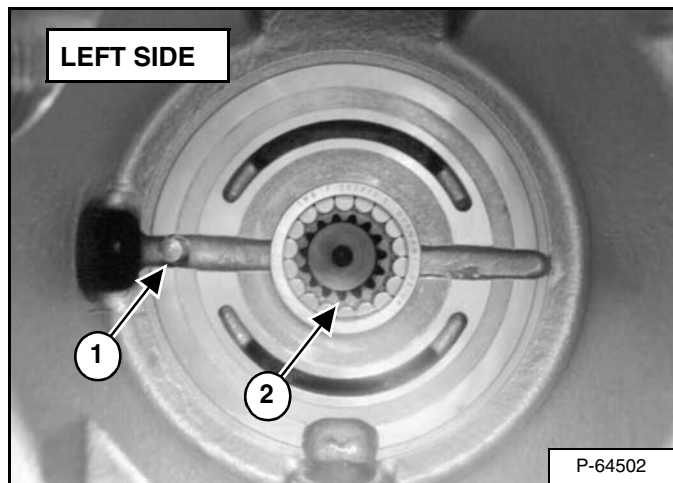


Figure 30-41-39

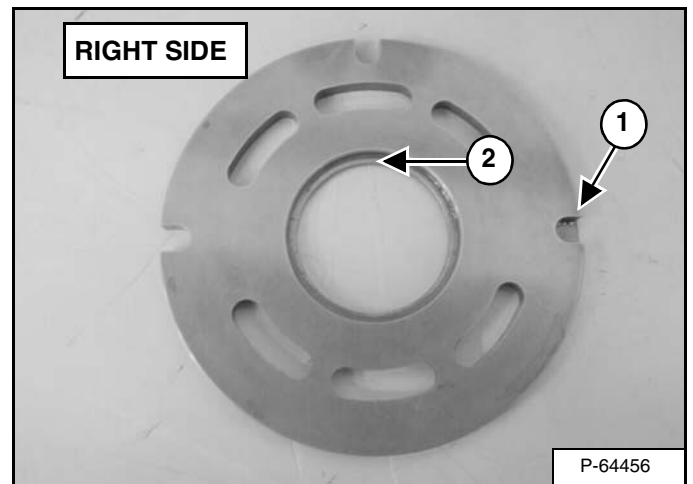
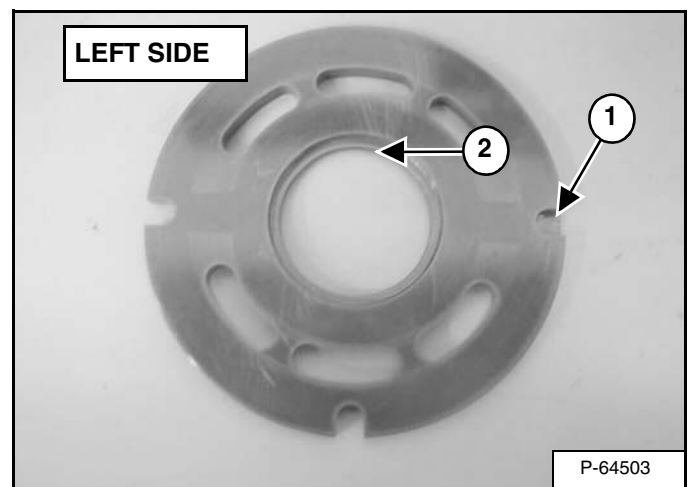


Figure 30-41-40



Assembly: Align the timing pin (Item 1) [Figure 30-41-37] and [Figure 30-41-38] in the case housing with the notch (Item 1) [Figure 30-41-39] and [Figure 30-41-40] that does not go through the valve plate.

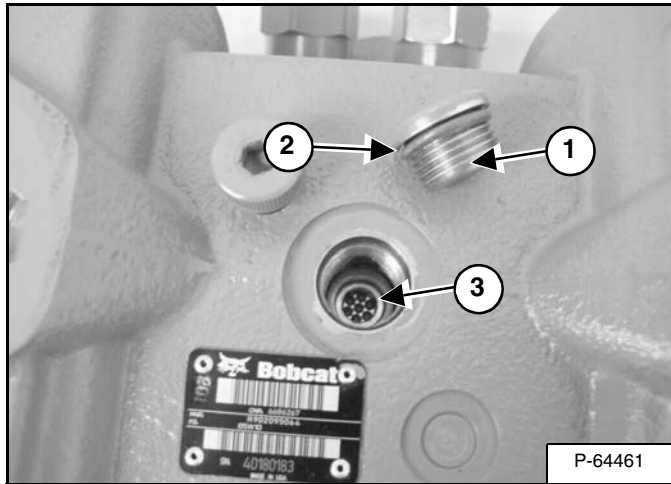
Align the shoulder of the roller bearing (Item 2) [Figure 30-41-37] and [Figure 30-41-38] with the beveled edge on the valve plate (Item 2) [Figure 30-41-39] and [Figure 30-41-40].

NOTE: Valve plate should sit **FLUSH** with the case housing when properly installed.

HYDROSTATIC PUMP (SJC) (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 30-41-75



Remove the plug (Item 1) from the top center of the case housing. Replace O-ring (Item 2) [Figure 30-41-75].

Assembly: Tighten plug to 45 ft.-lb. (10 N•m) torque.

Remove internal screen (Item 3) [Figure 30-41-75].

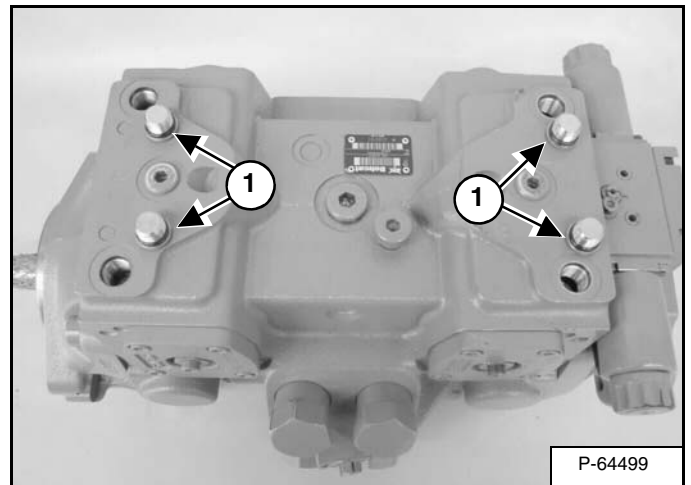
Assembly: Tighten internal screen to 7.4 ft.-lb. (62 N•m) torque.

Figure 30-41-76



Ensure screen is clean [Figure 30-41-76].

Figure 30-41-77

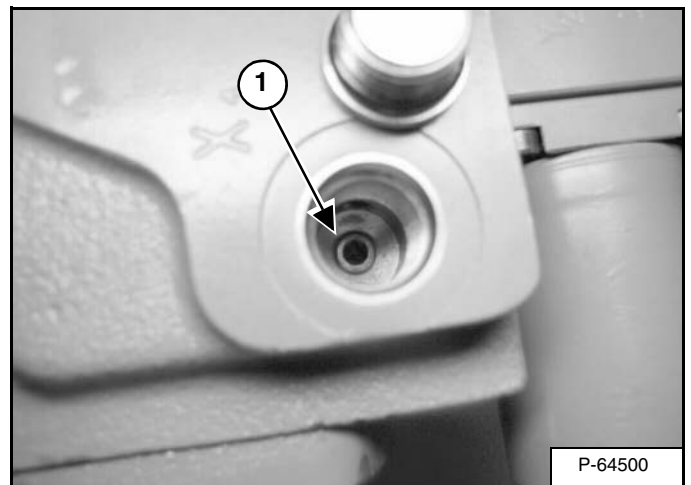


Remove the four control pressure plugs (Item 1) [Figure 30-41-77] at the top of the case housing to gain access to the four orifices (Item 1) [Figure 30-41-78].

Replace O-rings on plugs.

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

Figure 30-41-78



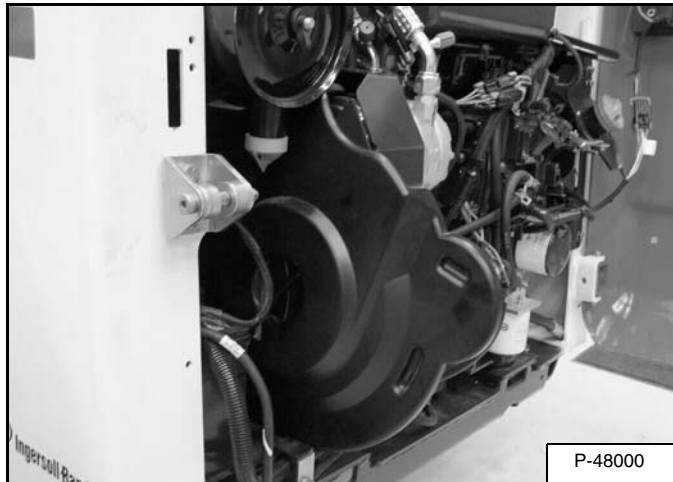
Ensure the four orifices (Item 1) [Figure 30-41-78] in case housing are clean and not plugged.

NOTE: The four orifices are no longer needed when software version 69 or above is installed on the loader.

DRIVE BELT (CONT'D)

Belt Removal And Installation

Figure 30-50-5



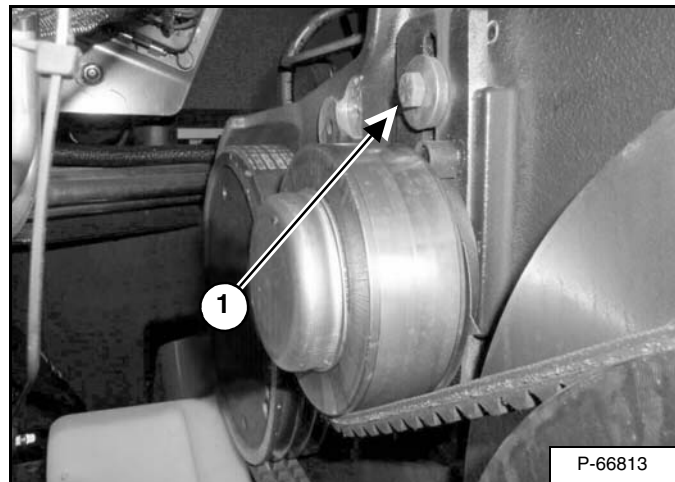
Stop the engine. Open the rear door.

Raise the operator cab. (See Raising Page 10-30-2.)

Remove the negative (-) cable from the battery. The battery may be removed for additional working clearance. (See Removal And Installation Page 60-20-1.)

Remove the belt shield **[Figure 30-50-5]**. (See Shield Removal And Installation Page 30-50-1.)

Figure 30-50-6



Remove the air conditioner belt if so equipped.

The belt tensioner is located between the flywheel and pump pulley. Loosen and remove the bolt (Item 1) **[Figure 30-50-6]** from the belt tensioner.

Remove the belt tensioner assembly.

Figure 30-50-7



Remove the drive belt from the pump pulley and flywheel. Remove the drive belt from the loader **[Figure 30-50-7]**.

Install the new drive belt. Install the belt tensioner assembly.

Adjust the drive belt. (See Adjusting Page 30-50-2.)

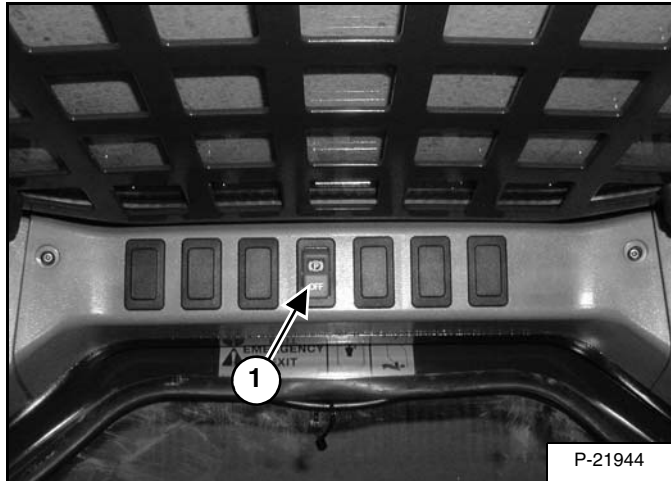
Reinstall belt shield and connect the negative (-) cable to the battery.

BRAKE

Description

The brake is used to hold the machine in place. The brake is operated by a switch (Item 1) [Figure 40-10-1] located on the front accessory panel.

Figure 40-10-1



The brake is automatically applied by a spring in the hydrostatic drive motor, if the loader is running, or not.

The brake block constantly receives hydraulic pressure from the charge pump while the engine is running. When the switch (Item 1) [Figure 40-10-1] is pressed to the “off” position, 12 volts is applied to a solenoid on the brake block. The hydraulic charge pressure is then diverted to a piston in the hydrostatic drive motor to compress the spring and relieves the pressure on the brakes metal and fiber discs. When the brake discs have enough pressure released, the hydrostatic drive motor is free to rotate.

When the solenoid is de-activated, the switch (Item 1) [Figure 40-10-1] is pressed to the “P” position, 12 volts is not being supplied to the brake block solenoid. The brake block will not let the hydraulic charge pressure enter the brake area of the hydrostatic drive motor. The spring will push back on the brake release piston in the hydrostatic motor and push the oil back to the hydraulic reservoir through the brake block.

Right Motor Brake Test

WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

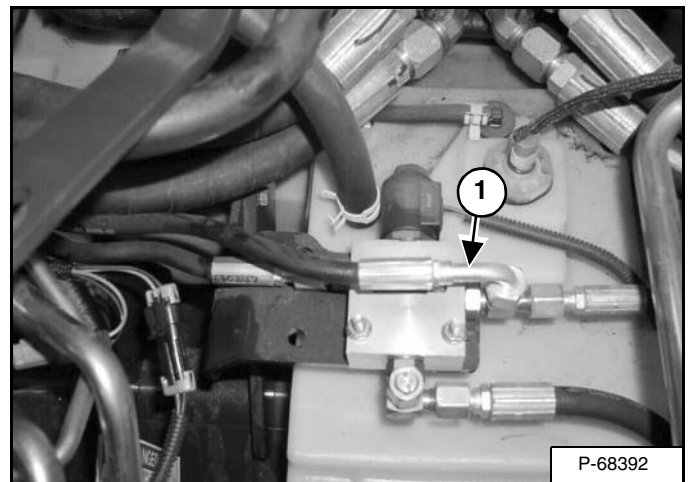
WARNING

AVOID INJURY OR DEATH

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

W-2103-0508

Figure 40-10-2



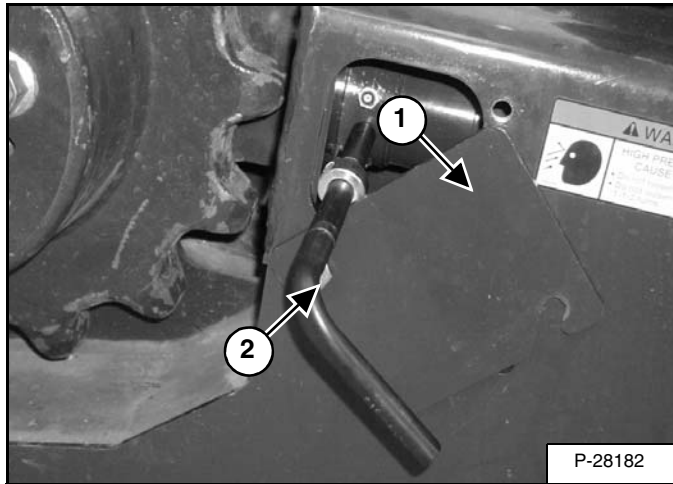
Mark and disconnect the right motor brake release hose (Item 1) [Figure 40-10-2] from the fitting on the #2 port of the brake block.

Cap the fitting on the #2 port of the brake block where the hose was removed.

TRACK CARRIAGE COMPONENTS (CONT'D)

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.

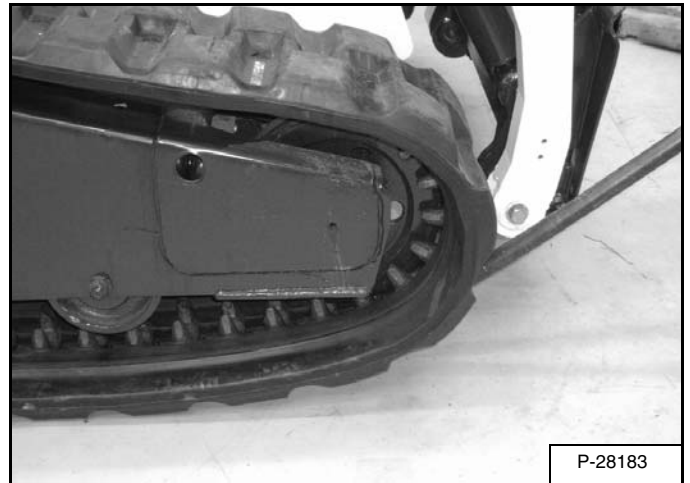
Turn the MEL tool/bleed fitting one more complete turn counterclockwise.

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.

