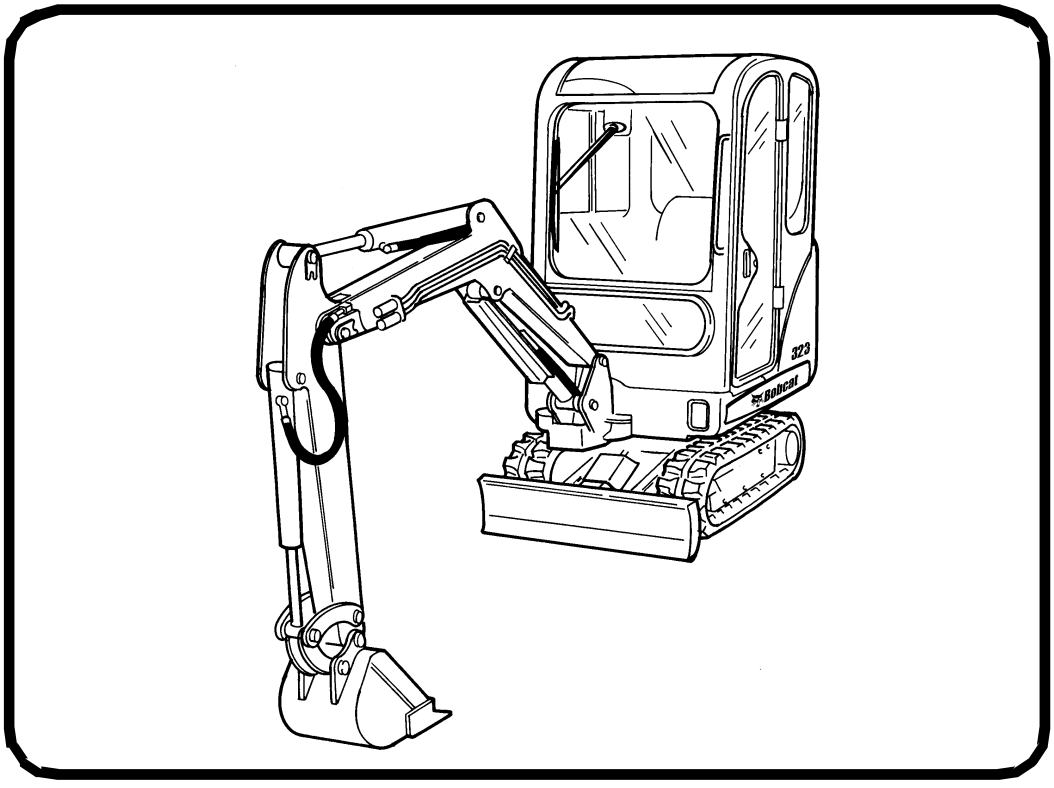
Bobcat®

Service Manual
323 Excavator

S/N 562411001 Above



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LIFTING AND BLOCKING THE EXCAVATOR

Procedure

Always park the machine on a level surface.

Figure 10-10-1

Raise one side of the machine (approximately 101,6 mm [4 in]) using the boom and arm as shown in **[Figure 10-10-1]**.

Raise the blade fully and install jackstands under the blade and the track frame. Lower the machine until all machine weight is on the jackstands.

Stop the engine.

⚠ WARNING

Put jackstands under the blade and rear corners of the undercarriage before working under the machine. Failure to block up the machine may allow it to move or fall and result in injury or death.

W-2218-1195

⚠ WARNING

AVOID INJURY

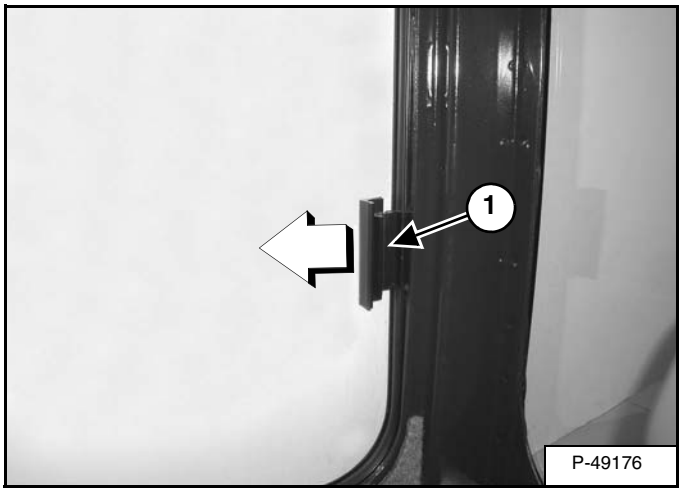
Keep fingers and hands out of pinch points when checking the track tension.

W-2142-0903

Right Side Windows

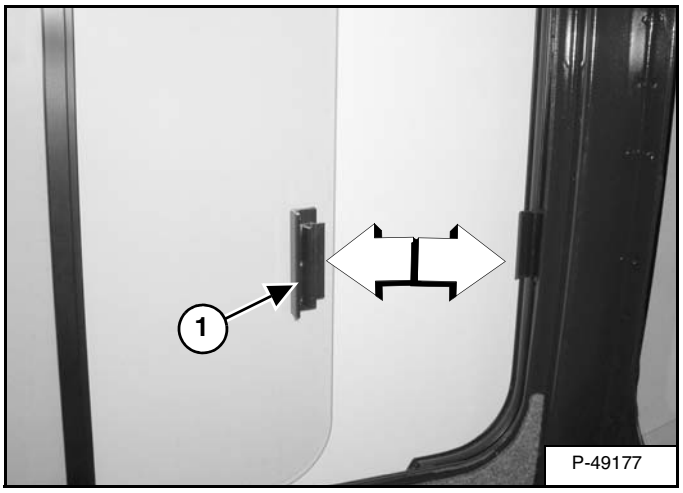
Opening The Right Rear Window

Figure 10-40-13



Pull forward on the latch (Item 1) **[Figure 10-40-13]**.

Figure 10-40-14

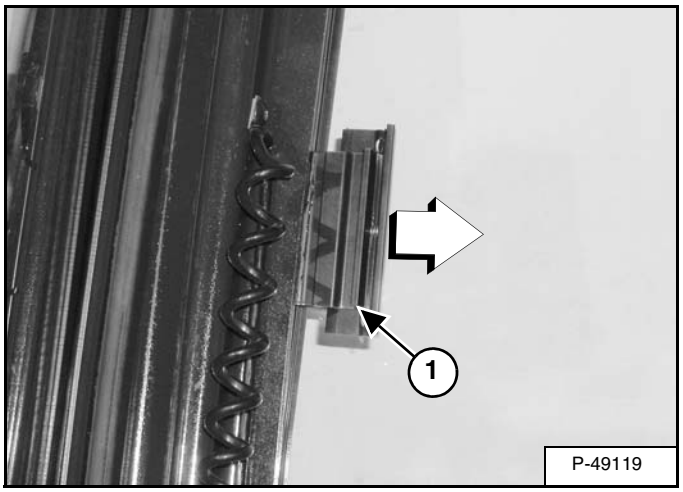


Pull the latch / handle (Item 1) **[Figure 10-40-14]** forward to open the window.

Push the handle back to close the window.

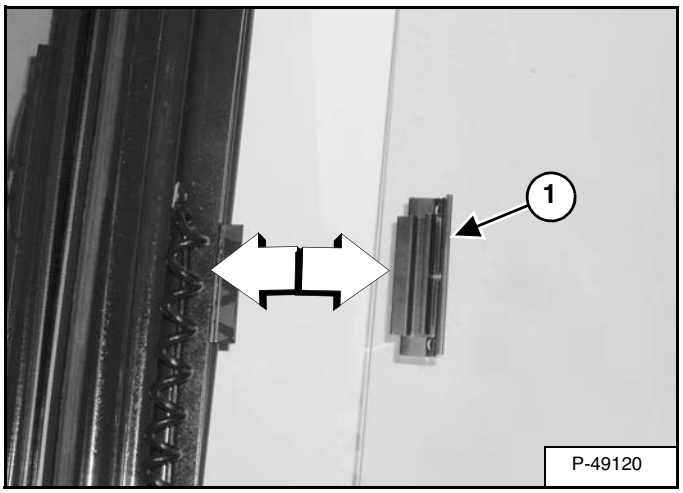
Opening The Right Front Window

Figure 10-40-15



Pull back on the latch (Item 1) **[Figure 10-40-15]**.

Figure 10-40-16



Pull the latch / handle (Item 1) **[Figure 10-40-16]** back to open the window.

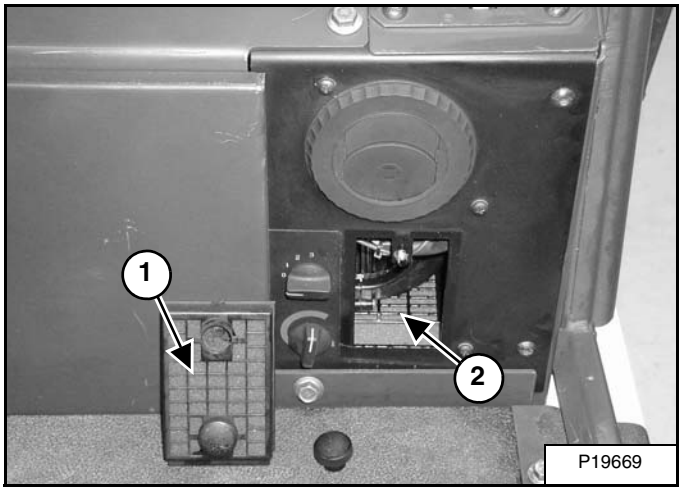
Push the handle forward to close the window.

HEATER AIR FILTERS

Recirculation Filter

The recirculation filter must be cleaned regularly. The filter is located at the left of the operator seat.

Figure 10-81-1



The recirculation filter is located on the front of the heater panel (Item 1) **[Figure 10-81-1]**.

Remove the knobs and remove the filter. Wash the filter with a mild detergent and water. Dry the filter before installing. Install the filter and tighten knobs.

Fresh Air Filter

The fresh air filter must be cleaned regularly.

The fresh air filter is located on the bottom of the heater, (Item 2) **[Figure 10-81-1]**.

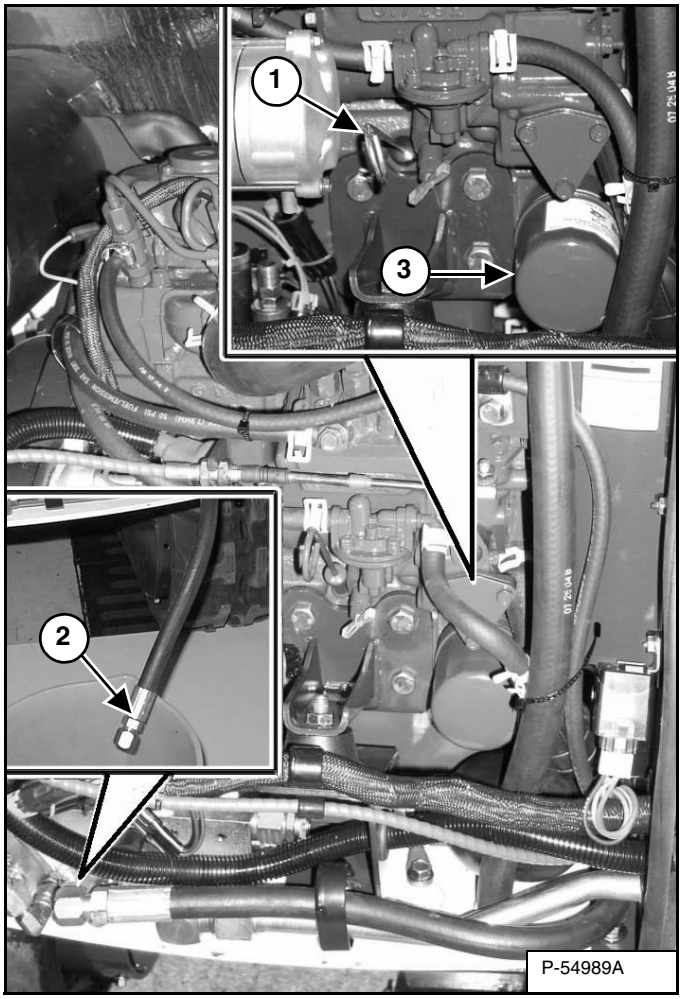
Remove the filter. Wash the filter with a mild detergent and water. Dry the filter before installing. Install the filter and secure.

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Check the engine oil every day before starting the engine for the work shift.