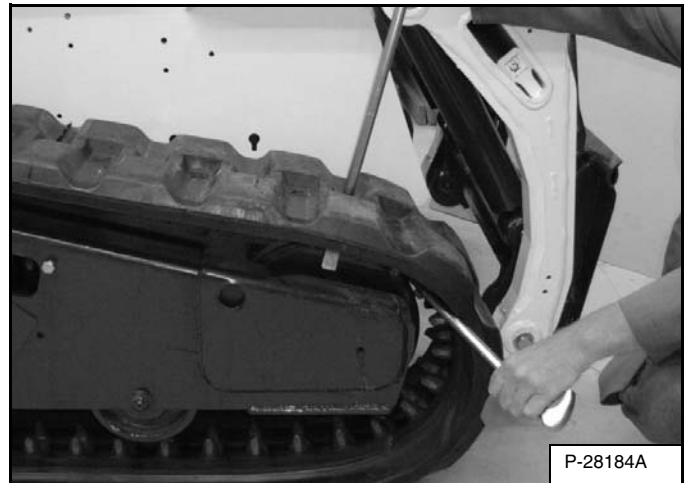
I-2067-0499

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 CARRIAGE COMPONENTS (CONT'D)

Track Damage Identification (Cont'd)

Separation Of Embedded Metals

Figure 40-20-38



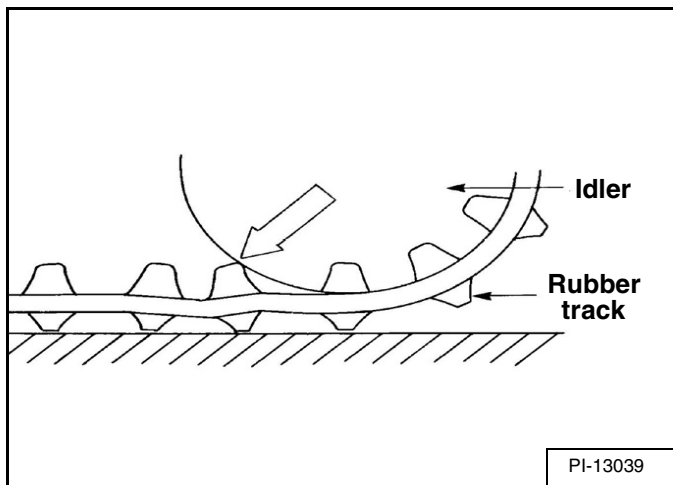
Damage:

Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body [Figure 40-20-38].

Replacement:

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

Figure 40-20-39

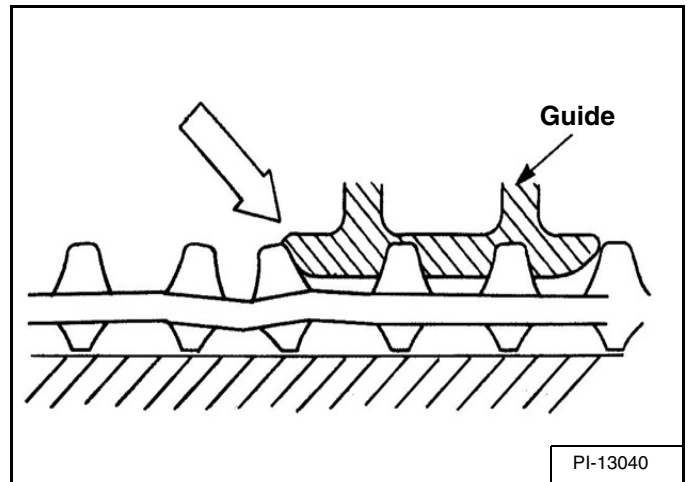


Causes of the damage:

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 40-20-39].

Figure 40-20-40



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

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MAIN FRAME

Continued On Next Page

OPERATOR CAB (CONT'D)

Gas Cylinder Removal And Installation (Cont'd)

Figure 50-20-7

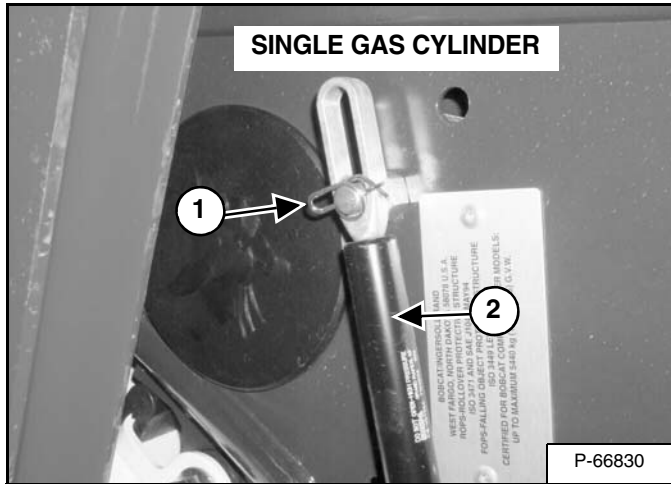
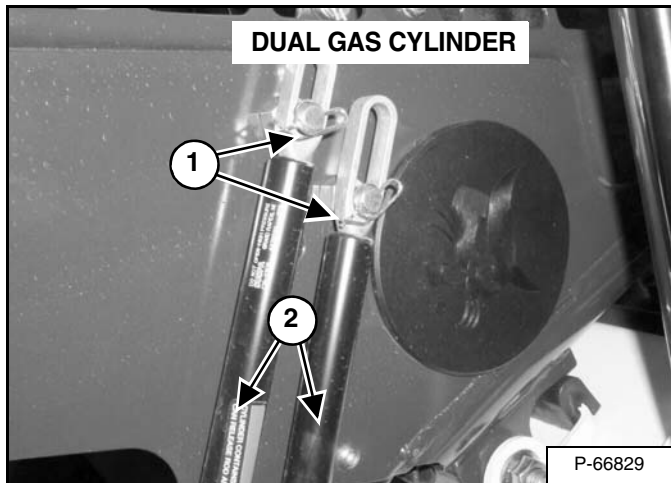


Figure 50-20-8



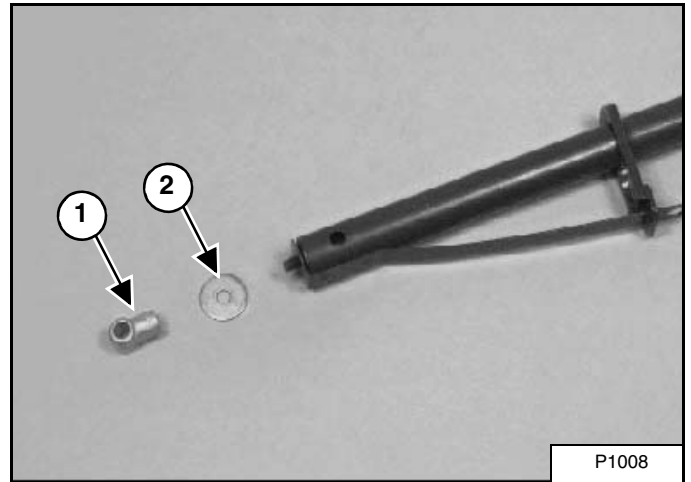
Remove the retaining pin(s) (Item 1) [Figure 50-20-7] and [Figure 50-20-8] from the top pivot pin(s).

Remove the gas cylinder(s) (Item 2) [Figure 50-20-7] and [Figure 50-20-8] from the operator cab.

Reverse the above procedure to install the gas cylinders onto the operator cab.

Gas Cylinder Bracket Disassembly And Assembly

Figure 50-20-9

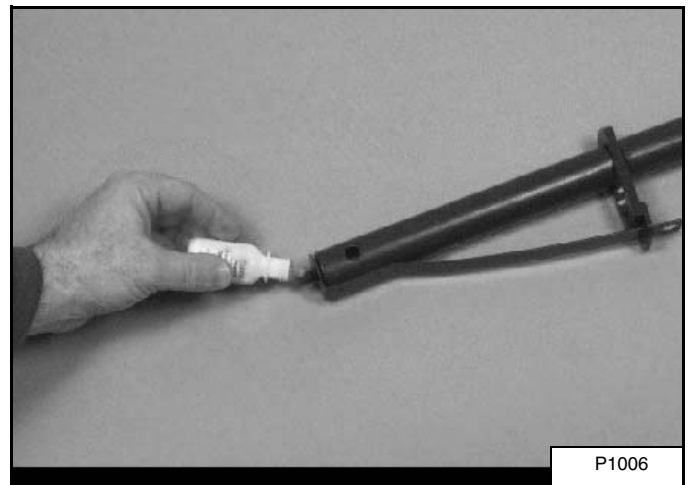


Remove the clevis (Item 1) and washer (Item 2) [Figure 50-20-9] from the end of the gas cylinder.

Remove the gas cylinder from the outer housing.

Assembly: Install a replacement cylinder inside the cylinder housing.

Figure 50-20-10



Apply a small amount of thread-locker on the threads of the cylinder rod [Figure 50-20-10].

Reinstall the washer and clevis on the cylinder rod.

BOB-TACH (HAND LEVER)

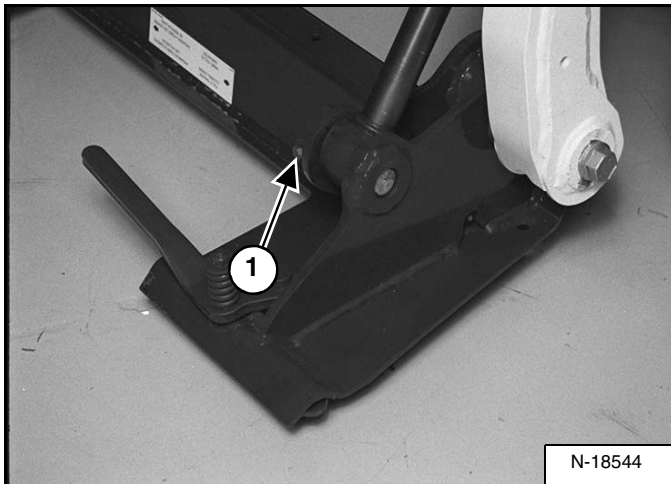
Description

The Bob-Tach is the section of the loader lift arm that attachments mount to. The Power Bob-Tach uses two manually operated, spring assisted, locking wedge and lever assemblies to secure the attachment the Bob-Tach.

The Bob-Tach is located on the front of the loader connected to the loader lift arms.

Removal And Installation

Figure 50-40-1



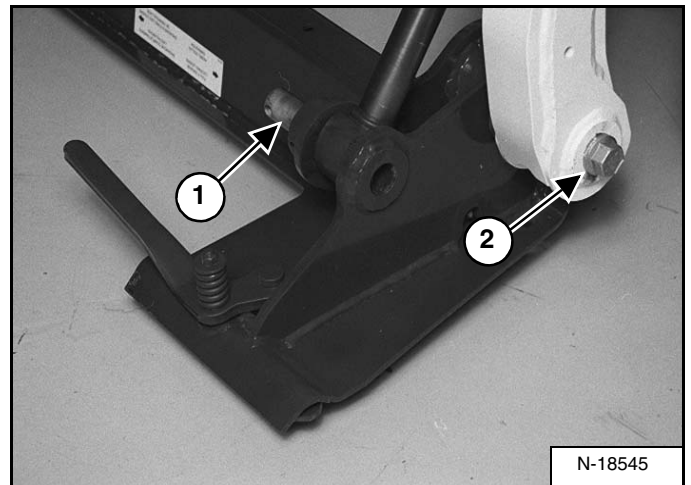
Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (approximately 3 in.) under each side of the Bob-Tach [Figure 50-40-1].

Lower the Bob-Tach onto the blocks.

Remove the retainer bolt (Item 1) [Figure 50-40-1] and nut from the tilt cylinder rod end pin (both sides).

Installation: Tighten the retainer bolt and nut to 25 - 30 ft.-lb. (34 - 38 N•m) torque.

Figure 50-40-2



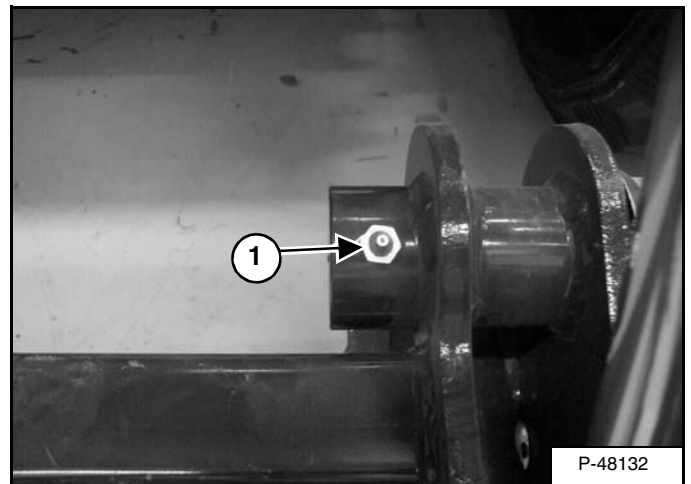
Remove the pivot pin (Item 1) [Figure 50-40-2] from the tilt cylinder rod end (both sides).

Remove the tilt cylinder rod end from the Bob-Tach (both sides).

Loosen the bolt (Item 2) [Figure 50-40-2] at the Bob-Tach pivot pin.

Installation: Tighten the bolt to 175 - 190 ft.-lb. (240 - 260 N•m) torque.

Figure 50-40-3

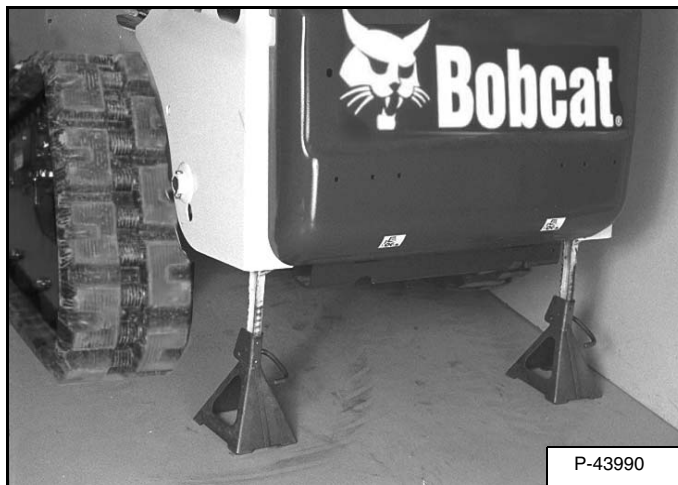


Remove the grease fitting (Item 1) (both sides) [Figure 50-40-3] out of the Bob-Tach frame. This allows grease to escape when driving the pivot pins into the Bob-Tach frame.

LIFT ARMS (CONT'D)

Removal And Installation

Figure 50-50-8

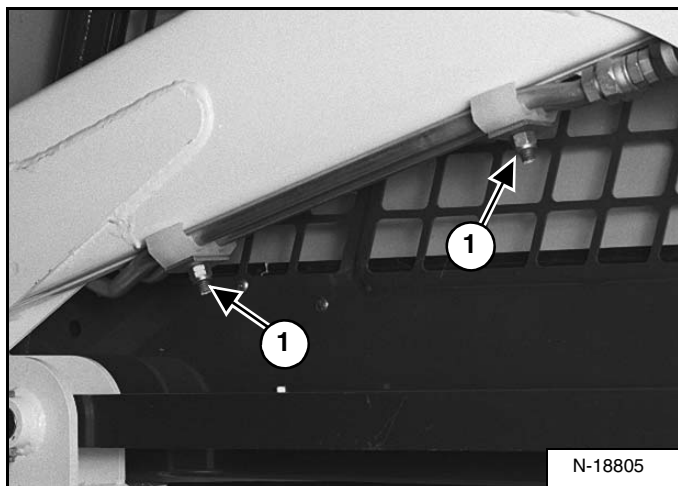


Roll the Bob-Tach fully forward. Stop the engine.

Remove the Bob-Tach frame from the lift arms. (See Removal And Installation on Page 50-40-1.)

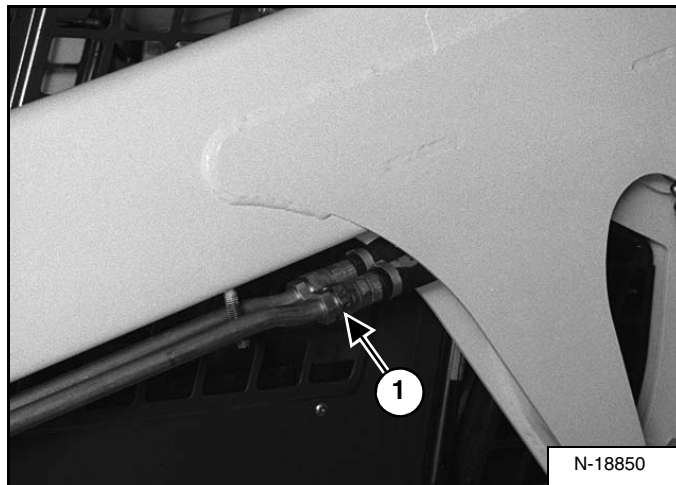
Install jackstands under the rear of the loader [Figure 50-50-8].

Figure 50-50-9



Remove the tubeline clamps (Item 1) [Figure 50-50-9] under the lift arms (both sides).

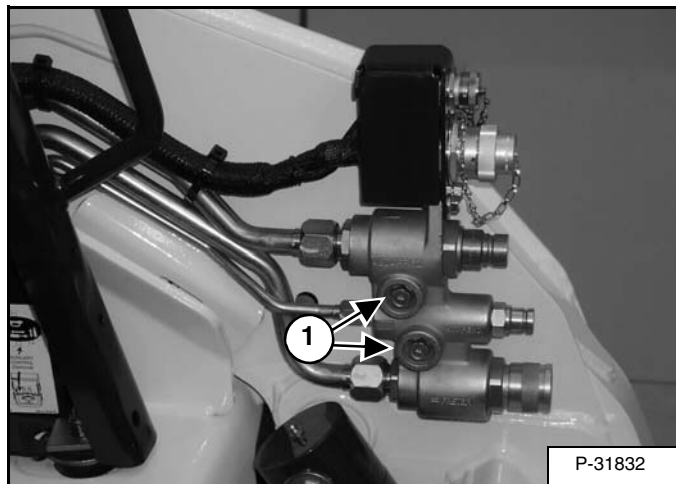
Figure 50-50-10



Mark the tubelines for correct installation (both sides). Pull the tubelines down, disconnect the hoses (Item 1) [Figure 50-50-10] (both sides).

Install plugs into the hose and tubeline ends.

Figure 50-50-11



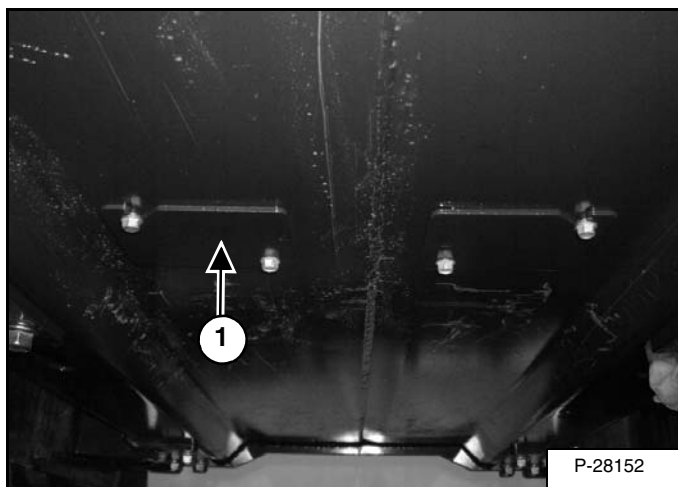
Remove the front auxiliary mount mounting bolts (Item 1) [Figure 50-50-11].

Remove the front auxiliary tubelines from the lift arms.

FUEL TANK

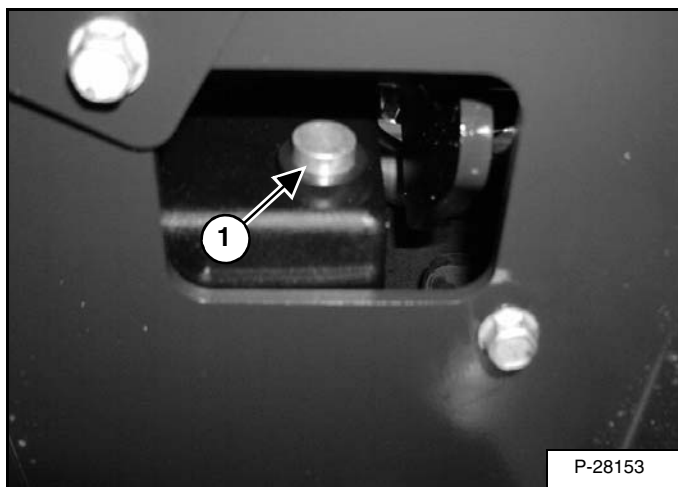
Removal And Installation

Figure 50-80-1



Remove left access cover (Item 1) [Figure 50-80-1] which is located from the rear of the machine below the undercarriage.

Figure 50-80-2

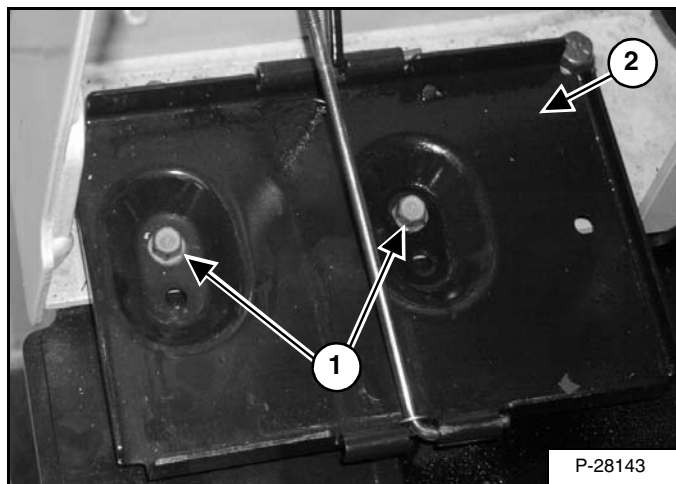


Drain the fuel from the tank through the fuel drain (Item 1) [Figure 50-80-2].

Open the rear door of the loader.

Remove the engine/hydrostatic pump assembly from the loader. (See Removal And Installation on Page 70-10-8.)

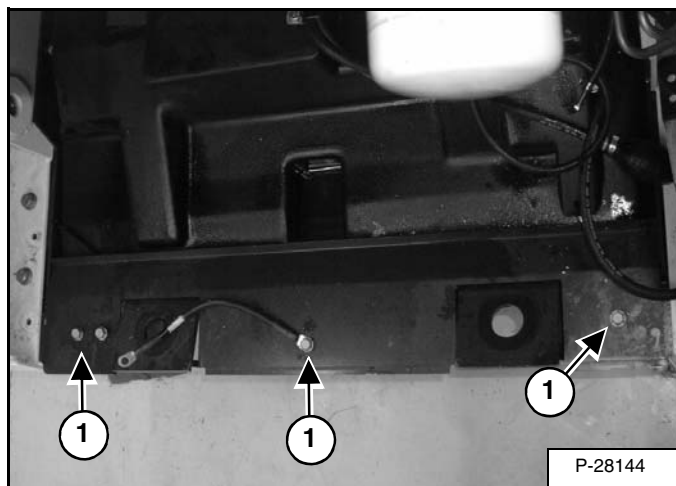
Figure 50-80-3



Remove the two mounting bolts (Item 1) [Figure 50-80-3] from the battery holder.

Remove the battery holder (Item 2) [Figure 50-80-3] from the loader.

Figure 50-80-4



Remove the mounting bolts (Item 1) [Figure 50-80-4] from the fuel tank retainer bracket.

Description

This diagram shows an exploded view of a rear axle assembly. The central component is a long, black, curved axle tube. At each end, there is a differential housing with a large, multi-lobed output flange. The axle tube is connected to these housings via yokes and pinion shafts. The entire assembly is shown in relation to a chassis frame, which includes a cross-member and various mounting brackets. The diagram is a technical illustration used for assembly or repair purposes.

Steering linkage bars attach to the pintle arms where a rubber torsion bushing is pressed into the pintle arms.

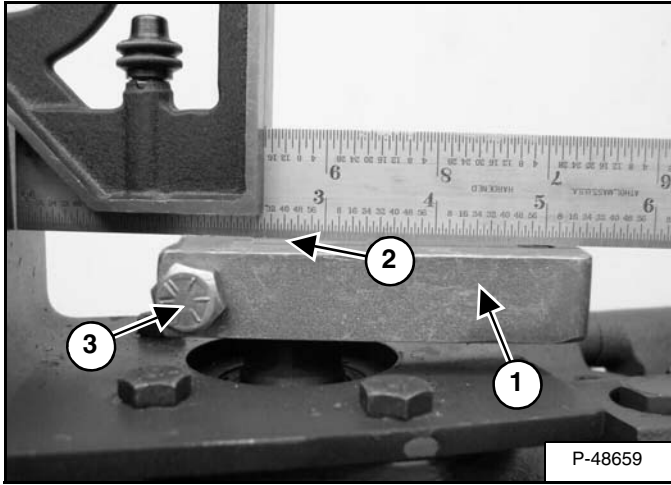
NOTE: Torsion bushings need to be replaced if torn or rotating in the housing. Loosen torsion bushing bolts slightly before adjustments are made. Do not fully tighten torsion bushing bolts again until all steering adjustments have been made first.

1. Set neutral of pintle arms, "creep"
2. Set linkage travel at steering linkage bars
3. Set drift at drift adjustment bolts

CONTROL PANEL (CONT'D)

Linkage Removal And Installation (Cont'd)

Figure 50-100-23



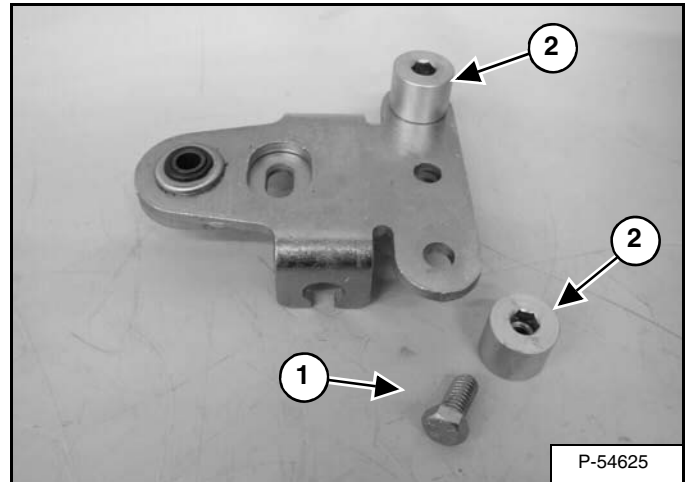
NOTE: When installing the pintle base (Item 1) onto the pump shaft (Item 2) [Figure 50-100-23], the cutouts on the pump shaft will not line up with the bolt (Item 3) [Figure 50-100-23].

Installation: Install the pintle base (Item 1) onto the pump shaft (Item 2) [Figure 50-100-23]. The top of the pintle base should be level with the top of the pump shaft. Tighten the bolt to 35 - 40 ft.-lb. (47,5 - 54,2 N•m) torque.

NOTE: After installing the linkage onto the hydrostatic pumps the linkage neutral adjustment procedure must be performed. See Page 50-100-13 for Linkage Neutral Adjustment procedure.

Pintle Arm Disassembly And Assembly

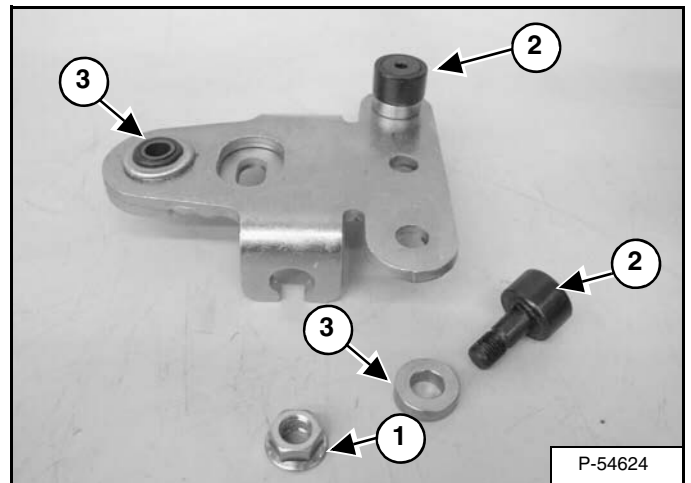
Figure 50-100-24



Remove the bolt (Item 1) from the pintle solid cams (Item 2) [Figure 50-100-24] and inspect the pintle solid cams for damage or excessive wear.

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

Figure 50-100-25



NOTE: The pintle roller cams (Item 2) [Figure 50-100-25] are used on ACS loaders only.

Remove the nut (Item 1) from the pintle roller cams (Item 2) and inspect the pintle roller cams and washers (Item 3) for damage [Figure 50-100-25].

Inspect the torsion bushing (Item 3) [Figure 50-100-25] for damage and replace as needed.

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

CONTROL PANEL (SJC)

Description

The SJC control panel has two electronic handles that control the steering, lift, and tilt functions. There is no mechanical linkages connecting to the hydrostatic pumps or the control valve.

The control panel is connected to the lower main frame and wraps around and underneath the operator seat.

Removal And Installation

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

DANGER



P-90328

AVOID DEATH

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

D-1009-0409

WARNING

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

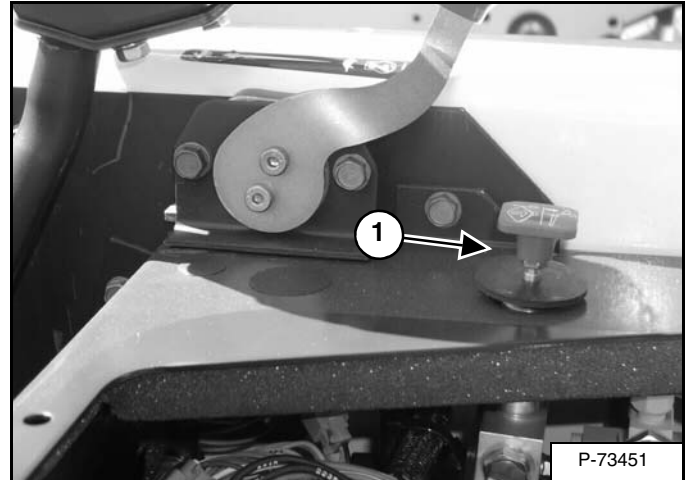
W-2059-0598

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

Raise the operator cab. (See Raising on Page 10-30-2.)

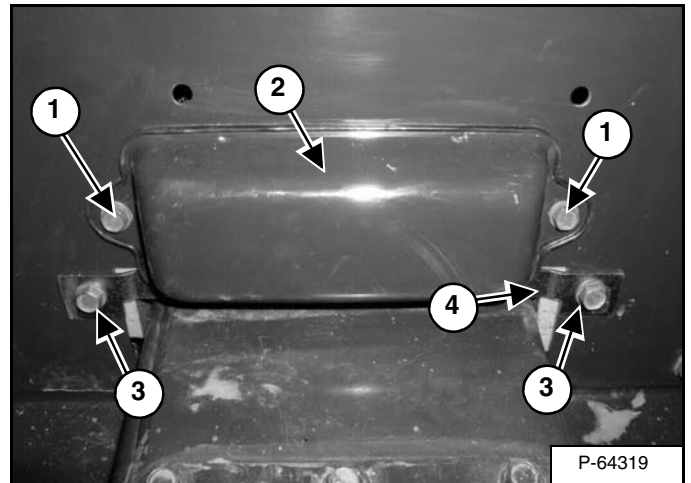
Remove the engine speed control. (See Removal And Installation on Page 70-20-1.)

Figure 50-101-1



Remove the lift arm bypass control knob and rubber washer (Item 1) [Figure 50-101-1].

Figure 50-101-2



Remove the fuse cover mount screws (Item 1) [Figure 50-101-2].

Installation: Tighten screws to 8 - 11 ft.-lb. (11 - 15 N•m) torque.

Remove the fuse/relay cover (Item 2) [Figure 50-101-2].

Remove the fuse/relay shield mounting screws (Item 3) [Figure 50-101-2].

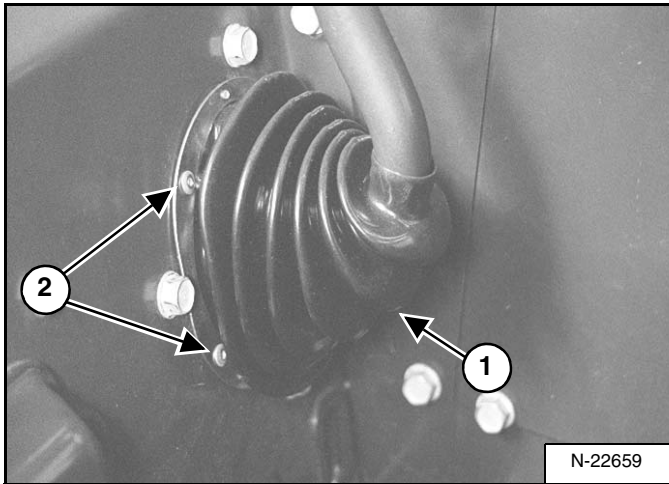
Installation: Tighten screws to 15 - 20 ft.-lb. (20 - 27 N•m) torque.

Remove the fuse/relay shield (Item 4) [Figure 50-101-2]

CONTROL HANDLE/LEVER (ACS) (CONT'D)

Boot Removal And Installation

Figure 50-111-22



To replace the rubber boot (Item 1) **[Figure 50-111-22]** on the control panel, remove the control lever. (See Lever Removal And Installation on Page 50-111-5.)

Drill out the four rivets (Item 2) **[Figure 50-111-22]** located on the flange of the rubber boot and remove the old boot.

Install the new boot and reinstall the control lever. (See Lever Removal And Installation on Page 50-111-5.)

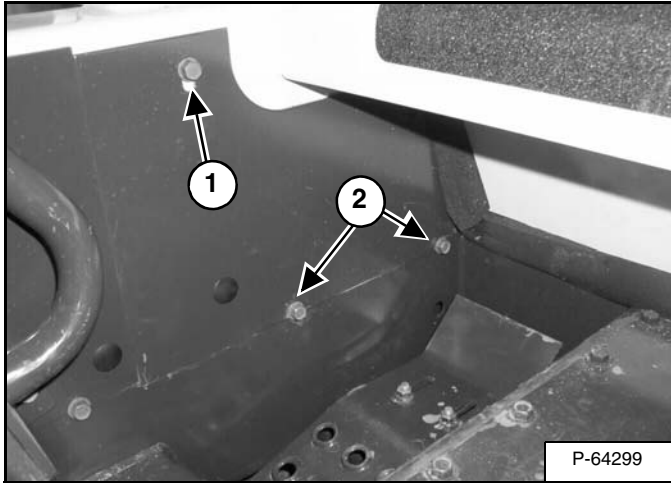
ACCESS PANEL (INSIDE) (SJC)

Removal And Installation (Left)

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

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 50-121-1

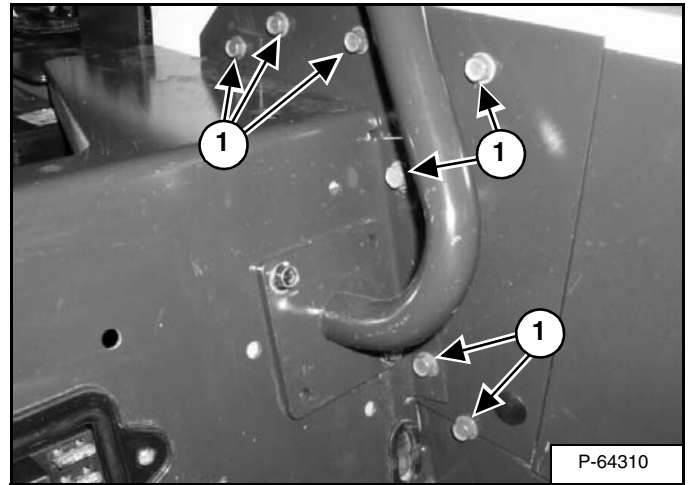


Remove the top mounting screw (Item 1) and loosen the two bottom screws (Item 2) [Figure 50-121-1].

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

Remove the inside front access panel from the loader.

Figure 50-121-2



Remove the seven mount screws (Item 1) [Figure 50-121-2]

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

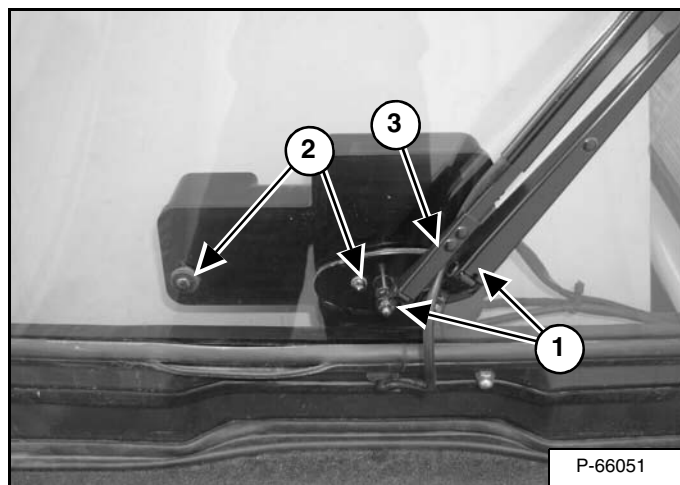
Move the lever assembly a slight amount toward the center of the loader, to allow clearance for the panel to be removed.