Figure 10-110-1



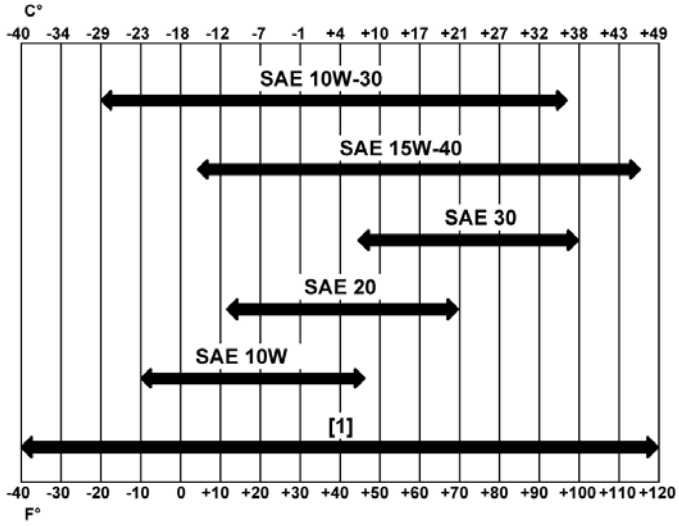
Open the rear door and remove the dipstick (Item 1) **[Figure 10-110-1]**.

Keep the oil level between the marks on the dipstick.

Oil Chart

Figure 10-110-2

ENGINE OIL
RECOMMENDED SAE VISCOSITY NUMBER
(LUBRICATION OILS FOR DIESEL ENGINE CRANKCASE)



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CI-4 OR BETTER)

[1] Synthetic Oil - Use recommendation from Synthetic Oil Manufacturer.

Use good quality engine oil that meets API Service Classification of CI-4 or better **[Figure 10-110-2]**.

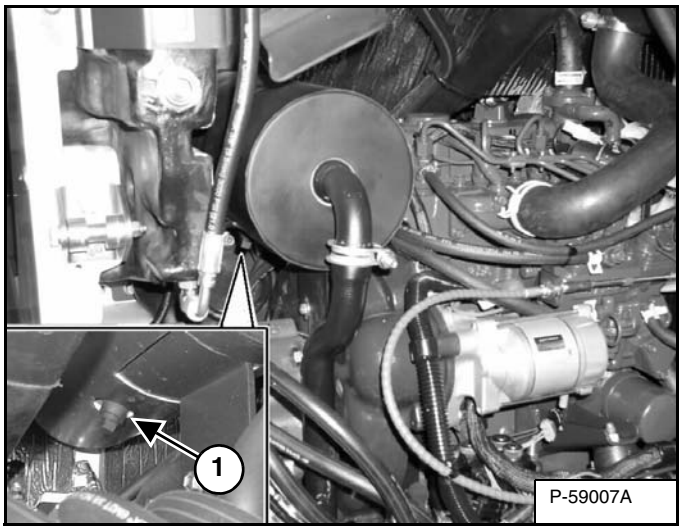
SPARK ARRESTER MUFFLER

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

Do not operate the excavator with a defective exhaust system.

Stop the engine. Open the tailgate.

Figure 10-150-1



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

Start the engine and run for about ten seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler. (The carbon deposits will be forced out of the muffler cleanout hole.)

Stop the engine. Install and tighten the plug.

Close the tailgate.

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

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

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

WARNING

When the engine is running during service, the steering levers must be in neutral.

Failure to do so can cause injury or death.

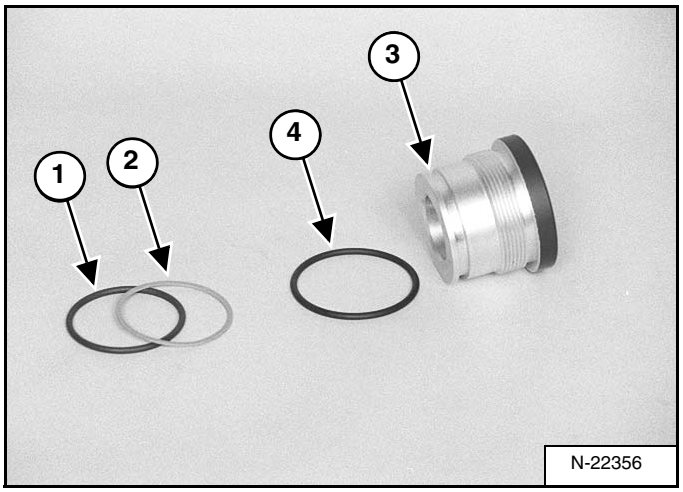
W-2203-0595

Troubleshooting The Travel Circuit

TROUBLESHOOTING THE TRAVEL CIRCUIT		
PROBLEM	**CAUSE**	**CORRECTION**
Travel system inoperable.	Lever linkage incorrectly adjusted.	Readjust.
	Track tension too tight.	Readjust.
	Defective pump.	Check, repair or replace.
	Travel motor counterbalance spool sticking.	Repair or replace.
	Travel motor internal leakage excessive.	Repair or replace.
	Travel motor defective.	Repair or replace.
	Travel motor gears defective.	Repair or replace.
	Swivel joint defective.	Repair or replace.
	Main relief valve pressure too low.	Readjust or replace.
Travel power.	Track tension too tight.	Readjust.
	Main relief valve pressure too low.	Readjust or replace.
	Travel motor counterbalance spool sticking.	Repair or replace.
Speed too slow.	Lever linkage incorrectly adjusted.	Readjust.
	Swivel joint internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Low pump pressure.	Check, repair or replace.
	Travel motor internal leakage excessive.	Repair or replace.
Machine not running straight.	Lever linkage incorrectly adjusted.	Readjust.
	Track tension not equal.	Readjust.
	Pump output not equal.	Repair or replace.
	Travel motor internal leakage not equal.	Repair or replace.
	Travel motor counterbalance spool sticking.	Repair or replace.
	Main relief valve pressure set too low.	Repair or replace.
	Swivel joint internal leakage excessive.	Repair or replace.
	Control valve internal leakage not equal.	Repair or replace.
Machine will not hold on slope or while digging.	Travel motor counterbalance valve leakage excessive.	Repair or replace.
	Hose damage.	Replace.
Blade drops while machine is moving.	Lever linkage misadjusted.	Readjust.
	Cylinder internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Swivel joint internal leakage from travel motor pressure circuit into blade cylinder circuit.	Repair or replace.

Disassembly (Cont'd)

Figure 20-20-22

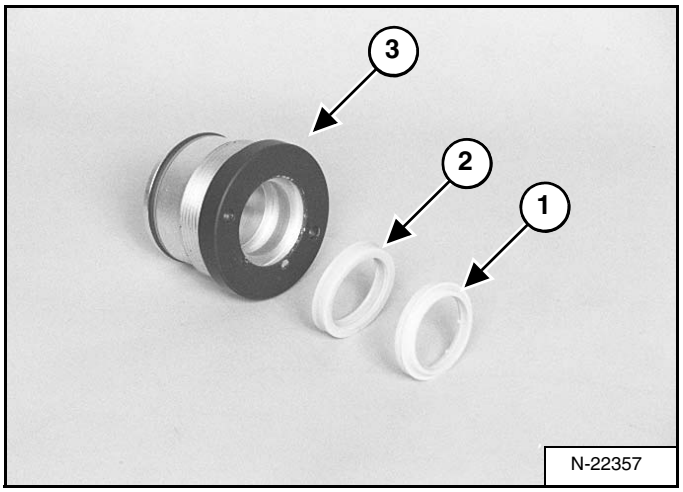


Remove the O-ring (Item 1) and the back-up ring (Item 2) from the groove in the head (Item 3) **[Figure 20-20-22]**.

Remove the O-ring (Item 4) **[Figure 20-20-22]**.

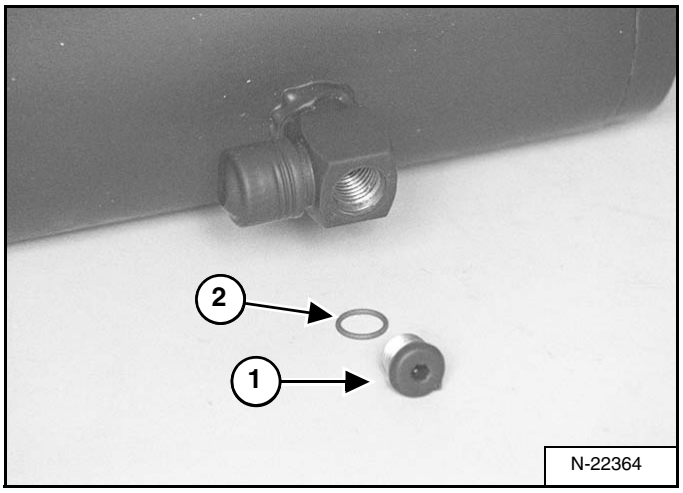
NOTE: The O-ring (Item 1) and back-up ring (Item 2) [Figure 20-20-22] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

Figure 20-20-23



Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-20-23]**.

Figure 20-20-24



Remove plug (Item 1) and O-ring (Item 2) **[Figure 20-20-24]**.

Assembly

Use the following tools to assemble the cylinder:

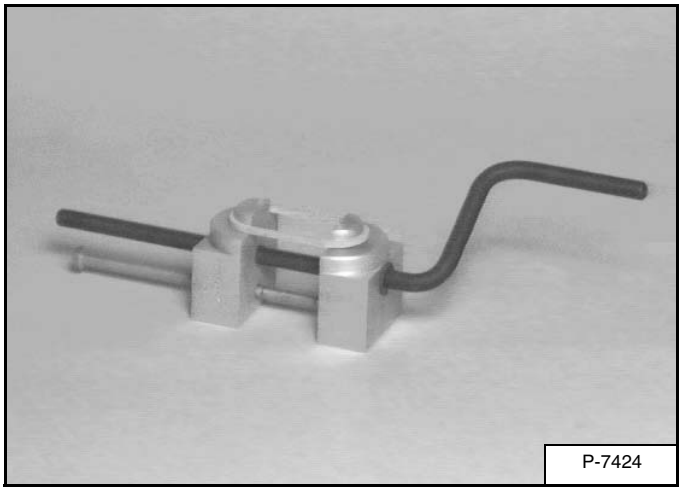
MEL1396 - Universal Seal Expander
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-2 - Special Offset Pins

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

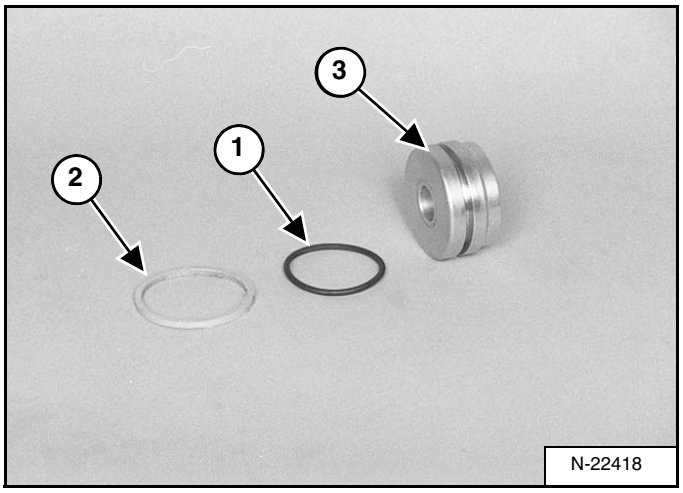
Figure 20-21-14



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-21-14]**.

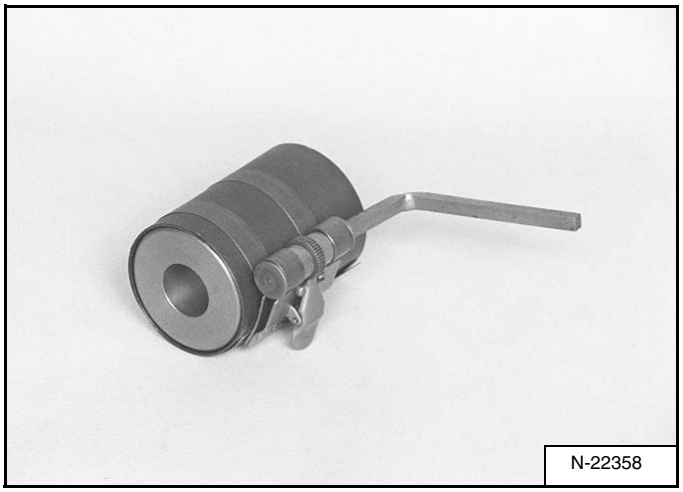
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-21-15



Standard Piston: Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-21-15]**.

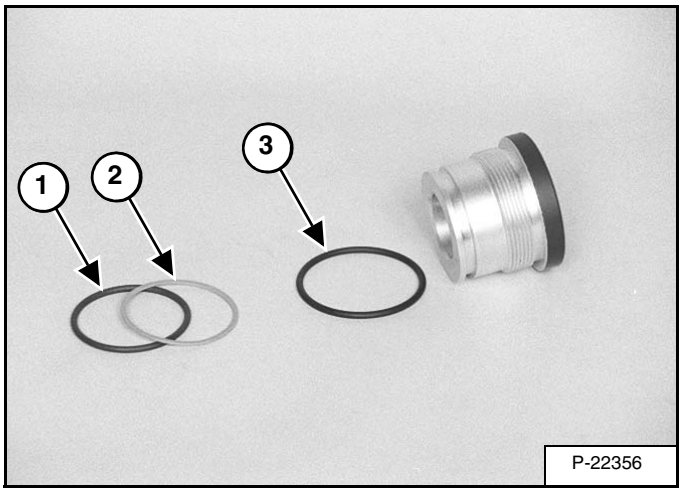
Figure 20-21-16



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-21-16]**.