Remove the inside rear access panel from the loader.

WINDOW (FRONT DOOR)

Removal (Standard Window)

Figure 50-133-1

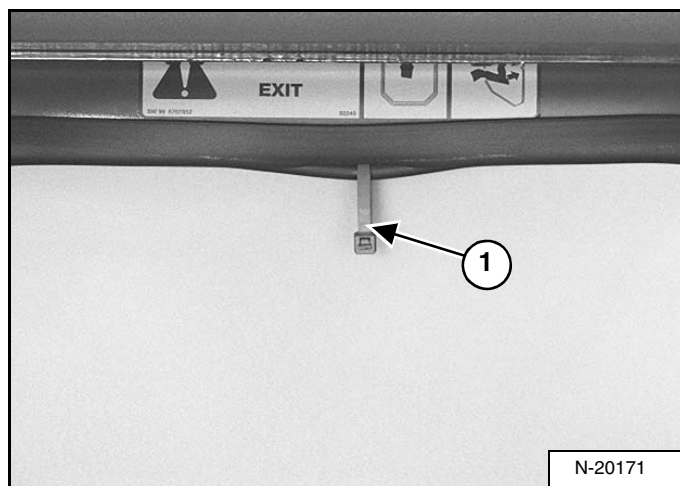


Remove the wiper arm assembly (Item 1) [Figure 50-133-1].

Remove the two screws (Item 2) and the nut (Item 3) [Figure 50-133-1].

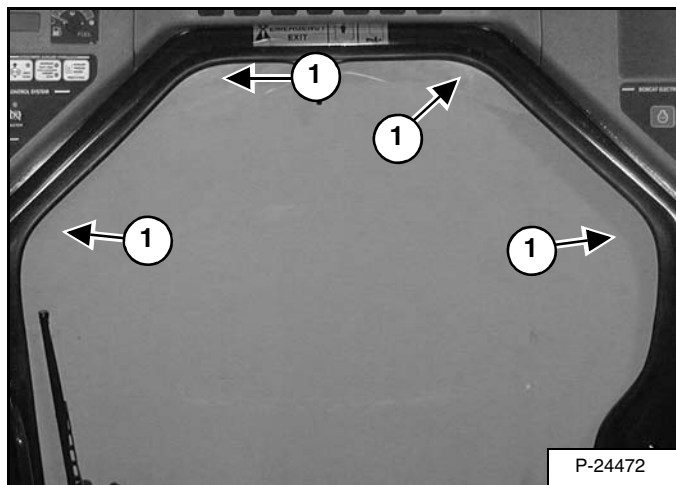
Secure the wiper motor inside the cab.

Figure 50-133-2



Pull the plastic loop (Item 1) [Figure 50-133-2] at the top of the window to remove the rubber cord.

Figure 50-133-3



Push the window out at any corner of the window (Item 1) [Figure 50-133-3].

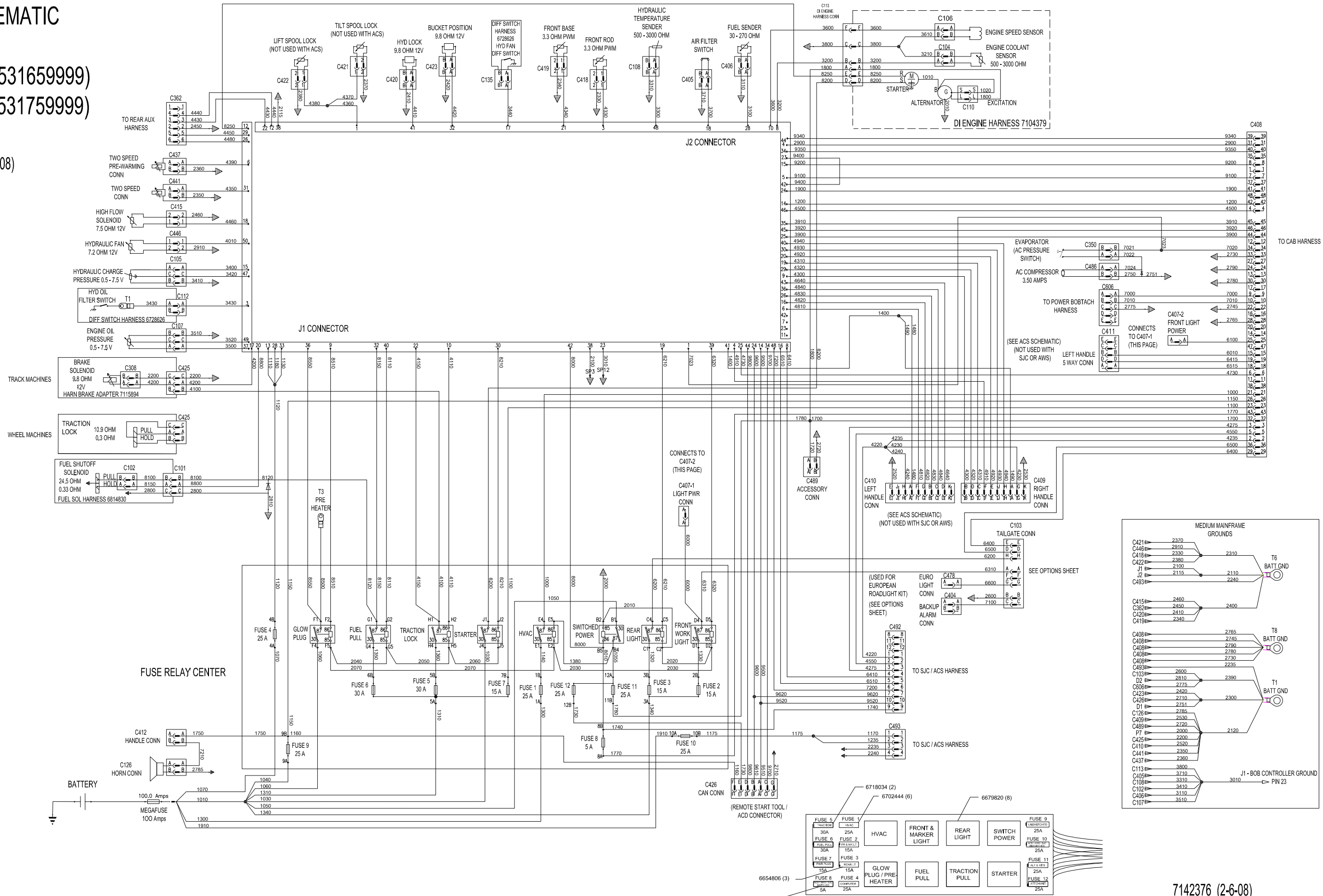
NOTE: The window may fall when pushing on the corners. Have a second technician assist you during the removal of the window.

T190 (S/N 531616562 - 531659999)
(S/N 531711727 - 531759999)

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TRACK MACHINES

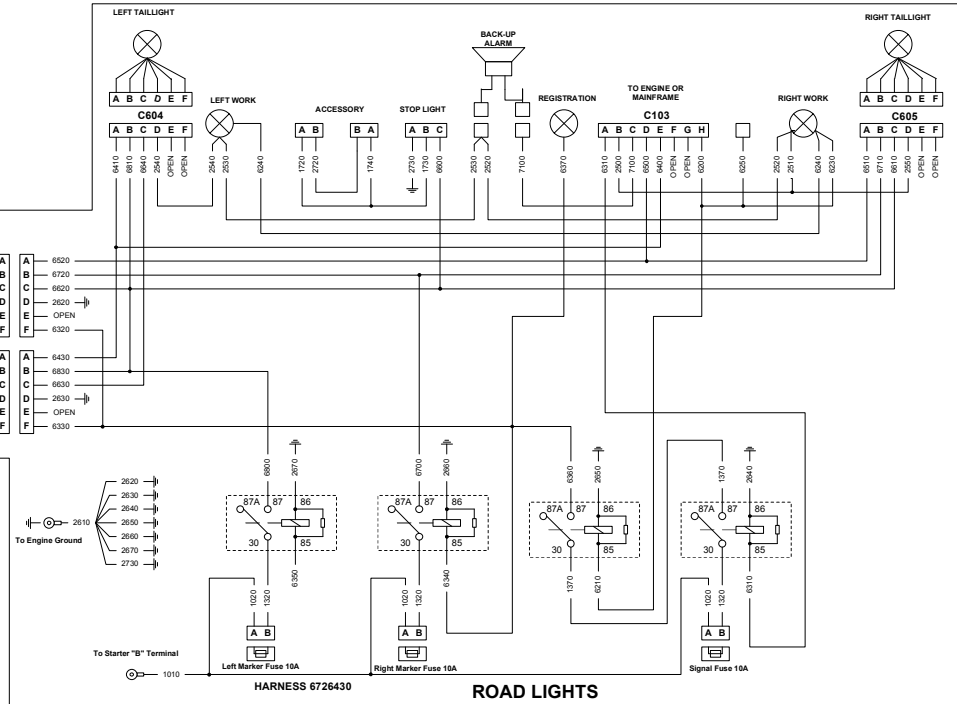
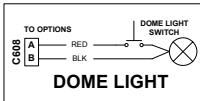
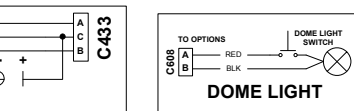
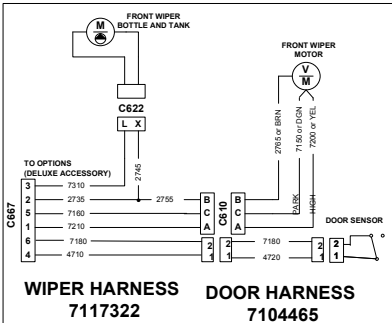
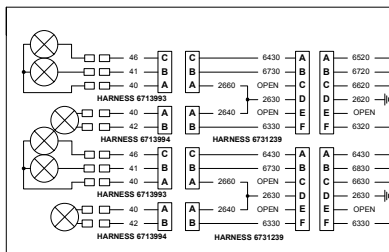
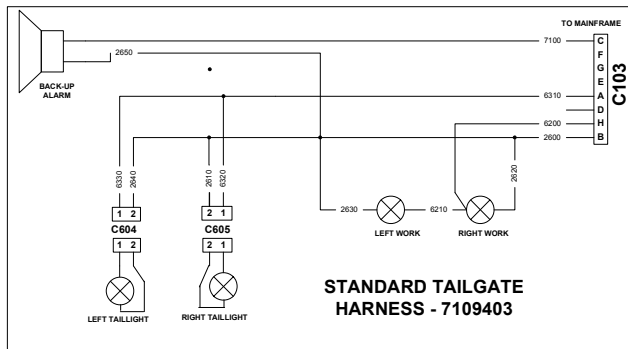
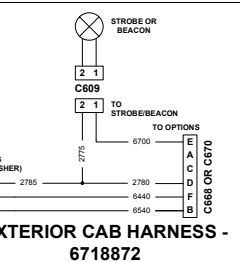
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OPTIONS

(PRINTED FEBRUARY 2008)
V-0759



WIRES CONNECT BY LETTER ACROSS CONNECTORS



SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

BATTERY FEED 1000-1999 RED, RED/WHIT, 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

V-0759 (2-6-08)

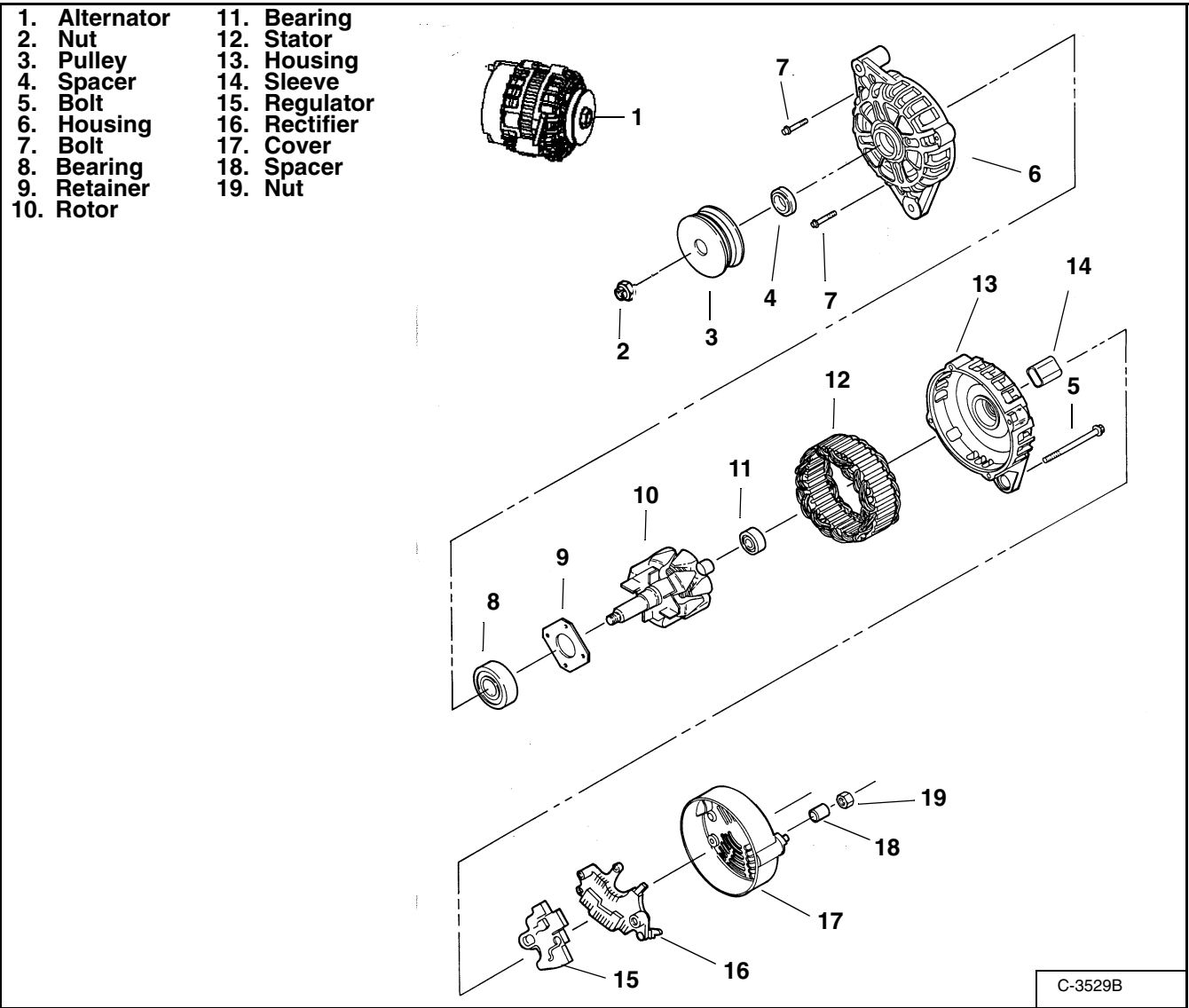


Bobcat®

ALTERNATOR (CONT'D)

Parts Identification

Figure 60-30-9



C-3529B

INSTRUMENT PANELS (CONT'D)

Removal And Installation (Left And Right)

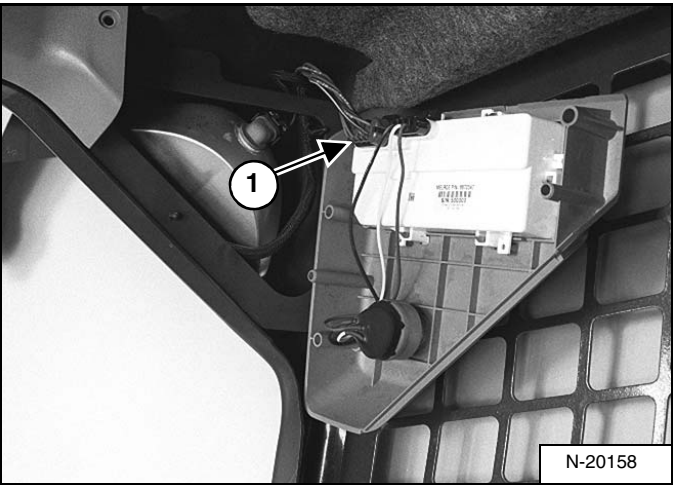
Figure 60-50-8



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

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

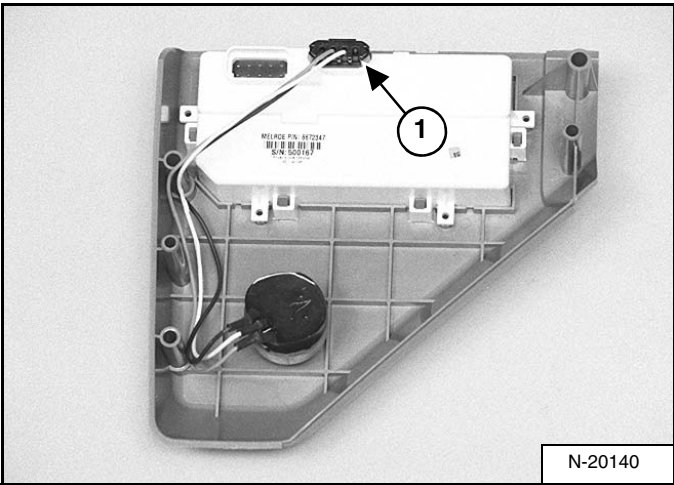
Figure 60-50-9



Pull the right instrument panel down and disconnect the wire harness connector (Item 1) [Figure 60-50-9] from the panel.

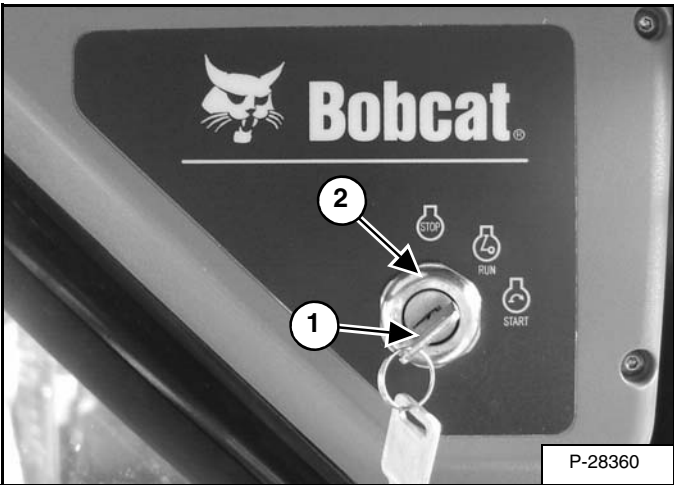
Remove the panel from the loader cab.