Disassembly (Cont'd)

Figure 20-22-17

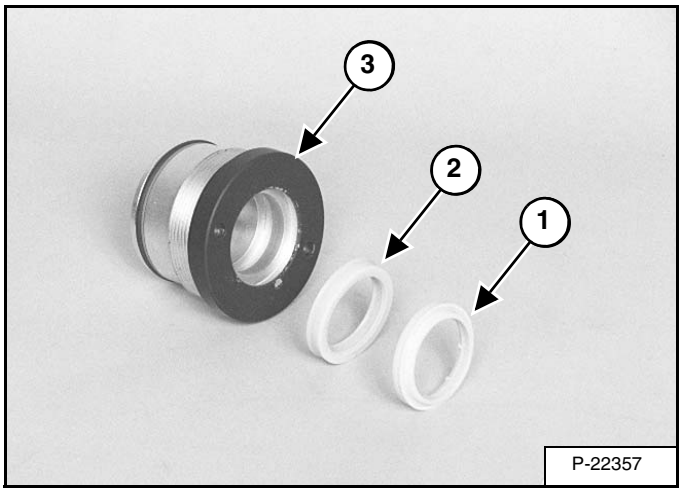


Remove the O-ring (Item 1) and the back-up ring (Item 2) **[Figure 20-22-17]**.

Remove the O-ring (Item 3) **[Figure 20-22-17]**.

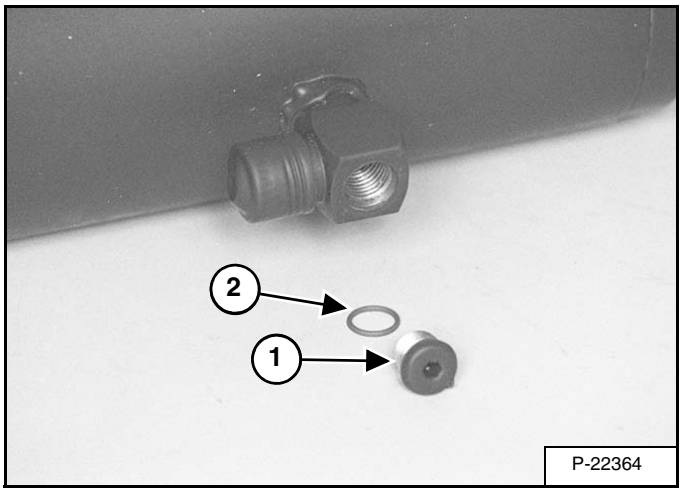
NOTE: The O-ring (Item 1) and back-up ring (Item 2) [Figure 20-22-17] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

Figure 20-22-18



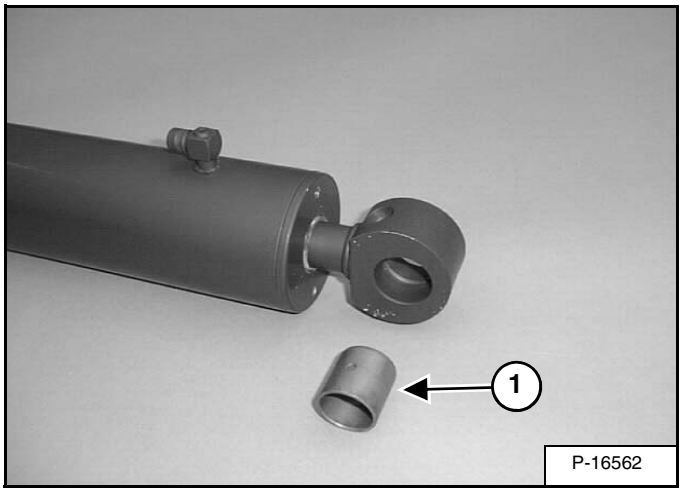
Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-22-18]**.

Figure 20-22-19



Remove plug (Item 1) and O-ring (Item 2) **[Figure 20-22-19]**.

Figure 20-22-20



Remove the bushing (Item 1) **[Figure 20-22-20]**.

Assembly

Use the following tools to assemble the cylinder:

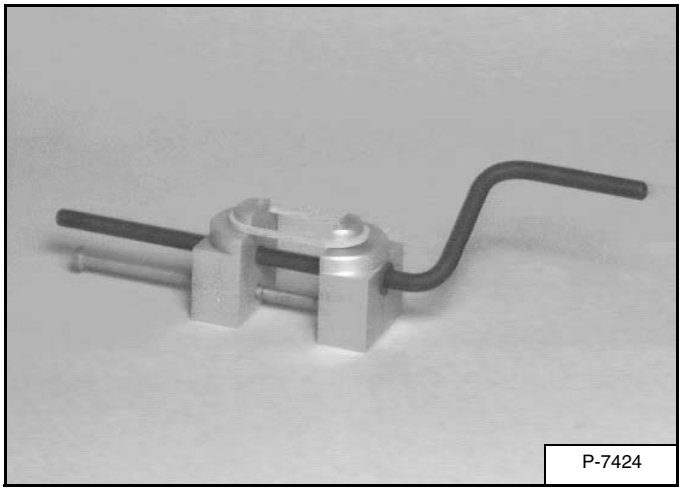
MEL1396 - Universal Seal Expander
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-2 - Special Offset Pins

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

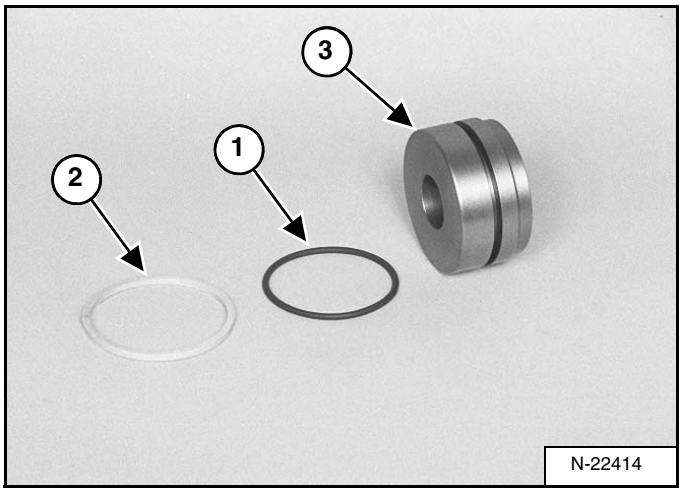
Figure 20-23-15



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-23-15]**.

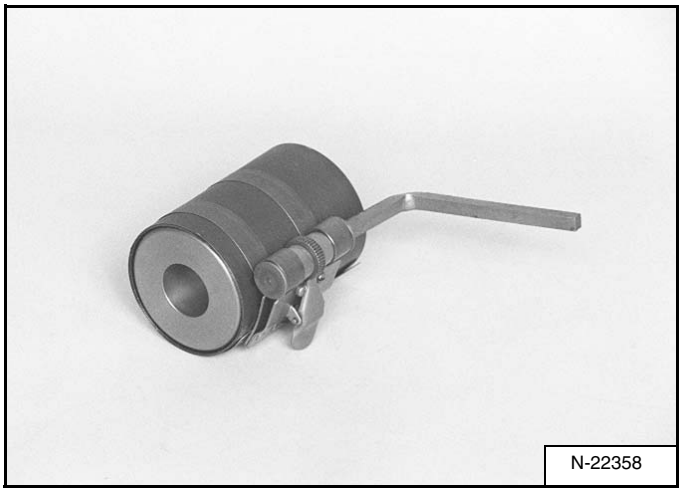
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-23-16



Standard Piston: Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-23-16]**.

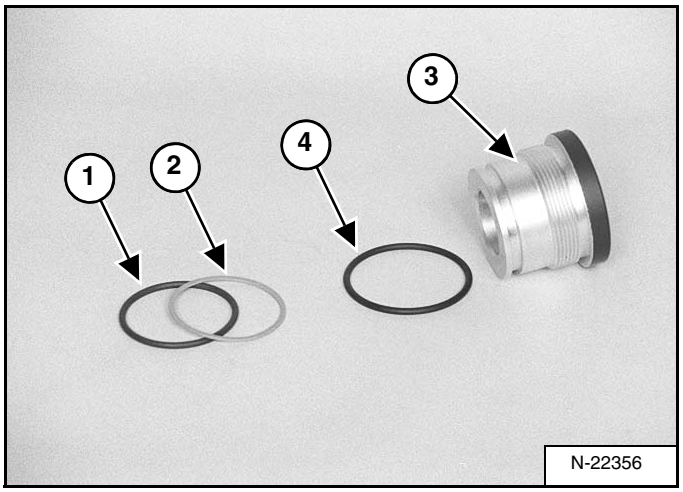
Figure 20-23-17



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-23-17]**.

Disassembly (Cont'd)

Figure 20-24-13

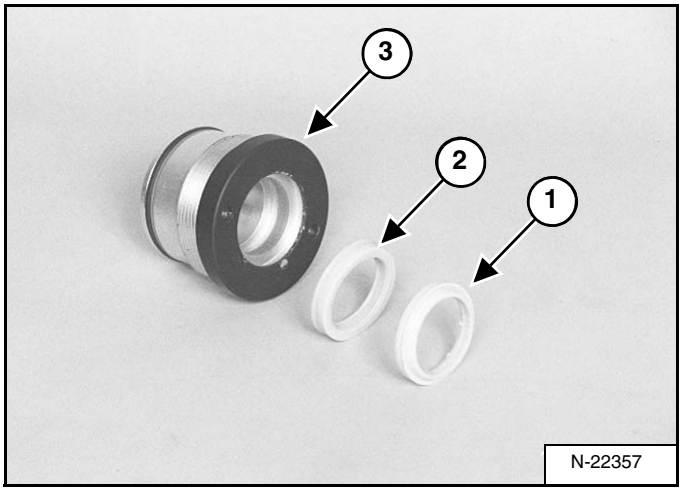


Remove the O-ring (Item 1) and the back-up ring (Item 2) from the groove in the head (Item 3) **[Figure 20-24-13]**.

Remove the O-ring (Item 4) **[Figure 20-24-13]**.

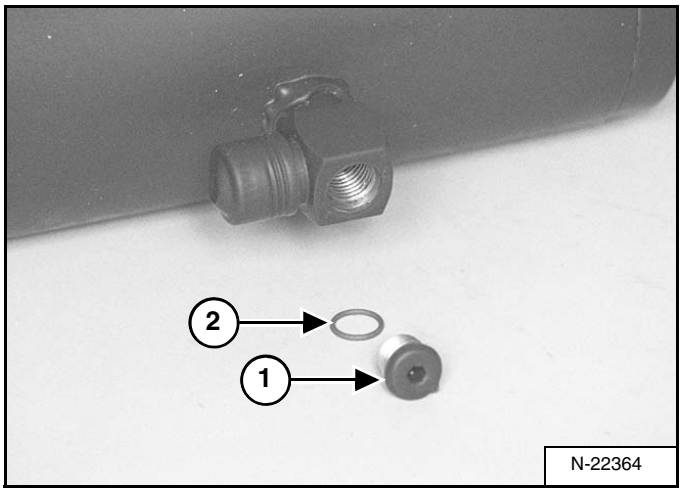
NOTE: The O-ring (Item 1) and back-up ring (Item 2) [Figure 20-24-13] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

Figure 20-24-14



Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-24-14]**.

Figure 20-24-15



Remove plug (Item 1) and O-ring (Item 2) **[Figure 20-24-15]**.

CYLINDER (TRACK FRAME EXPANSION) (CONT'D)

Disassembly

Clean the outside of the expansion cylinder before disassembly.

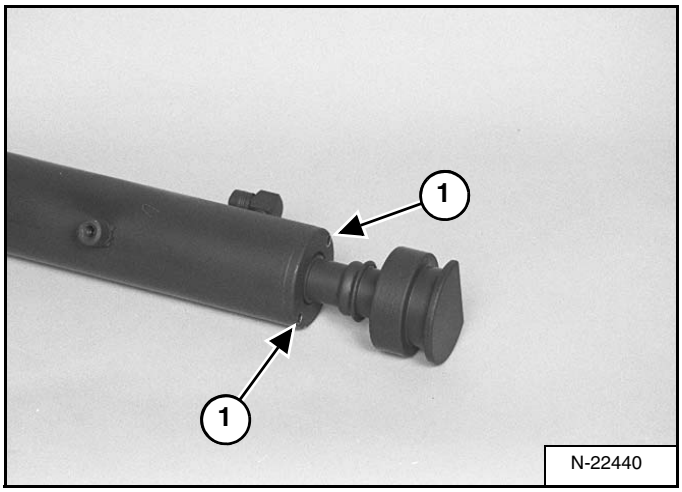
Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-1 - Standard Pins

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

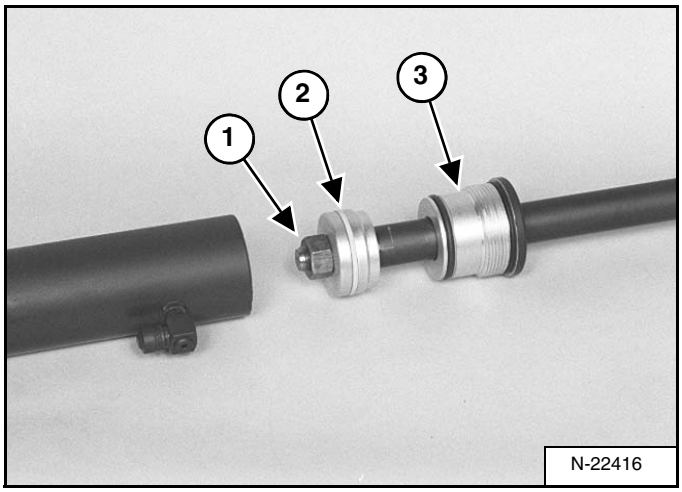
Put the base end of the cylinder in a vise.