Figure 60-50-10



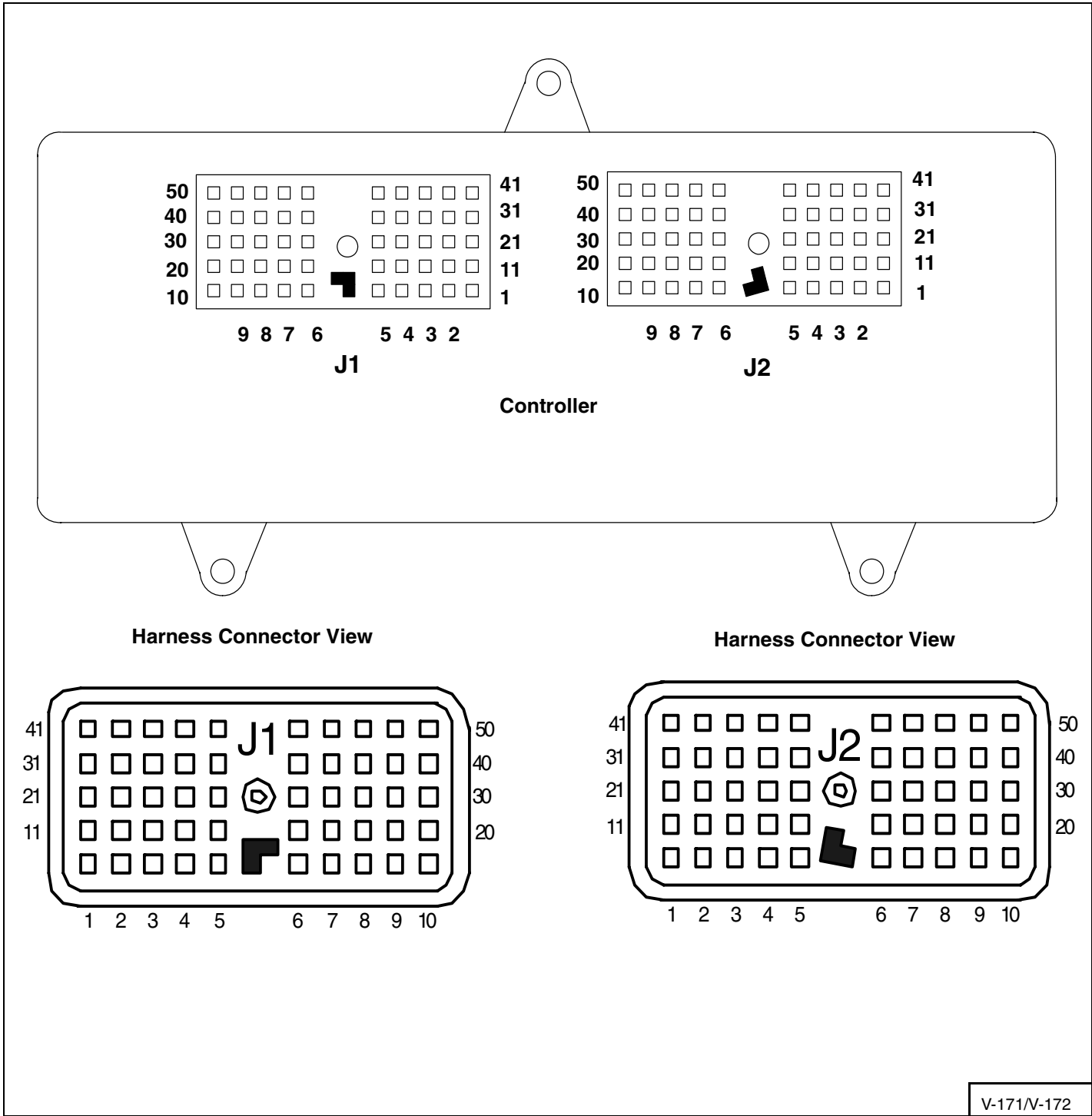
Disconnect the key switch wiring harness (Item 1) [Figure 60-50-10] from the back of the control panel.

Figure 60-50-11



Remove the ignition key (Item 1) from the switch. Remove the ignition switch retaining nut (Item 2) [Figure 60-50-11] from the switch.

Connector Identification



BOBCAT CONTROLLER (SJC) (DRIVE) (CONT'D)

Removal And Installation

WARNING

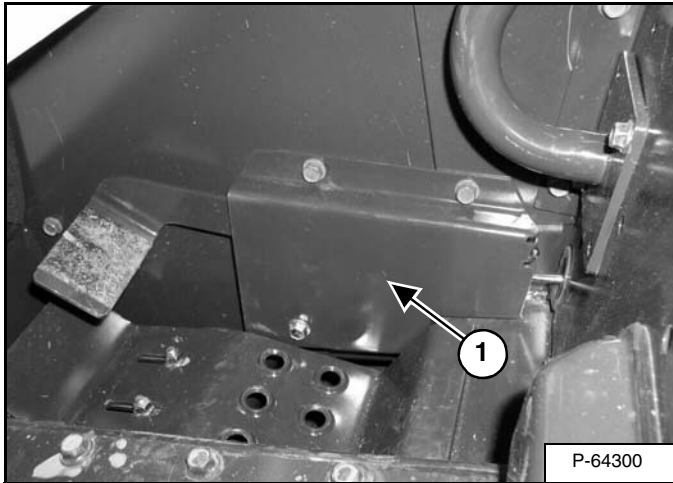
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

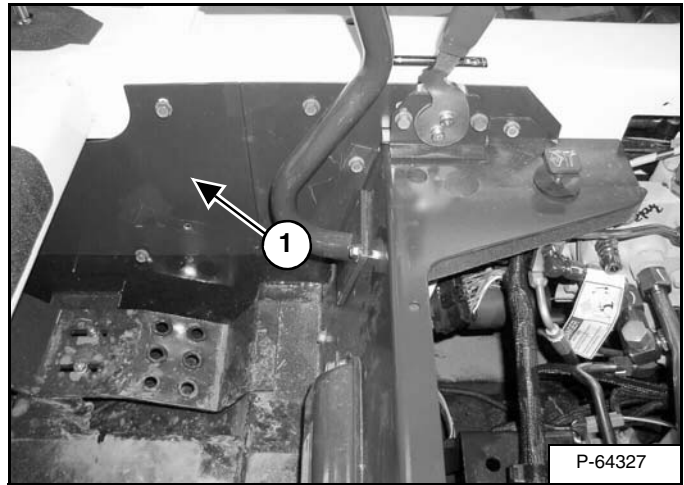
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 60-72-1



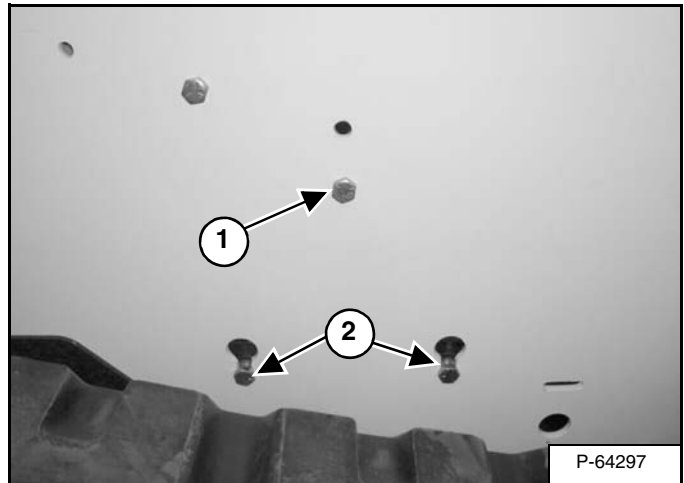
Remove the foot portion of the engine speed control (Item 1) [Figure 60-72-1]. (See Removal And Installation on Page 70-21-1.)

Figure 60-72-2



Remove the inside access panel (right side) (Item 1) [Figure 60-72-2].

Figure 60-72-3



Remove the top controller mounting bolt (Item 1). Loosen the two bottom controller mounting bolts (Item 2) [Figure 60-72-3] from the right side fender.

Lift and remove the controller from the fender.

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

DIAGNOSTIC SERVICE CODES (CONT'D)

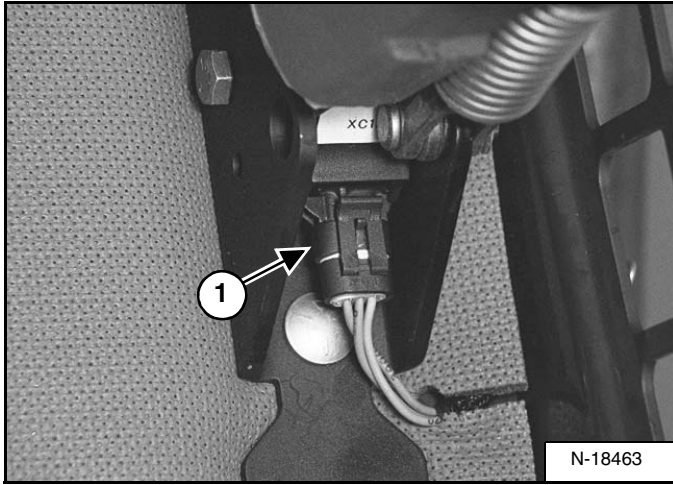
Service Codes List

CODE		CODE	
01-16	Air filter not connected	11-05	Seat bar sensor short to battery
01-17	Air filter plugged	11-06	Seat bar sensor short to ground
02-16	Hydraulic/Hydrostatic filter not connected	12-21	Front auxiliary PWM switch out of range high
02-17	Hydraulic/Hydrostatic filter plugged	12-22	Front auxiliary PWM switch out of range low
		12-23	Front auxiliary PWM switch not in neutral
03-09	Battery voltage low		
03-10	Battery voltage high	13-05	Fuel shut-off hold solenoid short to battery
03-11	Battery voltage extremely high	13-06	Fuel shut-off hold solenoid short to ground
03-14	Battery voltage extremely low	13-07	Fuel shut-off solenoid open circuit
03-22	Battery voltage out of range low		
		14-02	Fuel shut-off pull solenoid error ON
04-09	Engine oil pressure low	14-03	Fuel shut-off pull solenoid error OFF
04-14	Engine oil pressure extremely low		
04-15	Engine oil pressure shutdown level	15-02	Traction lock pull solenoid error ON
04-21	Engine oil pressure out of range high	15-03	Traction lock pull solenoid error OFF
04-22	Engine oil pressure out of range low		
		16-05	Traction lock hold solenoid short to battery
05-09	Hydraulic charge pressure low	16-06	Traction lock hold solenoid short to ground
05-10	Hydraulic charge pressure high	16-07	Traction lock hold solenoid open circuit
05-11	Hydraulic charge pressure extremely high		
05-14	Hydraulic charge pressure extremely low	17-05	Hydraulic lock valve solenoid short to battery
05-15	Hydraulic charge pressure shutdown level	17-06	Hydraulic lock valve solenoid short to ground
05-21	Hydraulic charge pressure out of range high	17-07	Hydraulic lock valve solenoid open circuit
05-22	Hydraulic charge pressure out of range low		
		18-05	Spool lock solenoid short to battery
06-10	Engine speed high	18-06	Spool lock solenoid short to ground
06-11	Engine speed extremely high	18-07	Spool lock solenoid open circuit
06-13	Engine speed no signal		
06-15	Engine speed shutdown level	19-02	Bucket positioning solenoid error ON
06-18	Engine speed out of range	19-03	Bucket positioning solenoid error OFF
07-10	Hydraulic oil temperature high	20-02	Two-speed solenoid error ON
07-11	Hydraulic oil temperature extremely high	20-03	Two-speed solenoid error OFF
07-15	Hydraulic oil temperature shutdown level		
07-21	Hydraulic oil temperature out of range high	21-02	Glow plug error ON
07-22	Hydraulic oil temperature out of range low	21-03	Glow plug error OFF
08-10	Engine coolant temperature high	22-02	Starter error ON
08-11	Engine coolant temperature extremely high	22-03	Starter error OFF
08-15	Engine coolant temperature shutdown level		
08-21	Engine coolant temperature out of range high	23-02	Rear base solenoid error ON
08-22	Engine coolant temperature out of range low	23-03	Rear base solenoid error OFF
09-09	Fuel level low	24-02	Rear rod solenoid error ON
09-21	Fuel level out of range high	24-03	Rear rod solenoid error OFF
09-22	Fuel level out of range low		
		25-02	Rear auxiliary relief solenoid error ON
10-17	Hydraulic charge filter plugged	25-03	Rear auxiliary relief solenoid error OFF

SEAT BAR SENSOR (CONT'D)

Testing

Figure 60-110-1

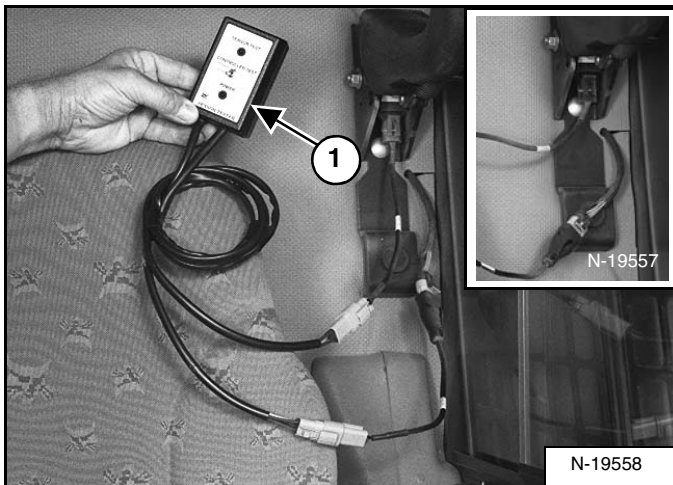


Use Sensor Tester (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

Connect the seat bar adapter sensor leads (MEL1567) to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) [Figure 60-110-1].

Figure 60-110-2

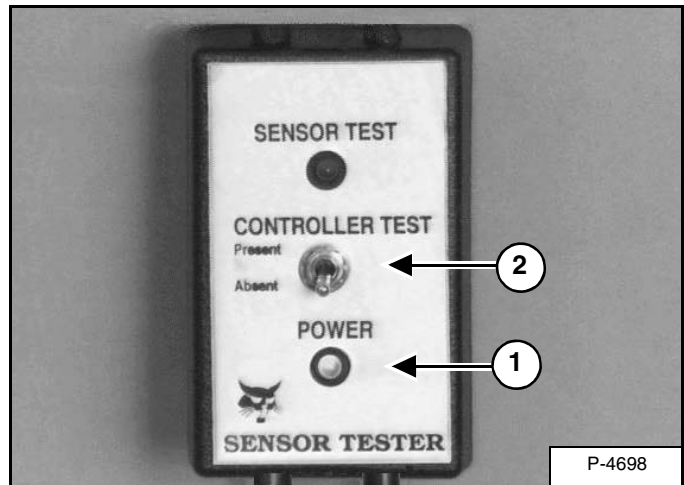


Connect the Sensor Tester (Item 1) [Figure 60-110-2] inline, to the seat bar sensor connectors. See inset [Figure 60-110-2].

Turn the key to the ON position. **DO NOT START THE ENGINE.**

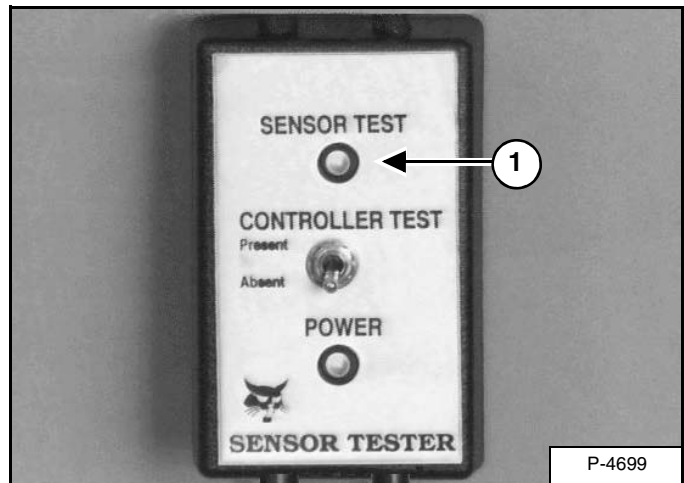
The toggle switch (Item 2) [Figure 60-110-3] can be in either the **Absent** or **Present** position.

Figure 60-110-3



If there is no power light (Item 1) [Figure 60-110-3] on the sensor tester, check the tester or wiring harness.

Figure 60-110-4



Lower the seat bar. The Sensor Test light (Item 1) [Figure 60-110-4] should illuminate.

Raise the seat bar. The Sensor Test light (Item 1) [Figure 60-110-4] should go off.

If the above test fails, there is a problem with the seat bar sensor.

Disconnect the Sensor Tester.

Replace the Seat Bar Sensor. (See Removal And Installation on Page 60-110-3.)

If the above test passes, run the seat bar sensor BICS circuit test. (See Bobcat Interlock Control System (BICS) Circuit Test on Page 60-110-5.)

CONTROL SYSTEM (ACS) (CONT'D)

Troubleshooting Chart

The Advanced Control System (ACS) has a built-in diagnostic function which uses an icon on the right instrument panel to indicate the condition of the ACS SYSTEM. The system also records the alarm condition as a service code.

The control module continually checks the system in the order listed. The checks start with the lift handle sensor and then the lift actuator. If no problems are present, it will then check the tilt handle sensor and the tilt actuator. The system will stop its check at the first problem and then illuminate the icon.

The system starts its diagnostics and calibration when the ignition key is turned ON.

The following list shows the probable causes when the icon is illuminated.