Figure 20-25-20



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-25-20]** to loosen the head.

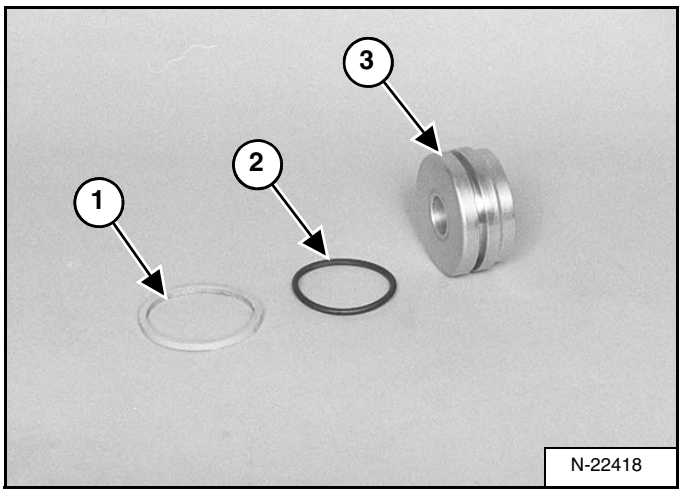
Figure 20-25-21



Remove the head and the rod assembly from the cylinder **[Figure 20-25-21]**. Put the rod end in a vise.

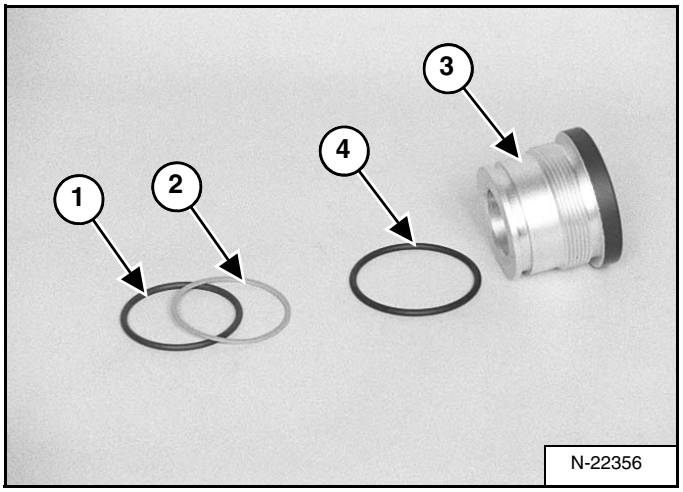
Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-25-21]**.

Figure 20-25-22



Standard Piston: Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-25-22]**.

Figure 20-25-23



Remove the O-ring (Item 1) and the back-up ring (Item 2) from the groove in the head (Item 3) **[Figure 20-25-23]**.

Remove the thin O-ring (Item 4) **[Figure 20-25-23]**.

NOTE: The O-ring (Item 1) and back-up ring (Item 2) [Figure 20-25-23] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

VALVES (CROSSPORT RELIEF)

Testing And Adjusting The Crossport Relief Valve

The hydraulic system has two crossport relief valves that protect the swing motor from high pressure.

The following tools will be needed for the testing at the diagnostic coupler:

MEL1355 - Test Kit includes the following:
MEL1355-3 - 34474 kPa (345 bar) (5000 psi) Gauge
MEL1355-12 - Coupler
MEL1355-9 - Thermometer

System Pressures At Gauge Port Specifications

TEST CONDITIONS

1. Engine High Idle Speed

2. Warm oil over relief function to minimum 66°C (150°F). Cycle all functions during warm up procedure.
   Warm oil until the pressure build-up valve stabilizes near its target pressure.

3. Activate function until cylinder movement stops. Hold over relief for 5 - 10 seconds.
   Record pressure.

Open the tailgate.

Figure 20-32-1

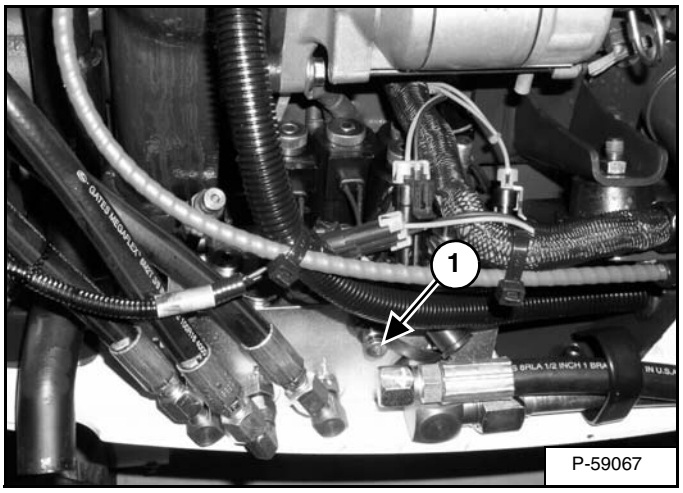
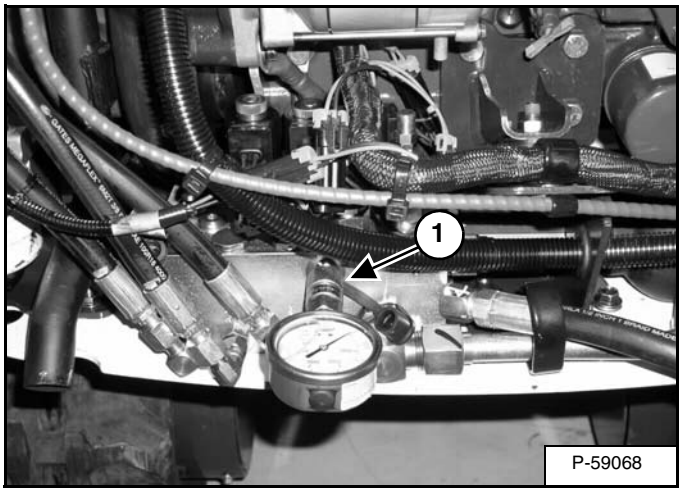


Figure 20-32-2



Connect the test gauge coupler from the test kit to the “G” diagnostic port (Item 1) **[Figure 20-32-1]** and **[Figure 20-32-2]**.

Lower the control console and fasten the seat belt.

Disassembly

Clean the outside of the hydraulic control valve before disassembly.

IMPORTANT

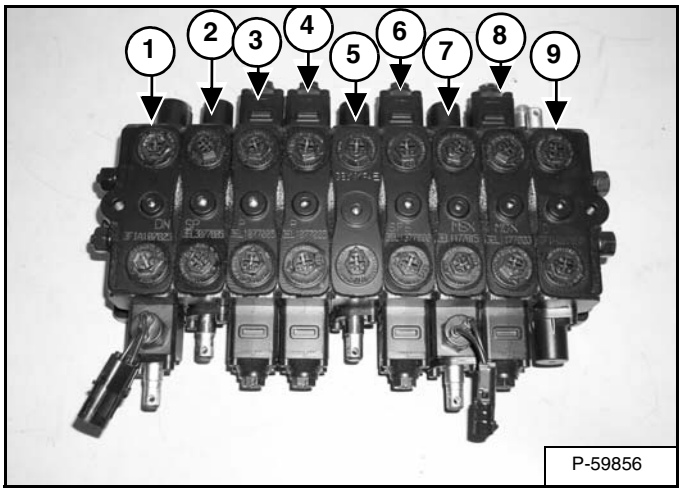
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 20-40-12

Remove the hoses and fittings **[Figure 20-40-12]**.

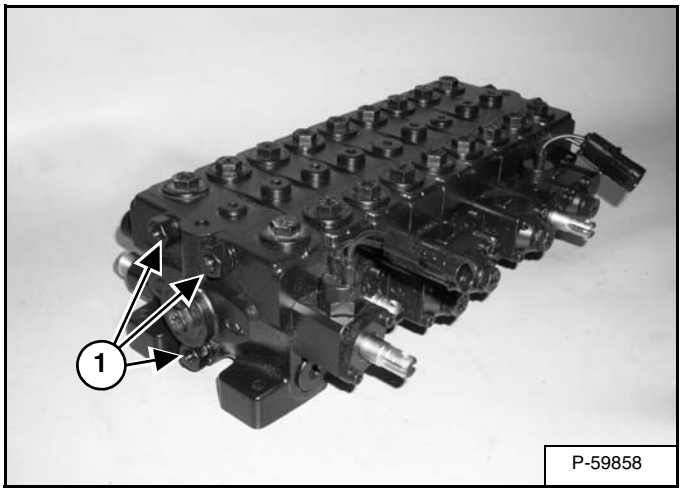
Figure 20-40-13



Mark the valve sections for ease of assembly **[Figure 20-40-13]**.

1. Right Travel Valve
2. Boom Swing Valve
3. Arm Valve
4. Bucket Valve
5. Auxiliary Valve
6. Boom Valve
7. Left Travel Valve
8. Swing Valve
9. Blade Valve

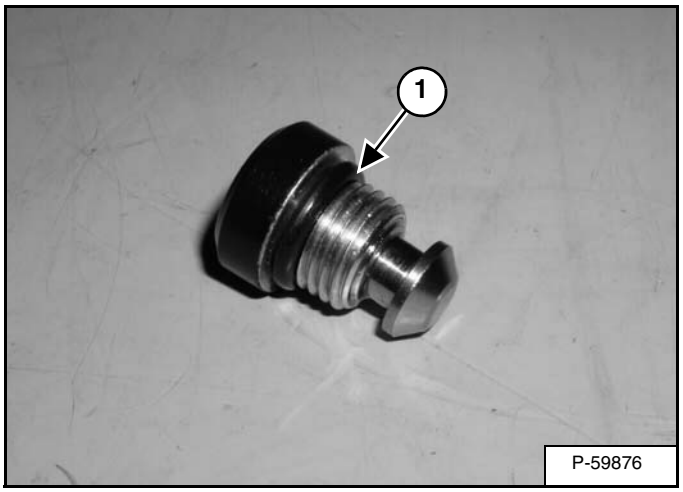
Figure 20-40-14



Remove the tie rod nuts and lock washers (Item 1) **[Figure 20-40-14]**.

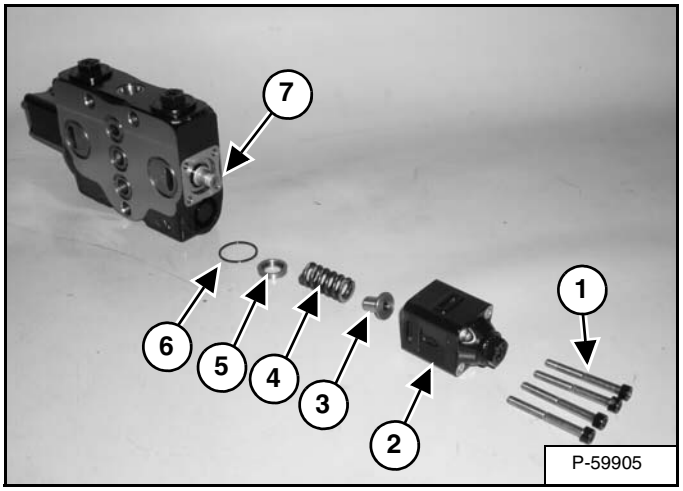
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-45



Remove the O-ring (Item 1) **[Figure 20-40-45]** from the load check valve.

Figure 20-40-46

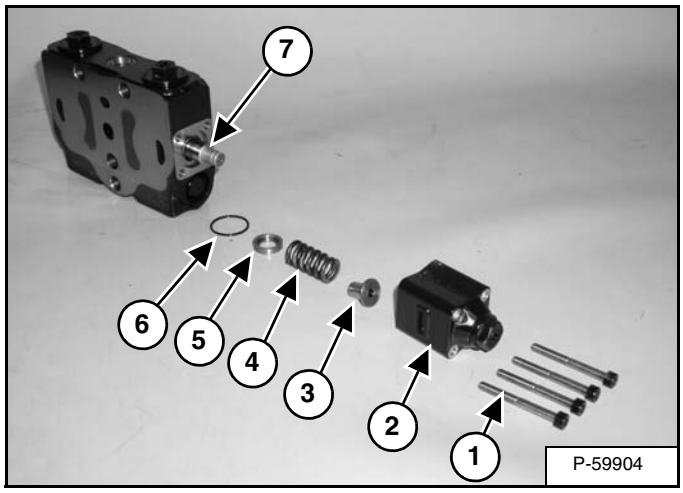


Remove the bolts (Item 1) spool cover (Item 2), spring seat (Item 3), spring (Item 4), spring retainer (Item 5) and O-ring (Item 6) **[Figure 20-40-46]**.