Advanced Control System	General Warning	Fuel Level	System Voltage	Engine Oil Pressure	Engine Coolant Temperature	Air Filter
Attachment Control Device	Two Speed	Glow Plugs	Seat Belt	Hydraulic Charge Pressure	Hydraulic Oil Temperature	Hydraulic Filter

Advanced Control System

Errors-**lights** solid with 3 beeps

32-04- **ACS** in error

32-23- **ACS** not calibrated

32-31- **Tilt** actuator fault

32-34- **Tilt** actuator not calibrated

32-35- **Tilt** handle/pedal not calibrated

32-36- **Lift** actuator fault

32-39- **Lift** actuator not calibrated

32-40- **Lift** handle/pedal not calibrated

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

32-61- **Handle** lock short to ground

32-62- **Handle** lock short to battery

32-63- **Pedal** lock short to ground

32-64- **Pedal** lock short to battery

32-65- **Sensor** supply voltage out of range

32-66- **Battery** out of range

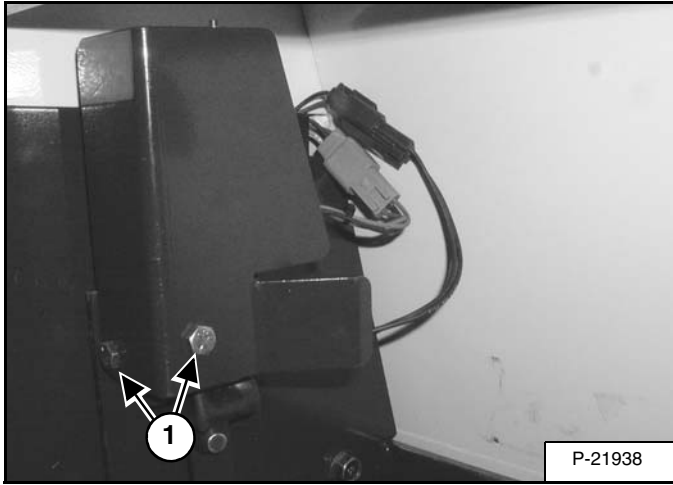
32-67- **Switch** flipped while operating

To see what error occurred. (See DIAGNOSTIC SERVICE CODES on Page 60-90-1.)

CONTROL SYSTEM (ACS) (CONT'D)

Foot Lock Solenoid Removal And Installation

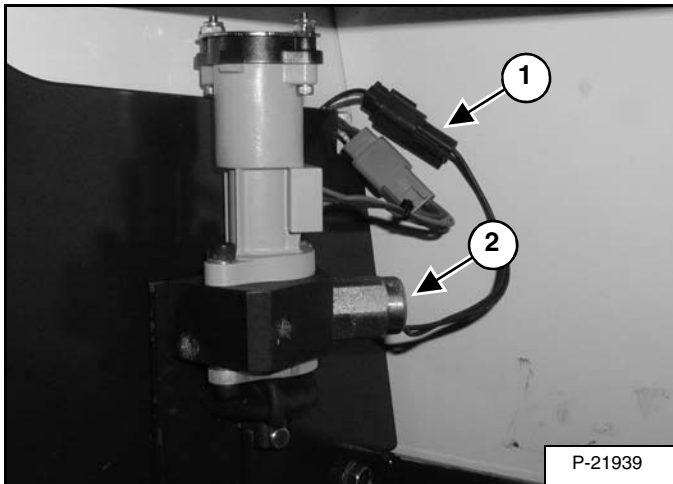
Figure 60-130-30



Remove the two bolts (Item 1) [Figure 60-130-30] from the foot sensor shield.

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

Figure 60-130-31

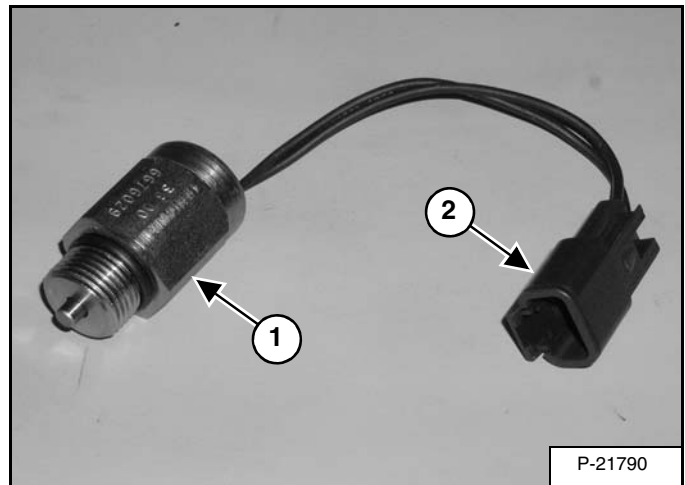


Disconnect the foot lock solenoid connector (Item 1) [Figure 60-130-31] from the harness.

Remove foot lock solenoid (Item 2) [Figure 60-130-31].

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 60-130-32



Check the O-ring (Item 1) [Figure 60-130-32] for damage. Replace as necessary.

CALIBRATION (CONT'D)

Actuator Testing (Cont'd)

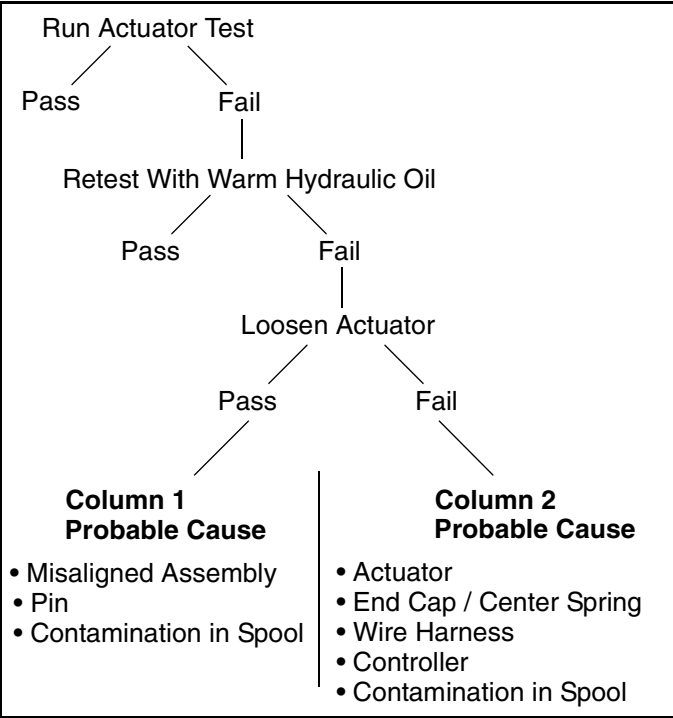
This test will engage both actuators to fully stroke the spools then allow the centering springs to return the spools to neutral. Next, both actuators are engaged to move the spools just past the neutral points then allow the centering springs to return the spools to neutral.

When complete, the Actuator Test will show a pass mode or fail mode. The pass mode indicates that no problems were detected. The fail mode indicates one or a combination of three problems below.

- **Actuator slow return to neutral.** The spool returns to neutral too slowly.
- **Actuator did not fully extend/retract.** During the test, the spool was not able to fully stroke in both directions.
- **Actuator out of neutral.** The spool did not return to the neutral window during the test.

NOTE: A time out will occur if the test cannot be completed within 8 seconds. If this happens, retry the test.

Figure 60-160-2



[Figure 60-160-2] If the initial Actuator Test results in a fail mode due to a **slow return to neutral**, follow the troubleshooting tree to pinpoint the probable cause.

If the Actuator Test fails after the hydraulic oil is warmed, go to the next step and loosen the bolts that mount the actuator to the control valve. Loosen the bolts just enough so the actuator can be moved slightly up / down or side / side.

Rerun the Actuator Test, if the test passes, check the following probable causes in **Column 1 [Figure 60-160-2]**. Check the probable causes in the order they are listed. Repairing one cause may be all that is required. Re-run the test to verify.

NOTE: Actuator and spool misalignment. Re-tighten the two bolts evenly, turn the first bolt one turn, then turn the other bolt one turn until both bolts are tight.

The pin may be too large. Oversized pins exceeding 0.248 in. (6,30 mm) in diameter should be replaced.

If the Actuator Test failed due to a **slow return to neutral** after checking the probable causes in **Column 1 [Figure 60-160-2]**, check the following probable causes in **Column 2 [Figure 60-160-2]**.

- Contamination in the spool.
- The spool end cap may be defective or the centering spring may be broken. Inspect the end cap and the centering spring, replace if necessary.
- The wire harness or connectors may have an intermittent short. Check the connections and wire harnesses.
- The controller may be defective, replace the controller.



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BACK-UP ALARM SYSTEM (CONT'D)

Troubleshooting (Joystick)

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



WARNING

AVOID INJURY OR DEATH

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

W-2003-0807

PROBLEM	CAUSE
Back-up alarm will not sound when the operator moves joystick(s) in the reverse position.	1, 2, 3, 4, 5, 6
Back-up alarm sounds when joystick(s) in neutral / forward position.	5, 6

KEY TO CORRECT THE CAUSE

1. The ground connection is not making a good contact.
2. The alarm is damaged.
3. The alarm wires are disconnected.
4. Check the fuses.
5. The wiring is damaged.
6. The joystick controller is not working correctly.

ENGINE INFORMATION (CONT'D)

Engine Specifications (Cont'd)

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

Cylinder Liner

Cylinder Bore I.D.	3.4252 - 3.4261 (87,000 - 87,022)
Allowable Limit	+0.0059 (+0,15)
Oversized Cylinder Liner (Bore) I.D.	3.4350 - 3.4359 (87,250 - 87,272)
Allowable Limit	+0.0059 (+0,15)

Piston Rings

Ring Gap (Top Ring)	0.0079 - 0.0138 (0,2 - 0,35)
Allowable Limit	0.0492 (1,25)
Ring Gap (2nd Ring)	0.0157 - 0.0217 (0,4 - 0,55)
Allowable Limit	0.0492 (1,25)
Ring Gap (Oil Ring)	0.0098 - 0.0177 (0,25 - 0,45)
Allowable Limit	0.0492 (1,25)
Side Clearance of Ring Groove:	
Second Ring	0.0037 - 0.0050 (0,093 - 0,128)
Allowable Limit	0.20 (0,0079)
Oil Ring	0.0008 - 0.0021 (0,02 - 0,060)
Allowable Limit	0.0059 (0,15)

Pistons

Piston Pin Bore	0.9843 - 0.9848 (25,0 - 25,013)
Allowable Limit	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)

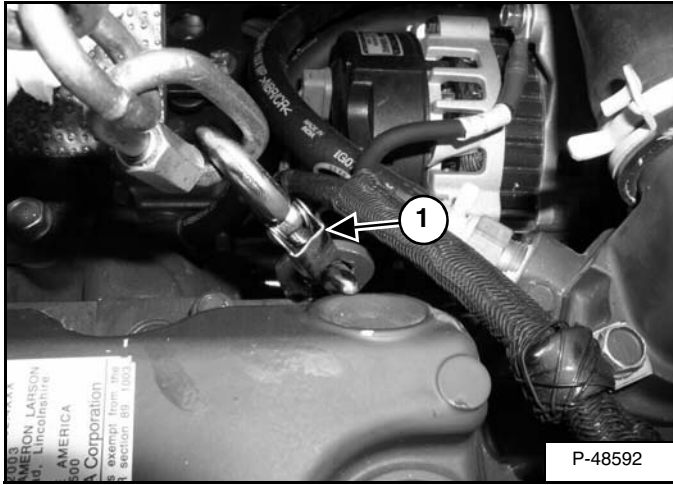
Oil Pump

Oil Pressure @ Rated RPM	43-64 PSI (294-441 kPa)
Allowable Limit	36 PSI (245 kPa)
Idle Speed Allowable Limit	7 PSI (49 kPa)
Clearance Between Inner Rotor & Outer Rotor	0.0012 - 0.0055 (0,03 - 0,14)
Clearance Between 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)

ENGINE INFORMATION (CONT'D)

Removal And Installation (Cont'd)

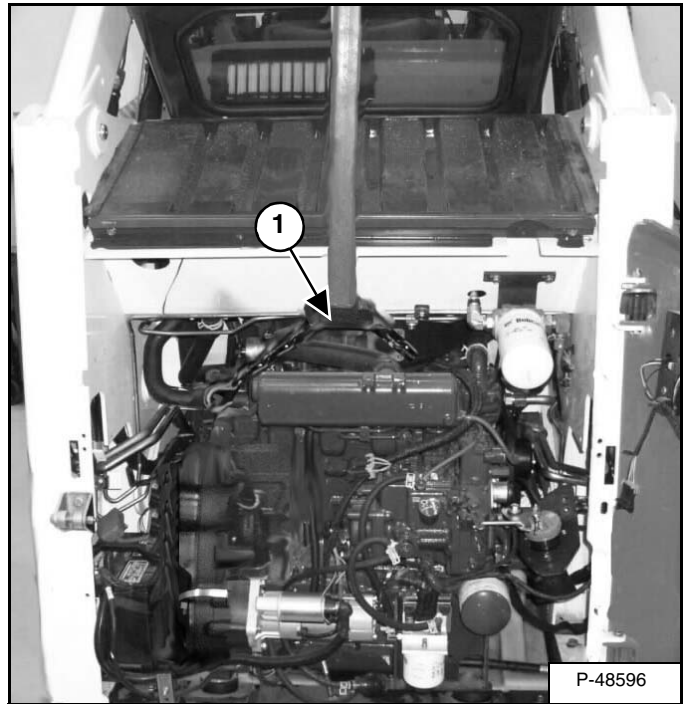
Figure 70-10-23



Fasten securely one end of the chain to the other lifting eye (Item 1) [Figure 70-10-23].

NOTE: You may need to adjust the chain which fastens to the engine a couple of times to reach the correct lifting position.

Figure 70-10-24



Install the chain hoist on the eyelet [Figure 70-10-24] of the removal tool.

Fasten a chain to other end of the removal tool with two bolts as shown in (Item 1) [Figure 70-10-24].

Remove the engine/hydrostatic pump assembly from the loader.

Reverse the removal procedure to install the engine.



ENGINE COOLING SYSTEM (CONT'D)

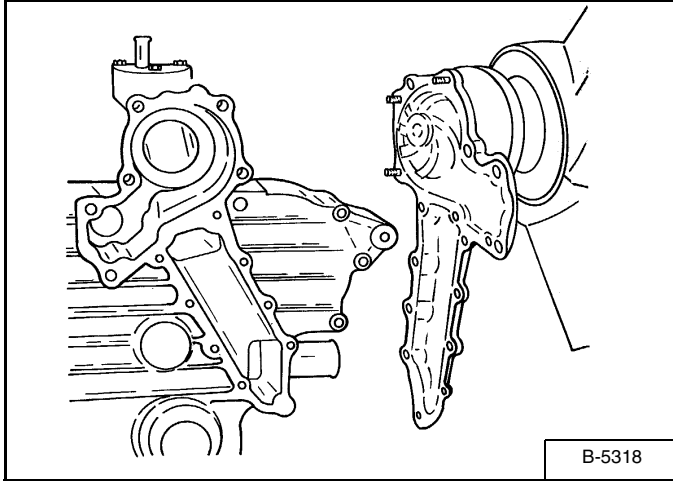
Water Pump Removal And Installation

Drain the cooling system.

Remove the alternator belt.

Remove the water pump bolts.

Figure 70-50-17

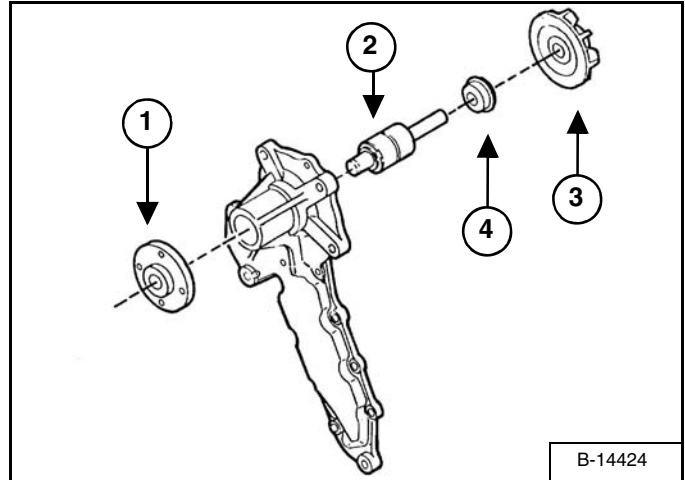


Remove the water pump [Figure 70-50-17].

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

Water Pump Disassembly And Assembly

Figure 70-50-18



Remove the flange (Item 1) [Figure 70-50-18].

Press the shaft (Item 2) and impeller (Item 3) [Figure 70-50-18] out the impeller side of the water pump.

Remove the impeller (Item 3) [Figure 70-50-18] from the shaft.

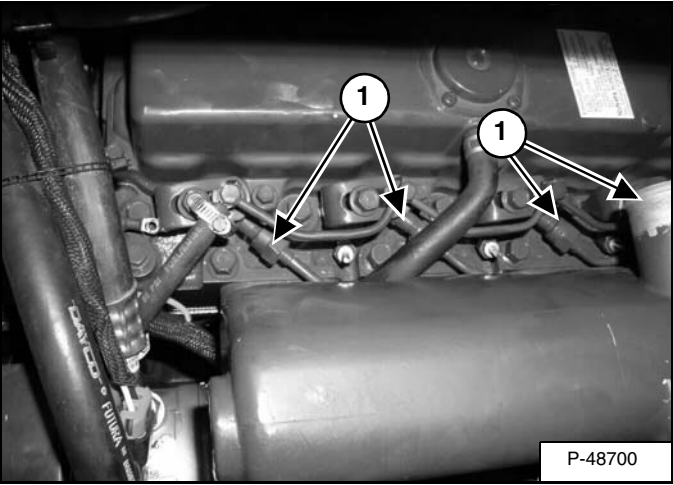
Remove the seal (Item 4) [Figure 70-50-18].

Install a new seal (Item 4) [Figure 70-50-18] when assembling the water pump.

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Removal And Installation

Figure 70-70-8



Clean the area around the injection pump thoroughly.

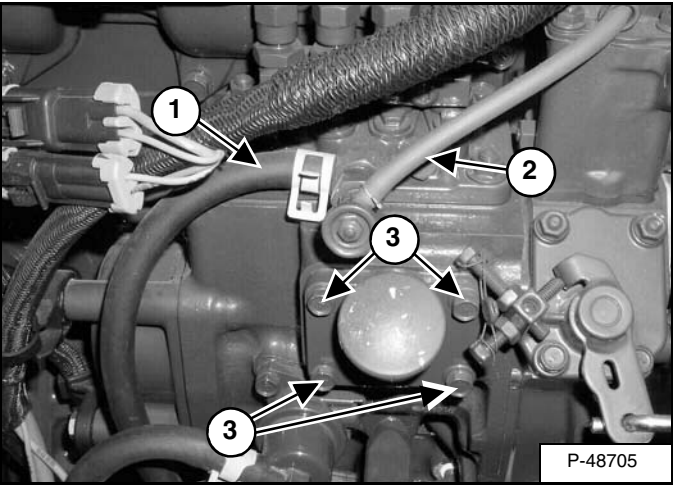
Disconnect the high pressure fuel lines (Item 1) [Figure 70-70-8] from the fuel injectors.

IMPORTANT

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

I-2029-0289

Figure 70-70-9

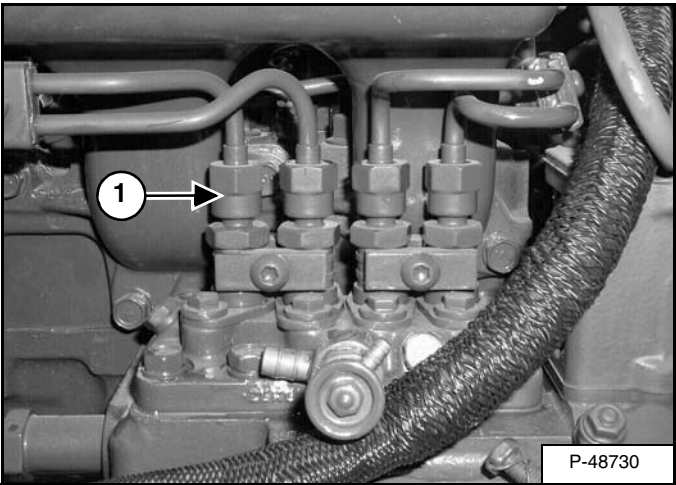


Disconnect the fuel inlet hose (Item 1) and the fuel return hose (Item 2) from the injection pump vent [Figure 70-70-9].

Cap the inlets on the injection pump vent where the hoses were removed [Figure 70-70-9].

Remove the four oil fill tube bolts (Item 3) [Figure 70-70-9].

Figure 70-70-10



Remove the high pressure fuel lines (Item 1) [Figure 70-70-10] from the injection pump.

CYLINDER HEAD (CONT'D)

Glow Plugs Removal And Installation (Cont'd)

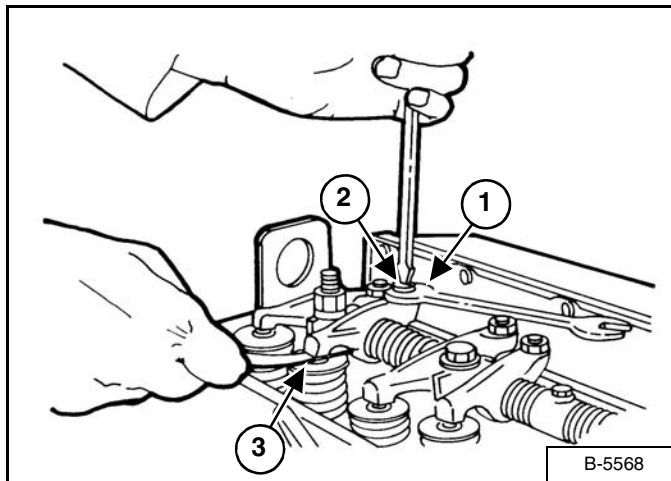
Figure 70-80-5



Photo **[Figure 70-80-5]** shows the glow plug removed from the engine. Inspect the glow plugs and replace when necessary.

Valve Clearance Adjustment

Figure 70-80-6



Adjust the valve clearance as follows:

Loosen the lock nut (Item 1) **[Figure 70-80-6]**.

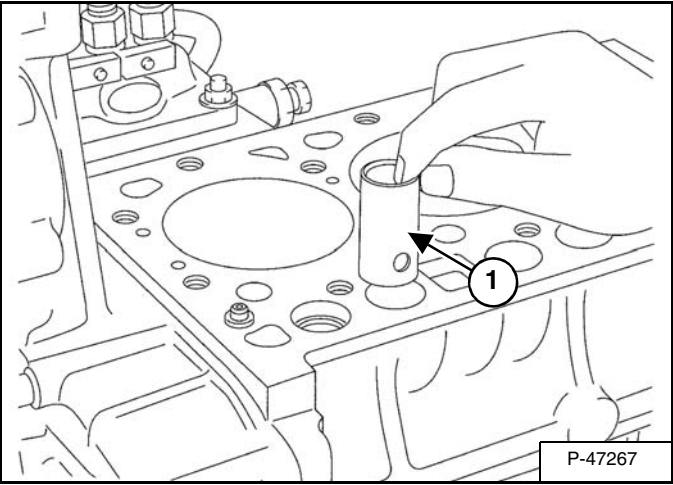
Turn the adjustment screw (Item 2) **[Figure 70-80-6]** until the correct clearance is obtained.

NOTE: The clearance is measured between the rocker arm and valve stem tip (Item 3) **[Figure 70-80-6]**.

CYLINDER HEAD (CONT'D)

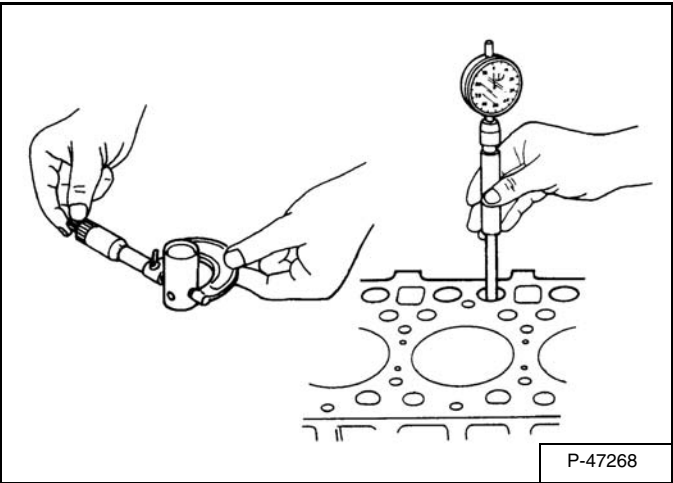
Valve Tappets

Figure 70-80-36



Remove the valve tappets (Item 1) [Figure 70-80-36].

Figure 70-80-37



Measure the O.D. of the tappet [Figure 70-80-37].

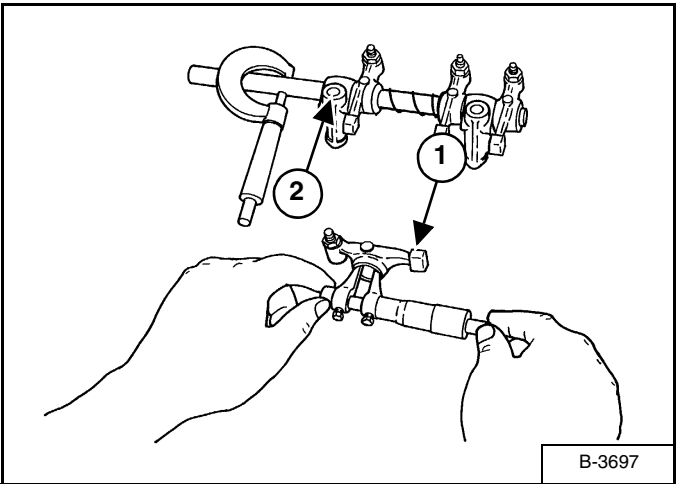
Measure the ID of the tappet bore [Figure 70-80-37].

If the clearance exceeds the allowable limit, replace the tappets.

Tappet OD	0.9433 - 0.9441 in. (23,96 - 23,98mm)
Tappet Bore ID	0.9449 - 0.9457 in. (24 - 24,02 mm)
Clearance Between Tappet and Tappet Bore	0.0008 - 0.0024 in. (0,02 - 0,06 mm)
Allowable limit	0.0028 in. (0,07 mm)

Rocker Arm And Shaft Checking

Figure 70-80-38



Measure the rocker arm I.D. (Item 1) [Figure 70-80-38] with an inside micrometer.

Measure the rocker arm shaft O.D. (Item 2) [Figure 70-80-38] with an outside micrometer.

If the clearance exceeds the allowable limit, replace the bushing.

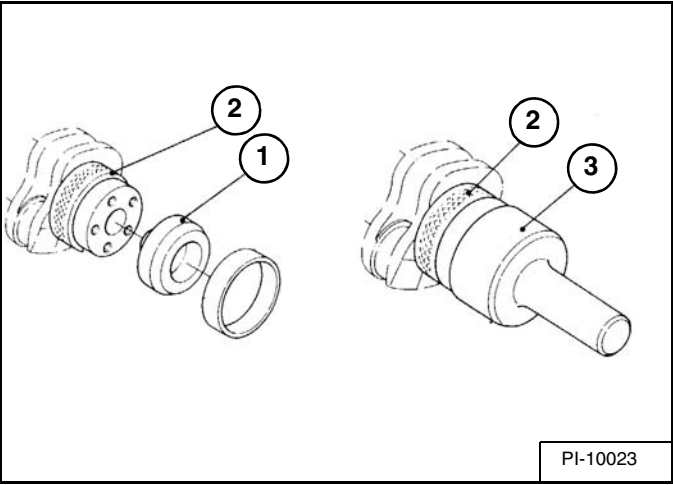
If the clearance still exceeds the allowable limit after the bushing is replace, replace the rocker arm shaft.

Oil Clearance Between Rocker Arm & Shaft	0.0006 - 0.0018 in. (0,016 - 0,045 mm)
Allowable Limit	0.004 in. (0,10 mm)
Rocker Arm Shaft O.D.	0.5501 - 0.5506 in. (13,973 - 13,984 mm)
Rocker Arm I.D.	0.5512 - 0.5519 in. (14,0 - 14,02 mm)

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Figure 70-90-29

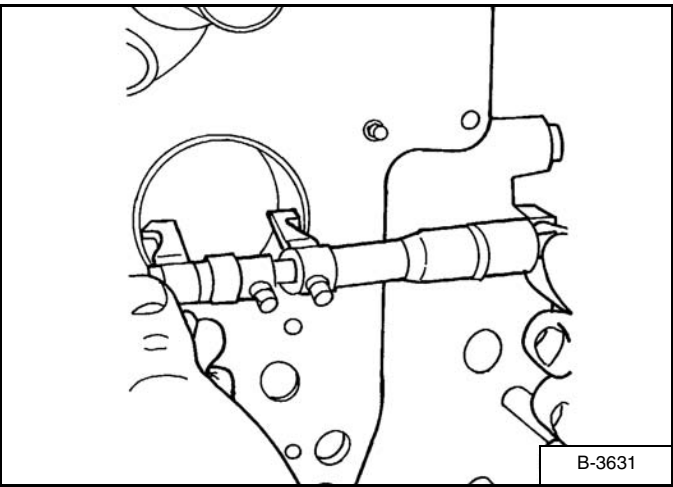


Install the sleeve guide (Item 1) and stop (Item 2) [Figure 70-90-29].

Heat the sleeve to approximately 300° F (150° C). Install the sleeve on the crankshaft using the special driver tool (Item 3) [Figure 70-90-29].

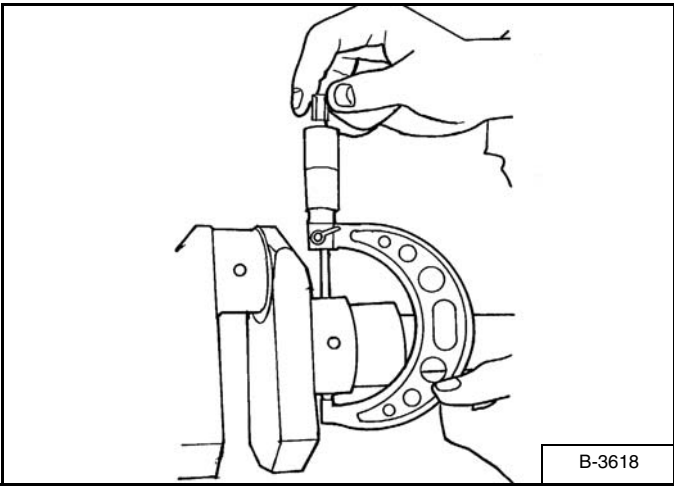
NOTE: The sleeve is installed with the larger chamfered surface to the front of the crankshaft (Item 1) [Figure 70-90-28 on Page 9].

Figure 70-90-30



Measure the I.D. of the No. 1 crankshaft bearing [Figure 70-90-30].

Figure 70-90-31



Measure the O.D. of the crankshaft journal [Figure 70-90-31].

Calculate the oil clearance.

If the clearance exceeds the allowable limit, replace the No. 1 crankshaft bearing.

Bearing 1:

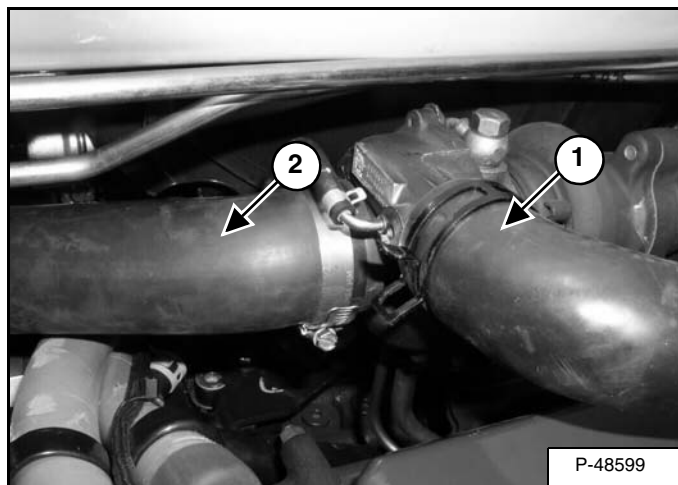
Bearing I.D.	2.3614 - 2.3637 in. (59,98 - 60,04 mm)
Journal O.D.	2.3591 - 2.3598 in. (59,92 - 59,94 mm)
Oil Clearance	0.0016 - 0.0046 in. (0,04 - 0,12 mm)
Allowable Limit	0.0079 in. (0,2 mm)

TURBOCHARGER (CONT'D)

Removal And Installation

Remove the muffler. (See Removal And Installation on Page 70-30-1.)

Figure 70-110-3



Remove the compressor outlet hose (Item 1) [Figure 70-110-3] from the turbo.

Remove the air cleaner hose (Item 2) [Figure 70-110-3] from the turbocharger.

Figure 70-110-4

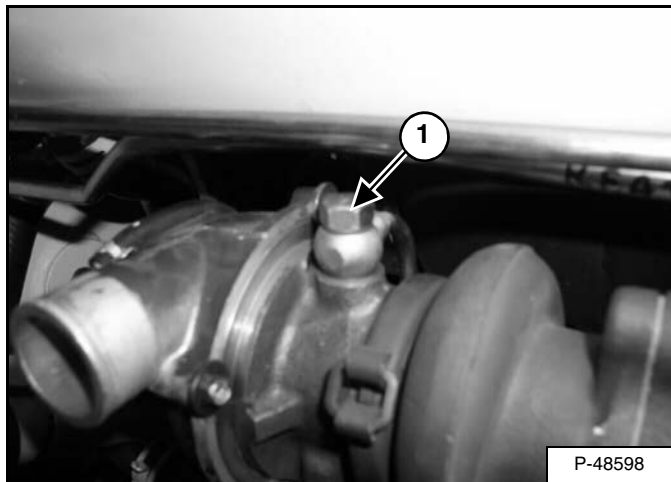
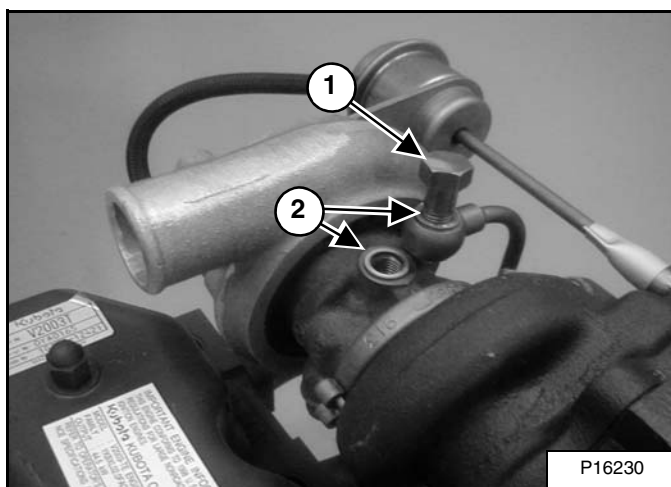


Figure 70-110-5



Remove the oil supply line fitting (Item 1) [Figure 70-110-4] and [Figure 70-110-5] and the brass washer(s) (Item 2) [Figure 70-110-5] from the turbocharger.

Installation: Tighten to 12 - 15 ft.-lb. (16,0 - 20,3 N•m) torque.

AIR CONDITIONING SYSTEM FLOW

Description

In an air conditioning system the refrigerant is circulated under pressure through five major components in a closed circuit. At these five points in the system the refrigerant goes through pressure and temperature changes.

The compressor (Item 1) See Chart on Page 80-10-3. takes in heated, low pressure refrigerant gas through the suction valve (low pressure side) and as the name indicates, pressurizes the heated refrigerant and forces it through the discharge valve (high pressure side) on the condenser (Item 2) See Chart on Page 80-10-3.

Ambient air passing through the condenser removes the heat from refrigerant resulting in physical state change in the refrigerant from a gas to a liquid.

The liquid refrigerant moves on to the receiver/drier (Item 3) See Chart on Page 80-10-3. where impurities such as moisture and dirt are filtered out. The receiver/drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) See Chart on Page 80-10-3.