Installation: Install the lip of the spring retainer (Item 5) over the spool (Item 7) **[Figure 20-40-46]**.

Installation: Tighten the bolts to 6,6 N•m (5 ft-lb) torque.

Figure 20-40-47

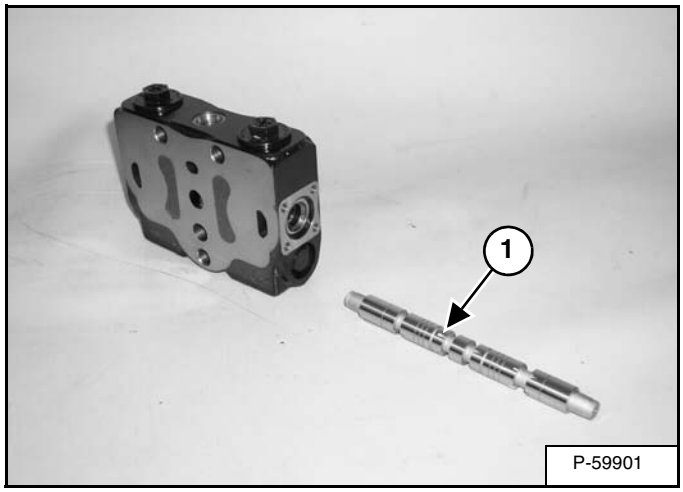


Remove the bolts (Item 1), spool cover (Item 2), spring seat (Item 3), spring (Item 4), spring retainer (Item 5) and O-ring (Item 6) **[Figure 20-40-47]**.

Installation: Install the lip of the spring retainer (Item 5) over the spool (Item 7) **[Figure 20-40-47]**.

Installation: Tighten the bolts to 6,6 N•m (5 ft-lb) torque.

Figure 20-40-48



Remove the spool (Item 1) **[Figure 20-40-48]**.

The spool and valve section are not serviced separately.

NOTE: When the spool is removed, use care not to scratch the spool surface. Do not interchange spools and valve sections.

Boom Valve Section Disassembly And Assembly

IMPORTANT

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

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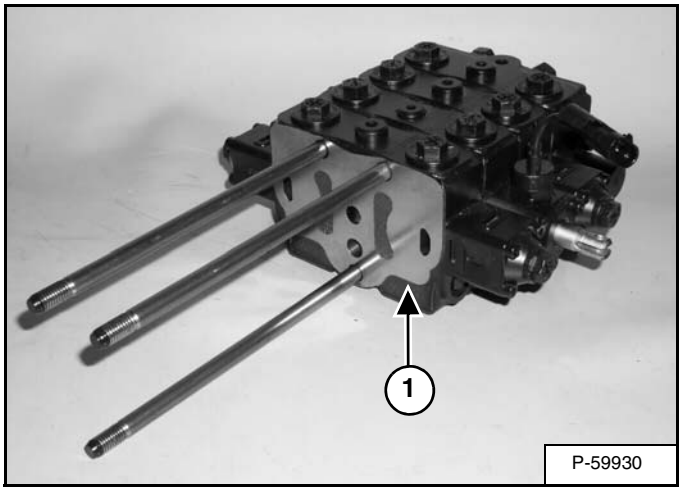
Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

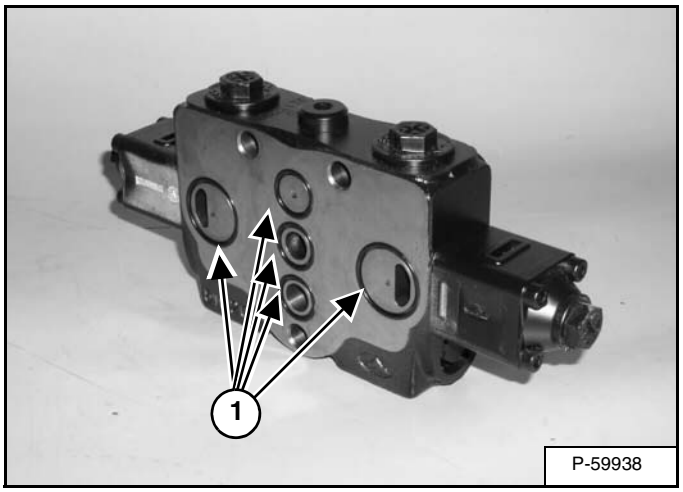
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-40-77



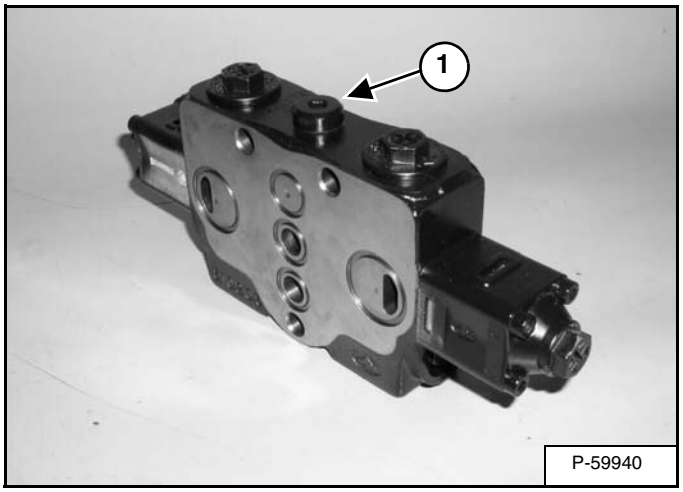
Remove the boom valve section (Item 1) **[Figure 20-40-77]** from the valve assembly.

Figure 20-40-78



Remove the O-rings (Item 1) **[Figure 20-40-78]** from the boom valve section.

Figure 20-40-79

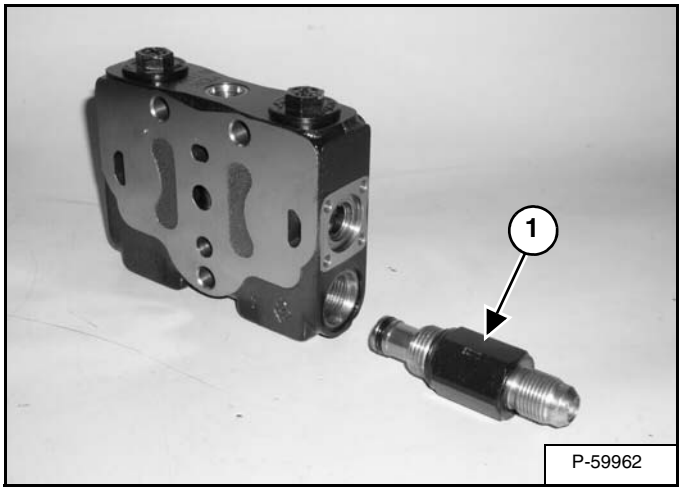


Remove the load check valve (Item 1) **[Figure 20-40-79]**.

Installation: Tighten the load check valve to 24 N•m (18 ft-lb) torque.

Swing Valve Section Disassembly And Assembly (Cont'd)

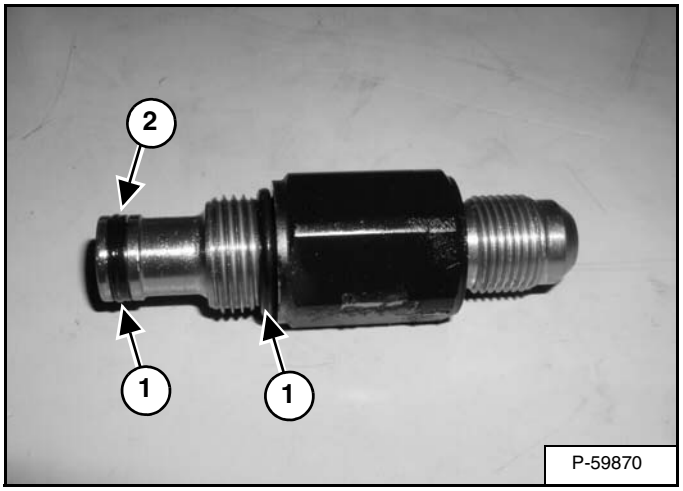
Figure 20-40-109



Remove the fitting (Item 1) **[Figure 20-40-109]**.

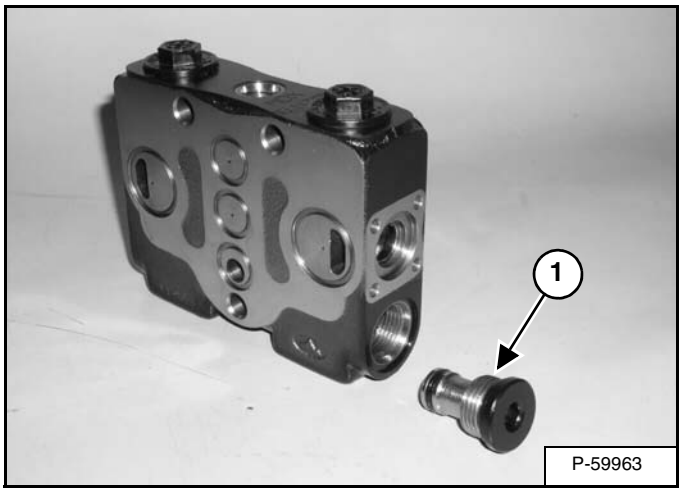
Installation: Tighten the fitting to 42 N•m (31 ft-lb) torque.

Figure 20-40-110



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-110]** from the fitting.

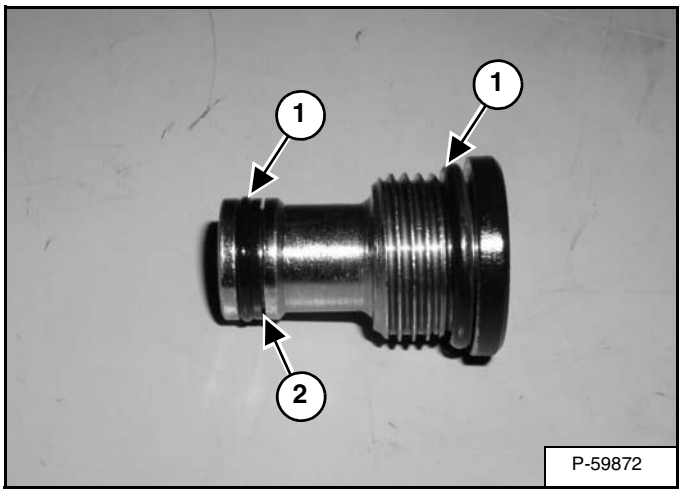
Figure 20-40-111



Remove the plug (Item 1) [**[Figure 20-40-111]**

Installation: Tighten the plug to 42 N•m (31 ft-lb) torque.

Figure 20-40-112



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-112]** from the plug.

HYDRAULIC PUMP

Description

IMPORTANT

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

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Figure 20-50-1

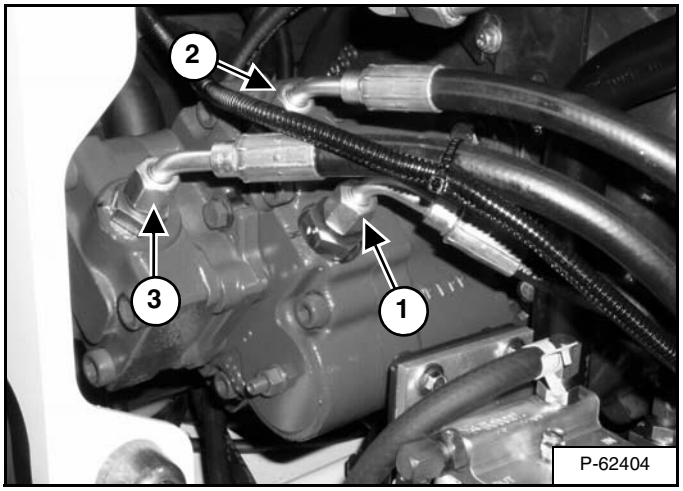
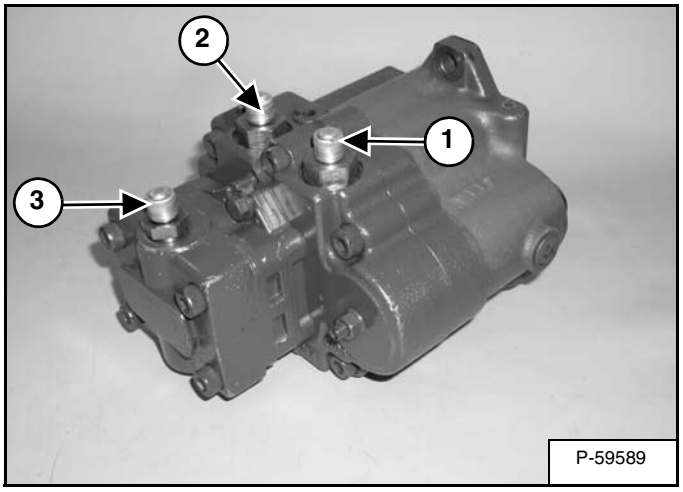


Figure 20-50-2



Pump outlet one (Item 1) **[Figure 20-50-1]** and **[Figure 20-50-2]** provides hydraulic fluid to the right hand travel, boom swing, arm, bucket and auxiliary valve sections.