The expansion valve meters the amount of refrigerant into the evaporator coil (Item 5) See Chart on Page 80-10-3. As the refrigerant passes through the expansion valve, it again changes its physical state. It becomes a low temperature, low-pressure liquid and saturated vapor. The low pressure liquid immediately starts to boil and vaporize as it enters the evaporator. The hot humid air of the machine's cab is drawn through or blown into the evaporator by the evaporator fan (Item 6) See Chart on Page 80-10-3. Since the refrigerant is colder than the air, it absorbs the heat from the air and produces cooled air, which is pushed into the cab by the fan. The moisture in the air condenses on the evaporator coil and drips into the drain pan, which directs the water out of the cab.

The refrigerant cycle is completed when the heated low pressure gas is again drawn into the compressor.

REGULAR MAINTENANCE (CONT'D)

Air conditioning Service Chart

Service Company/Phone Number:

Date:

Machine Model:

Machine Serial Number:

Machine Hours:

Machine Dealer:

Customer:

Pre Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature At Head Position:			
Temperature Into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

Explain Services Required:

Post Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature at Head Position:			
Temperature Into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

TROUBLESHOOTING (CONT'D)

Temperature/Pressure Chart

NORMAL EVAPORATOR RANGE		NORMAL CONDENSER RANGE	
TEMP F	PSIG	TEMP F	PSIG
16	15.69	93	110.20
18	17.04	94	112.10
20	18.43	95	114.10
22	19.87	100	124.30
24	21.35	102	128.50
26	22.88	104	132.90
28	24.47	106	137.30
30	26.10	108	141.90
32	27.79	110	146.50
34	29.52	112	151.30
36	31.32	114	156.10
38	33.17	116	161.10
40	35.07	118	166.10
42	37.03	120	171.30
44	39.05	122	176.60
45	40.09	124	182.00
50	45.48	126	187.50
55	51.27	128	193.10
60	57.47	130	198.90
65	64.10	135	213.70
70	71.19	140	229.40
75	78.75	145	245.80
80	86.80	150	263.00
85	95.40	155	281.10
90	104.40	160	300.10
91	106.30	165	320.10
92	108.20	170	340.80

Evaporator

Pressures represent gas temperatures inside the coil, not the coil surface. For an estimate of the temperature of the air coming off the coil add 8° - 10° F to the temperature on the chart.

Condenser

Temperatures are not ambient temperatures but condensing temperatures. Add 40° F to the ambient temperature to get the condensing temperature and then refer to the pressure chart to see appropriate pressure for ambient temperature.

Example: Ambient

Temperature=90° F

90° F

+40° F

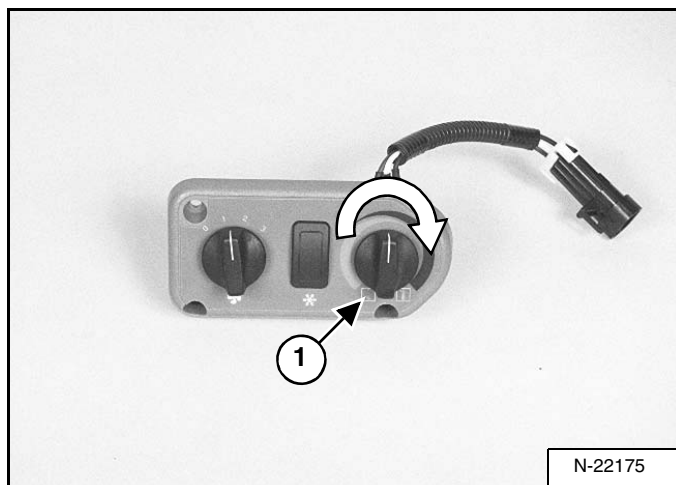
130° F condenser temperature=200 psig

Conditions and pressures will vary from system to system.

TROUBLESHOOTING (CONT'D)

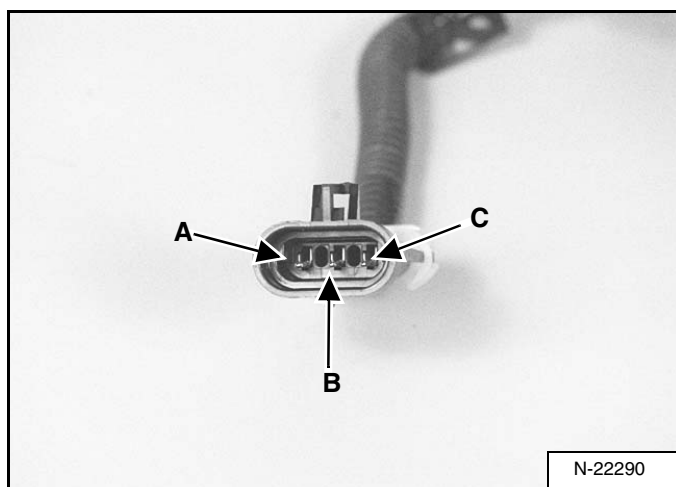
Electrical System (Cont'd)

Figure 80-30-29



To check the resistance of the white wire, turn the potentiometer control (Item 1) [Figure 80-30-29] to the full Heater position.

Figure 80-30-30



Check the resistance between the wire terminal A and wire terminal B frame [Figure 80-30-30] should be approximately 39 K ohm.

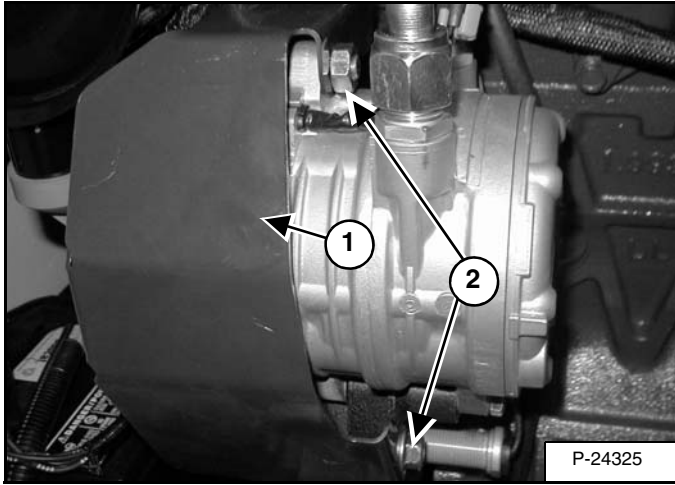
Check the resistance between the wire terminal C and wire terminal B frame [Figure 80-30-30] should be approximately 49 K ohm.

If the resistance is not found, replace the potentiometer.

COMPRESSOR (CONT'D)

Removal And Installation

Figure 80-50-2

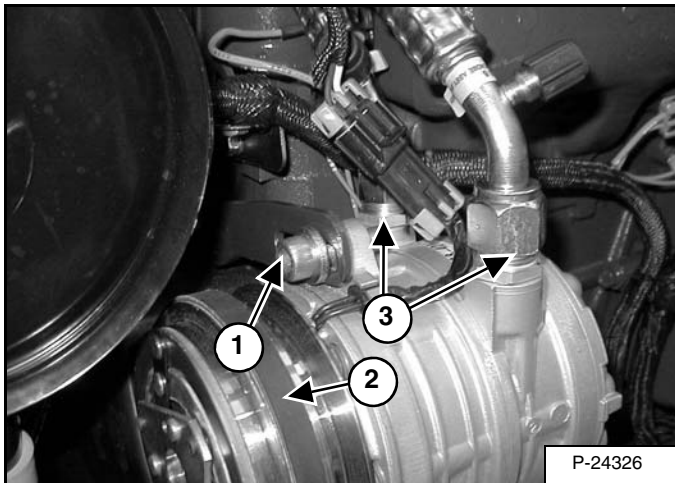


Remove drive belt guard.

Remove A/C belt guard (Item 1), by removing the mounting bolt and nut (Item 2) [Figure 80-50-2].

Evacuate the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

Figure 80-50-3



Remove the compressor adjustment bolt (Item 1) [Figure 80-50-3].

Installation: Tighten the compressor adjustment bolt to 34 ft.-lb. (46 N•m) torque.

Remove the compressor belt (Item 2) [Figure 80-50-3].

Mark the compressor hoses for proper installation.

WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

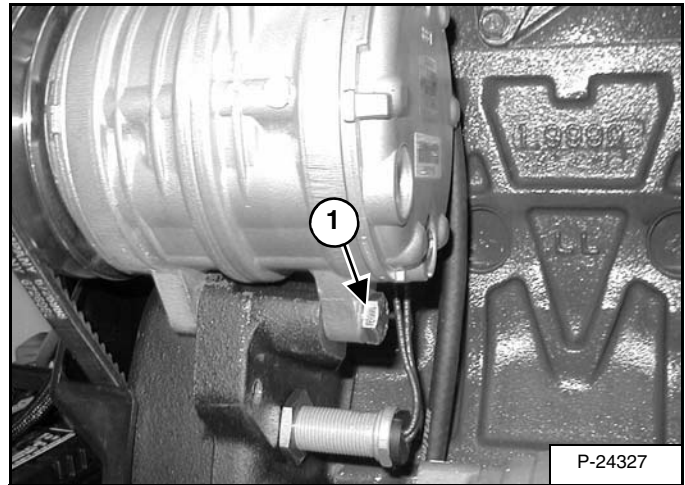
W-2371-0500

Remove the compressor hoses (Item 3) [Figure 80-50-3] from the compressor.

Installation: Tighten the compressor hoses to 22 ft.-lb. (29,8 N•m) torque.

Cap and plug the compressor hoses and the fittings with with the proper A/C caps and plugs.

Figure 80-50-4



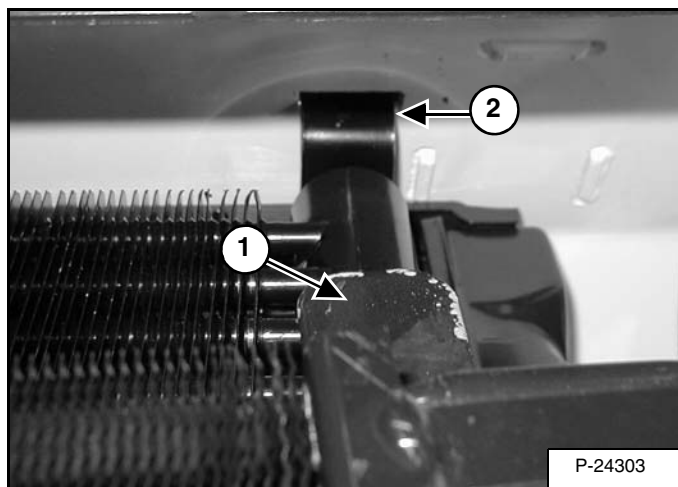
Remove the compressor mount bolt (Item 1) [Figure 80-50-4].

Remove the compressor from the loader.

CONDENSER (CONT'D)

Removal And Installation (Cont'd)

Figure 80-60-4

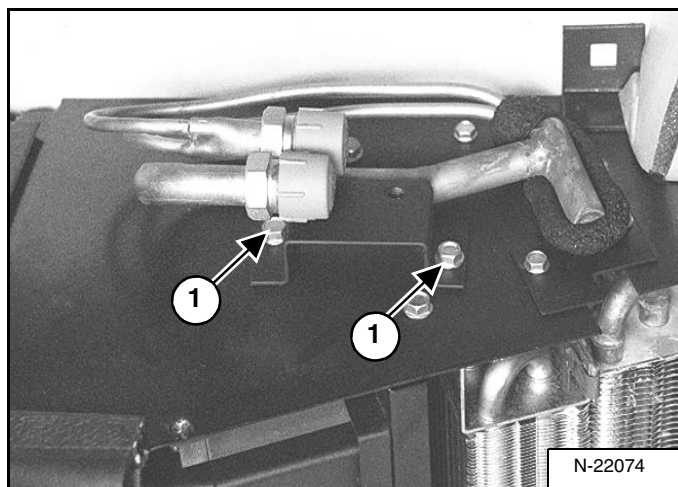


Installation: Make sure to insert tabs (Item 1), into the mounts (Item 2) **[Figure 80-60-4]**, evenly for ease of installation.

EXPANSION VALVE (CONT'D)

Removal And Installation (Cont'd)

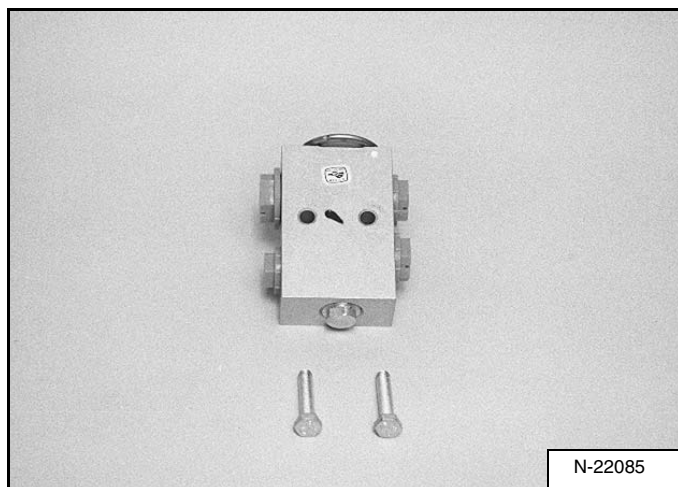
Figure 80-100-4



Remove the two mount bolts (Item 1) [Figure 80-100-4] from the expansion valve mount.

Remove the expansion valve mount from the unit.

Figure 80-100-5

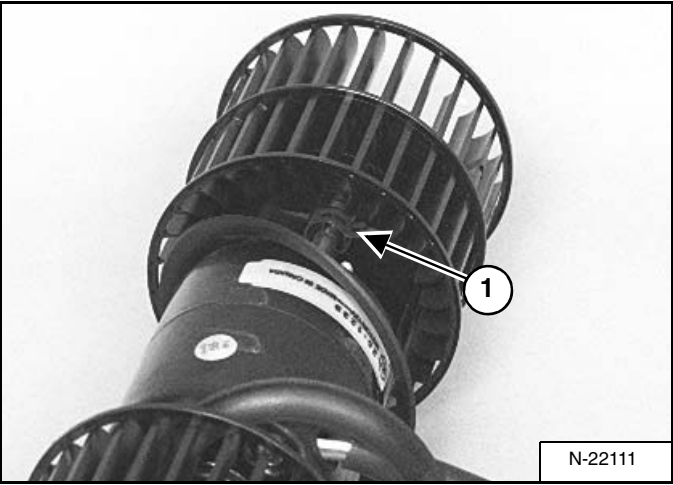


The expansion valve [Figure 80-100-5] is replaced as a complete unit.

BLOWER FAN (CONT'D)

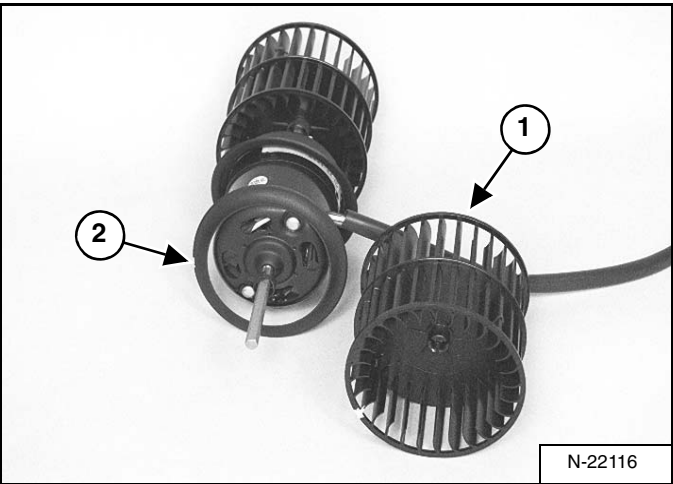
Disassembly And Assembly (Cont'd)

Figure 80-130-13



Remove the inside blower wheel clamp (Item 1) [Figure 80-130-13] from the blower wheel.

Figure 80-130-14

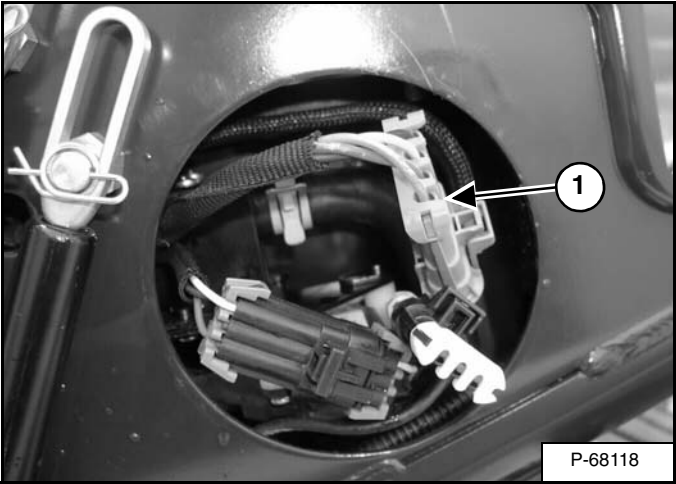


Remove the blower wheel (Item 1) and inside ring (Item 2) [Figure 80-130-14] from the blower motor shaft.

Repeat the procedure for the other blower wheel.

Connector Identification

Figure 80-130-15



The wiring code for the blower fan connector (Item 1) [Figure 80-130-15] is:

Number on Connector	Wire Color
A	Orange
B	Red
C	Yellow
D	Black

TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For General Metric Bolts

THREAD SIZE (DIA. X PITCH)	MATERIAL		
	HEAD MARK 4	HEAD MARK 7	HEAD MARK 10
M 5 x 0.8		3 - 4 ft.-lb. (4 - 5 N•m)	
M 6 x 1.0		6 - 7 ft.-lb. (8 - 9 N•m)	6 - 9 ft.-lb. (8 - 12 N•m)
M 8 x 1.25	6 - 9 ft.-lb. (8 - 12 N•m)	11 - 16 ft.-lb. (15 - 22 N•m)	18 - 25 ft.-lb. (24 - 34 N•m)
M 10 x 1.25	13 - 18 ft.-lb. (18 - 24 N•m)	22 - 30 ft.-lb. (30 - 41 N•m)	36 - 50 ft.-lb. (49 - 68 N•m)
M 12 x 1.25	22 - 30 ft.-lb. (30 - 41 N•m)	40 - 54 ft.-lb. (54 - 73 N•m)	69 - 87 ft.-lb. (94 - 118 N•m)
M 14 x 1.25	36 - 50 ft.-lb. (49 - 68 N•m)	58 - 80 ft.-lb. (79 - 108 N•m)	116 - 137 ft.-lb. (157 - 186 N•m)



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