Pump outlet two (Item 2) **[Figure 20-50-1]** and **[Figure 20-50-2]** provides hydraulic fluid flow to the left hand travel and boom valve sections.

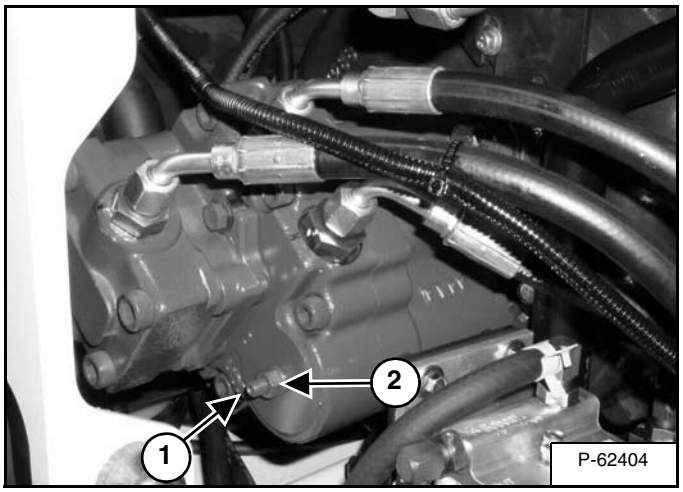
Pump outlet three (gear pump) (Item 3) **[Figure 20-50-1]** and **[Figure 20-50-2]** provides hydraulic fluid flow to the upperstructure swing and blade valve sections.

Torque Adjustment

Prior to making any torque adjustment, insure all piston and gear pump tests have been completed and they are to rated specifications. (See the following pages for pump tests.)

Prior to making any torque adjustment, make sure the no load engine rpm is correct.

Figure 20-50-3



The adjustment screw (Item 1) **[Figure 20-50-3]** is used to match the maximum hydraulic horsepower of the pump to the maximum rated engine horsepower.

Remove any auxiliary hydraulic attachments from the excavator.

Engage the swing lock.

Start the engine and move the speed control to the high rpm position.

Engage the following hydraulic functions, and continue to engage the functions.

Engage the auxiliary hydraulics.
Extend the bucket cylinder.
Extend the arm cylinder.
Extend the boom cylinder.
Extend the boom swing cylinder.
Engage the upperstructure swing.

Disassembly

IMPORTANT

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

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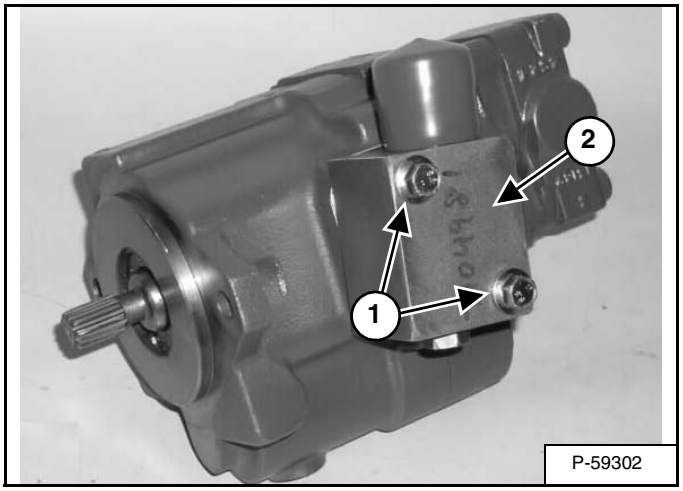
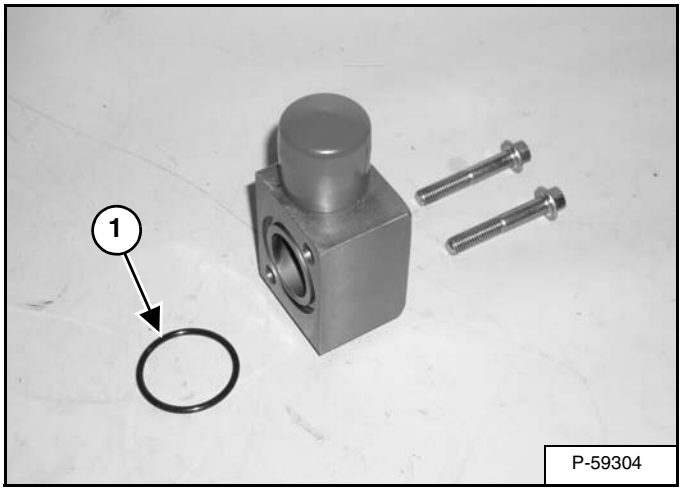
Figure 20-50-26



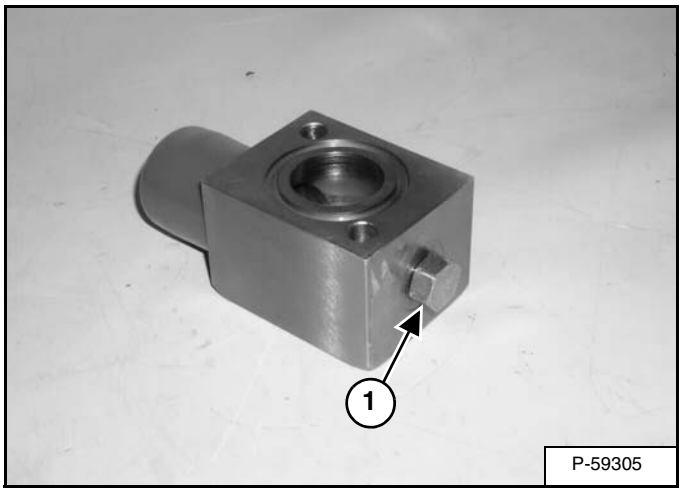
Remove the two bolts (Item 1) and pump block (Item 2) **[Figure 20-50-26]** from the back of the piston pump.

Figure 20-50-27



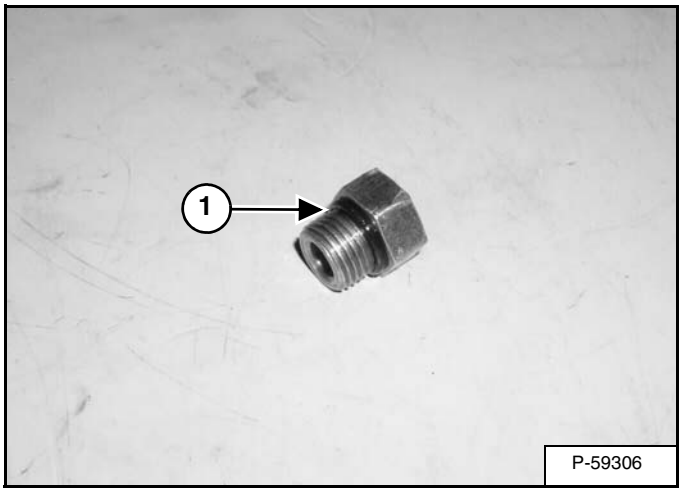
Remove the O-ring (Item 1) **[Figure 20-50-27]** from the pump block.

Figure 20-50-28



Remove the plug (Item 1) **[Figure 20-50-28]** from the pump block.

Figure 20-50-29



Remove the O-ring (Item 1) **[Figure 20-50-29]** from the plug.

Piston Pump Disassembly (Cont'd)

Figure 20-50-6

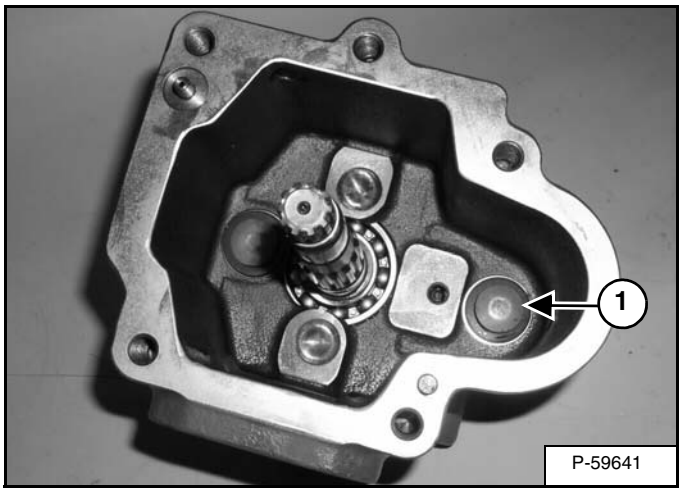
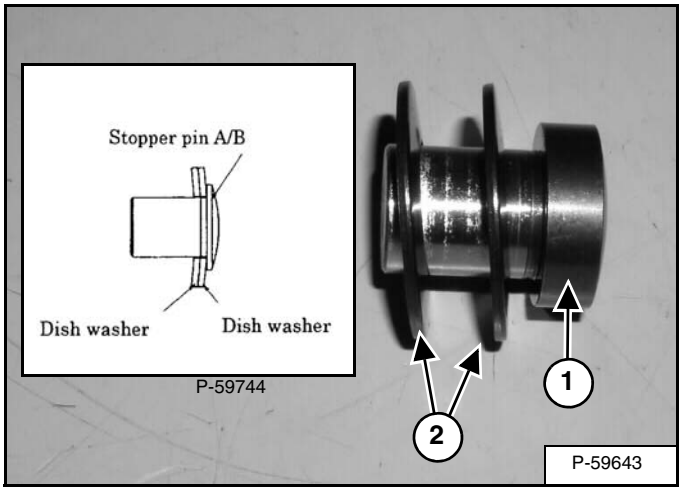


Figure 20-50-7



Remove the stopper pin A (Item 1) **[Figure 20-50-6]** and **[Figure 20-50-7]**, the two dish washers (Item 2) **[Figure 20-50-7]** from the pump housing.

Figure 20-50-8

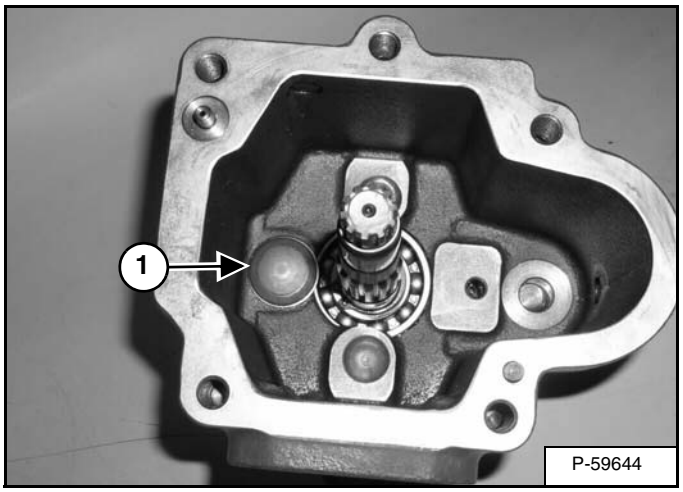
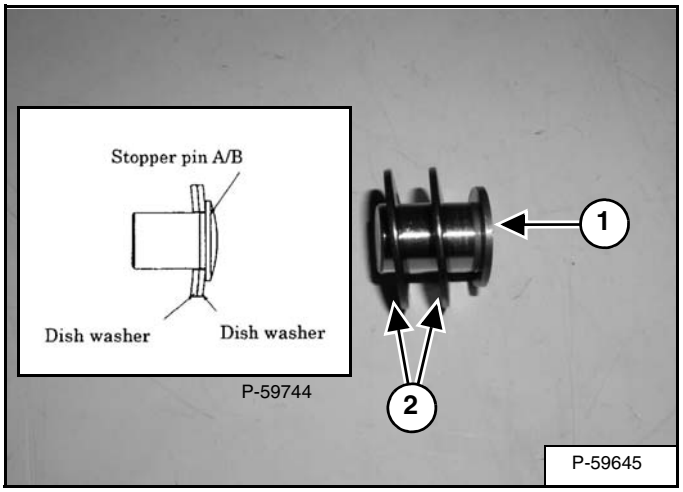


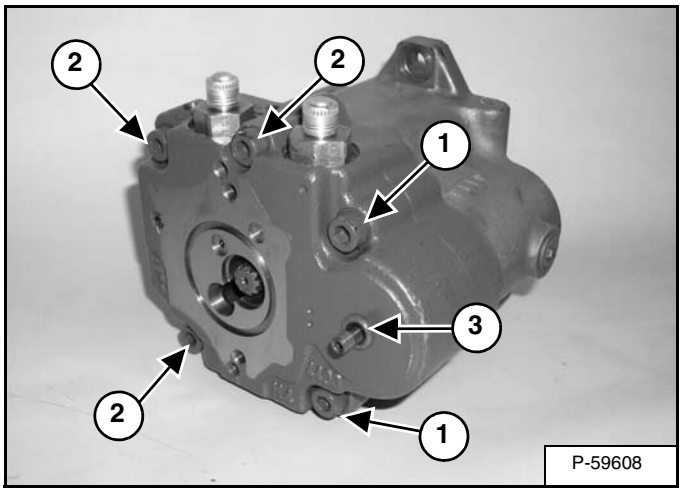
Figure 20-50-9



Remove the stopper pin B (Item 1) **[Figure 20-50-8]** and **[Figure 20-50-9]**, the two dish washers (Item 2) **[Figure 20-50-9]** from the pump housing.

Piston Pump Assembly (Cont'd)

Figure 20-50-46



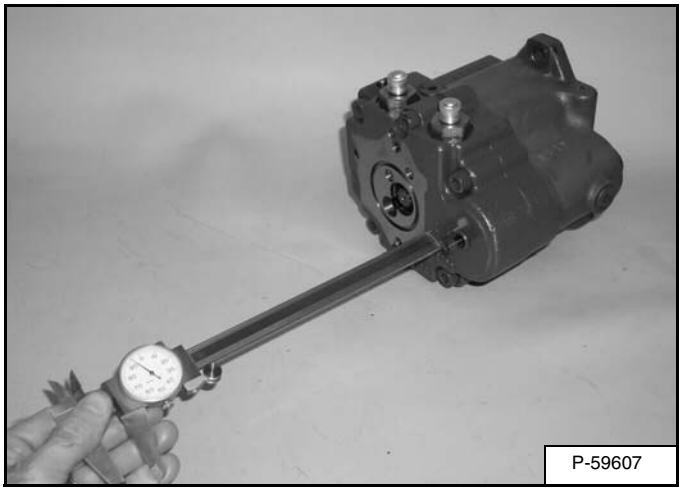
Install the two bolts (Item 1) **[Figure 20-50-46]** on either side of the pressure adjusting spring in the pump housing. Alternate tightening each bolt until both pump mounting housings are assembled.

Install the remaining three bolts (Item 2) **[Figure 20-50-46]** in the pump housing.

Installation: Tighten bolts to 54 - 63,7 N•m (39.8 - 47.0 ft-lb) torque.

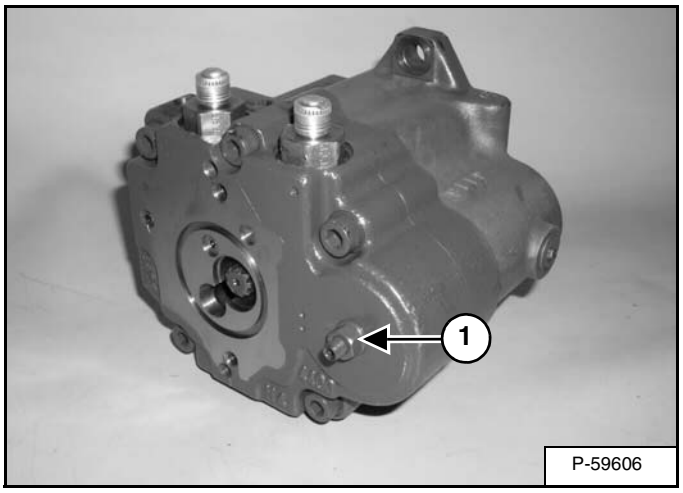
Install the seal washer (Item 3) **[Figure 20-50-46]** on the pump housing.

Figure 20-50-47



Set the measurement of the outside length of the pressure adjustment screw **[Figure 20-50-47]** taken before disassembly. Final adjustment may need to be made after assembly in excavator.

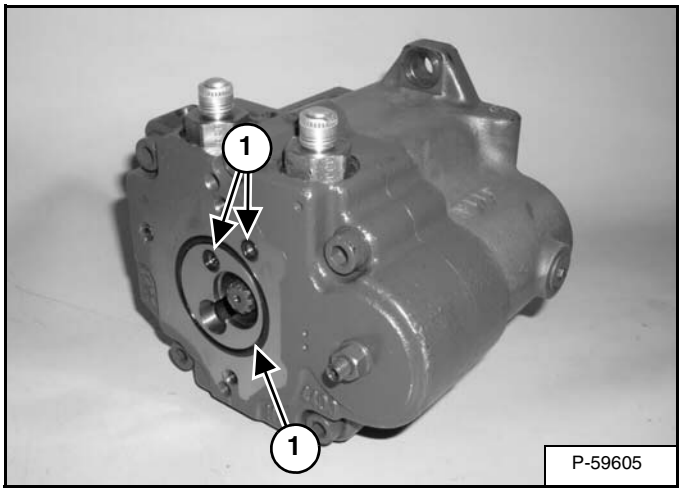
Figure 20-50-48



Install the pressure adjustment nut (Item 1) **[Figure 20-50-48]** on the pump housing.

Installation: Tighten clamp to 14,8 - 19,7 N•m (10.9 - 14.5 ft-lb) torque.

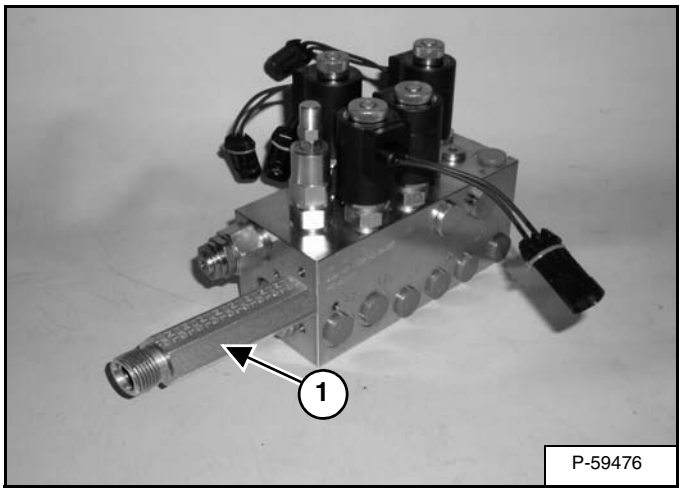
Figure 20-50-49



Install the three O-rings (Item 1) **[Figure 20-50-49]** on the pump housing.

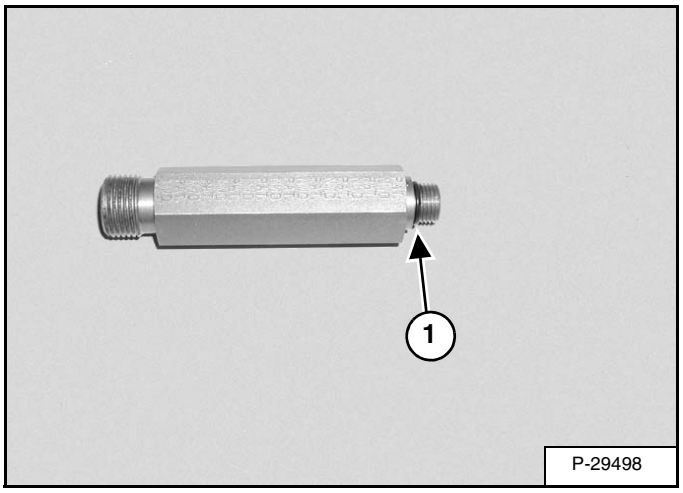
Disassembly

Figure 20-60-8



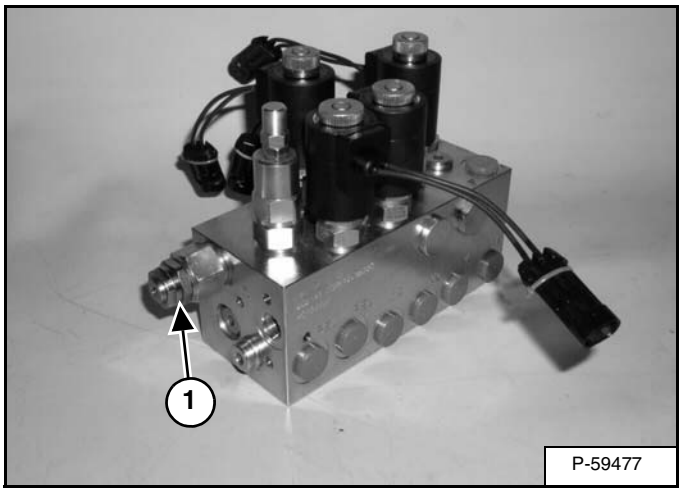
Remove the accumulator extension (Item 1) **[Figure 20-60-8]** from the manifold.

Figure 20-60-9



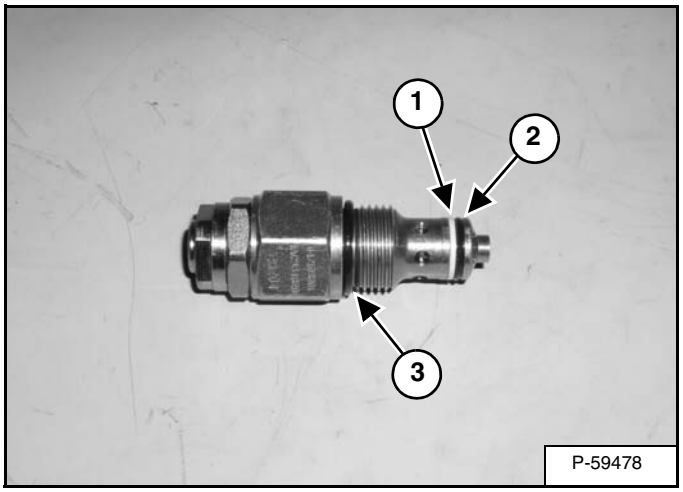
Remove the O-ring (Item 1) **[Figure 20-60-9]** from the accumulator extension.

Figure 20-60-10



Remove the relief valve (Item 1) **[Figure 20-60-10]** from the manifold.

Figure 20-60-11

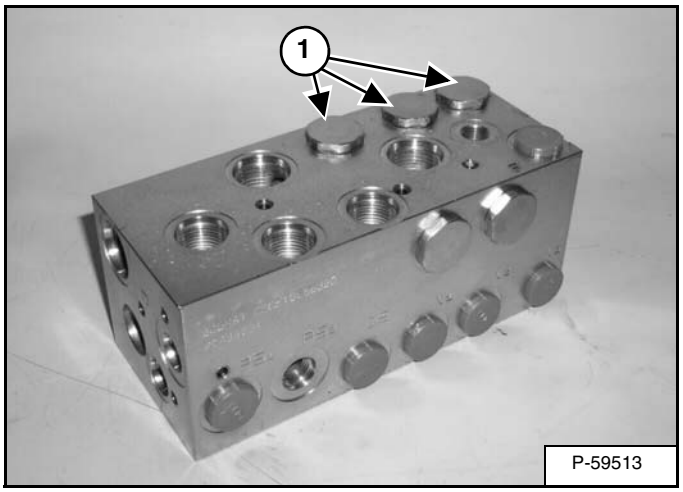


Remove the back-up ring (Item 1) O-ring (Item 2) **[Figure 20-60-11]** from the relief valve.

Remove the O-ring (Item 3) **[Figure 20-60-11]** from the relief valve.

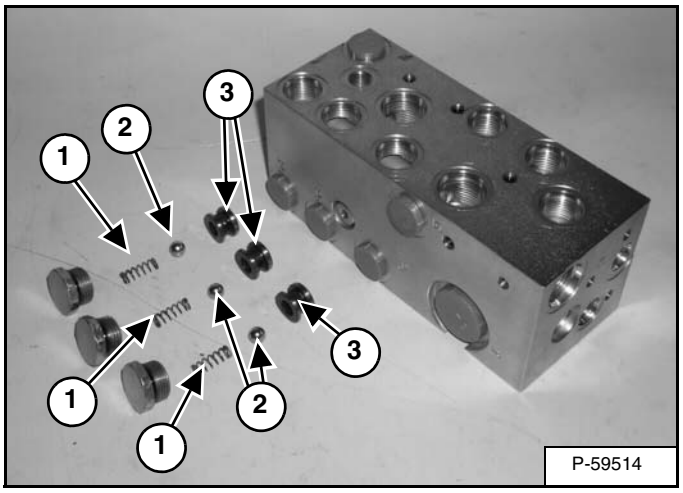
Disassembly (Cont'd)

Figure 20-60-48



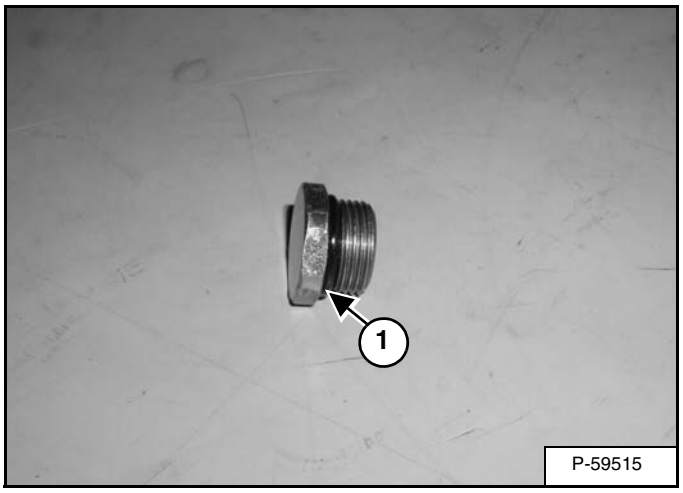
Remove the plugs (Item 1) **[Figure 20-60-48]** from the top of the manifold.

Figure 20-60-49



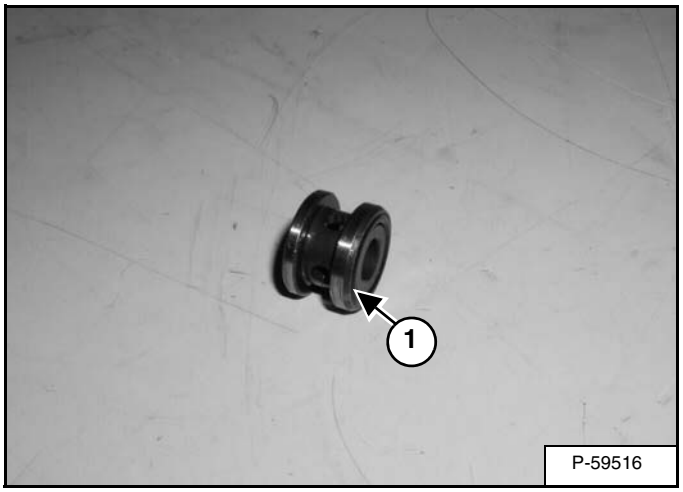
Remove the springs (Item 1), check balls (Item 2) and seats (Item 3) **[Figure 20-60-49]**.

Figure 20-60-50



Remove the O-ring (Item 1) **[Figure 20-60-50]** from the plugs.

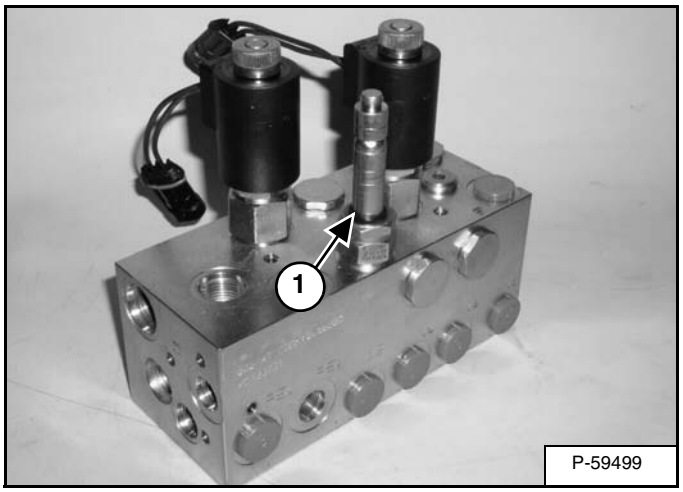
Figure 20-60-51



Remove the O-ring (Item 1) **[Figure 20-60-51]** from the seats.

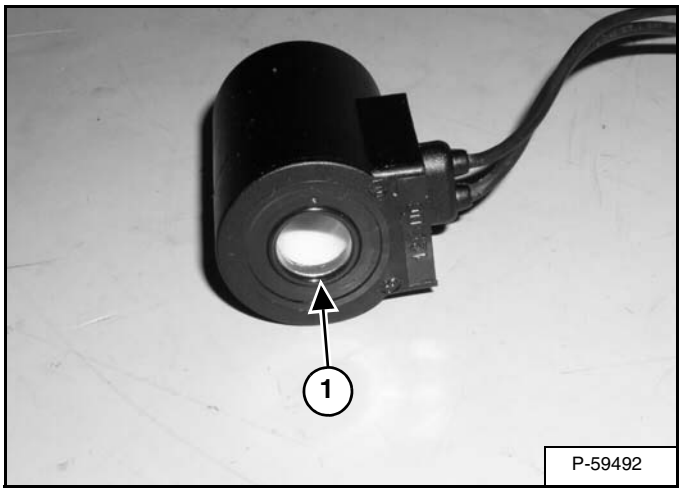
Assembly (Cont'd)

Figure 20-60-88



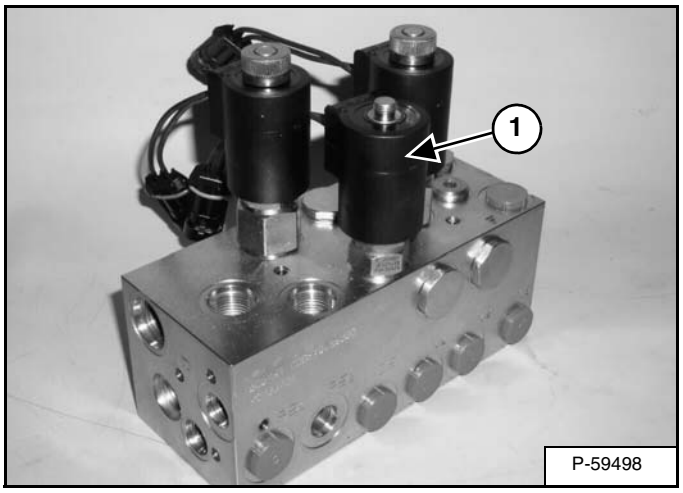
Install the O-ring (Item 1) **[Figure 20-60-88]** on the solenoid stem.

Figure 20-60-89



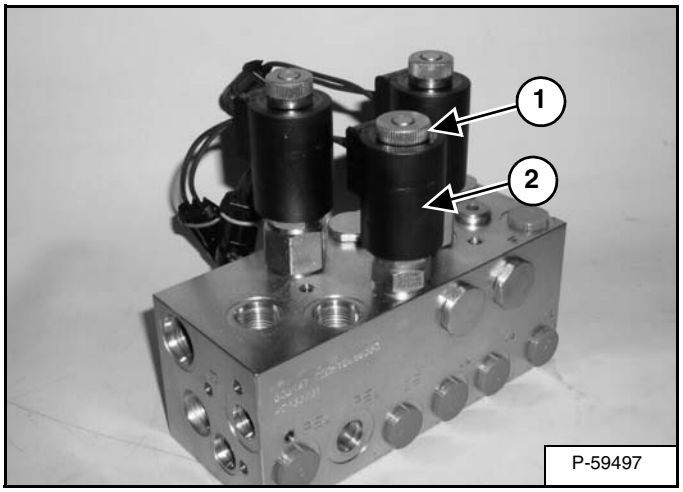
Install the O-ring (Item 1) **[Figure 20-60-89]** on the coil.

Figure 20-60-90



Install the coil with yellow tie strap (Item 1) **[Figure 20-60-90]** on the two-speed boost solenoid stem.

Figure 20-60-91



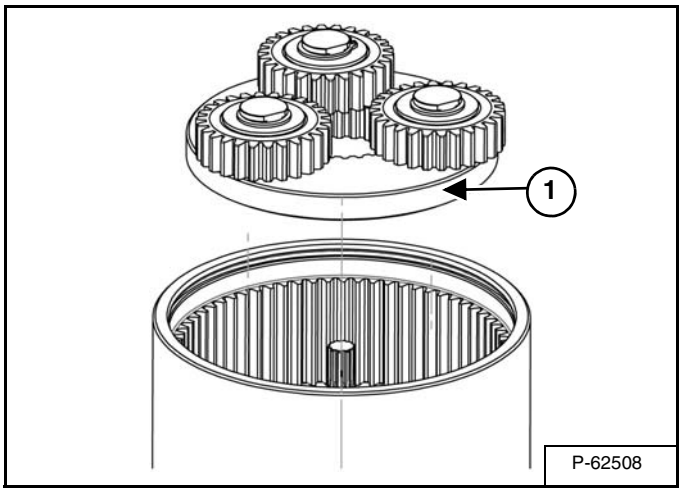
Install the nut (Item 1) on the two-speed boost solenoid (Item 2) **[Figure 20-60-91]**.

Tighten the nuts to 6 N•m (4.4 ft-lb) torque.

NOTE: Overtightening the nut (Item 1) [Figure 20-60-91] may cause solenoid or coil failure.

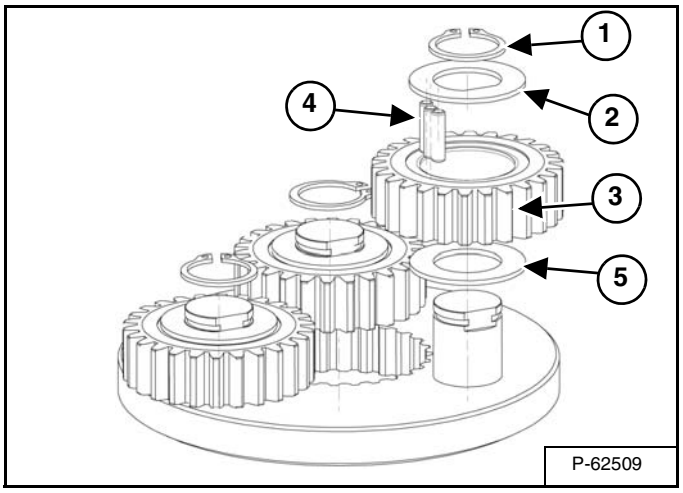
Disassembly (Cont'd)

Figure 20-70-11



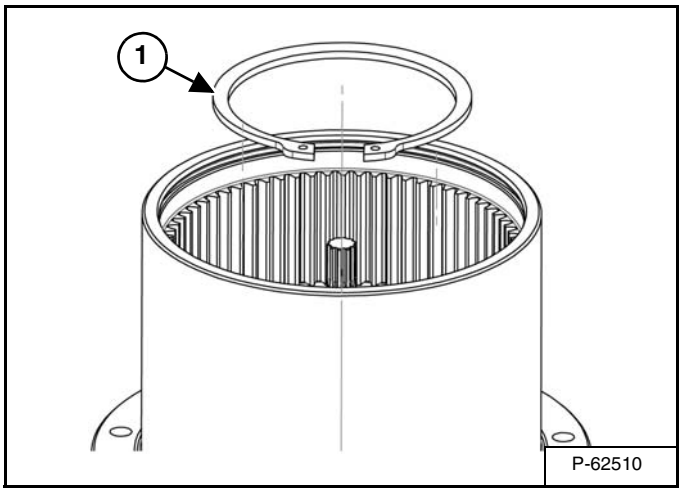
Remove the second stage planetary carrier (Item 1) **[Figure 20-70-11]** using your hands.

Figure 20-70-12



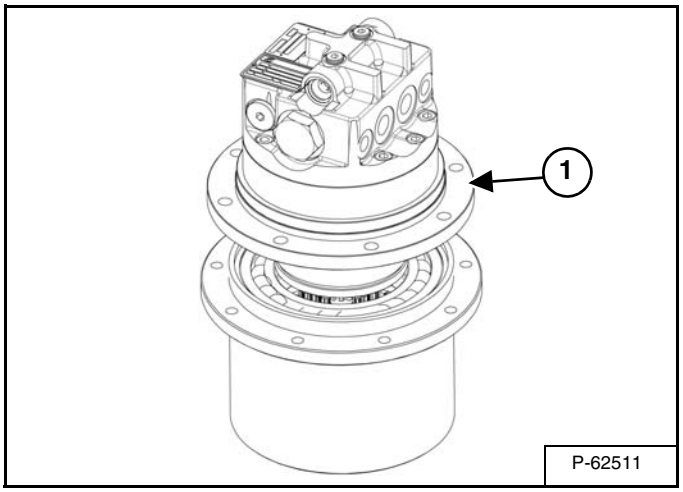
Remove the retaining rings (Item 1), anti-rotation washer (Item 2), planetary gears (Item 3), needle bearings (Item 4) and thrust washer (Item 5) **[Figure 20-70-12]** from the first stage planetary carrier assembly.

Figure 20-70-13



Remove the retaining ring (Item 1) **[Figure 20-70-13]** from the hub to free the two bearings, ring gear and motor.

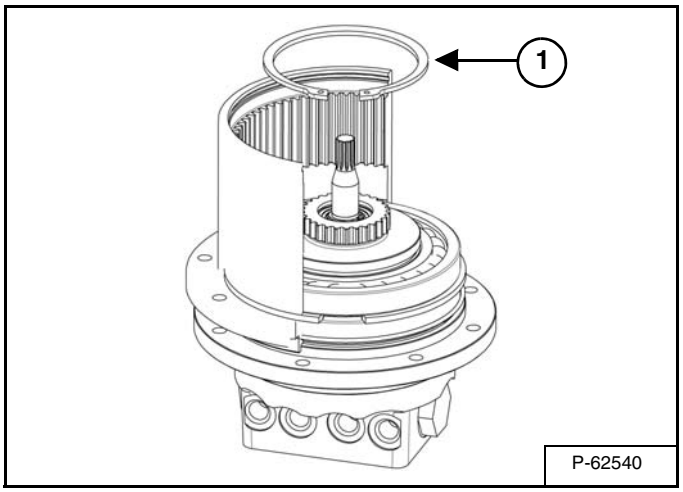
Figure 20-70-14



Remove the hub (Item 1) **[Figure 20-70-14]** from the ring gear.

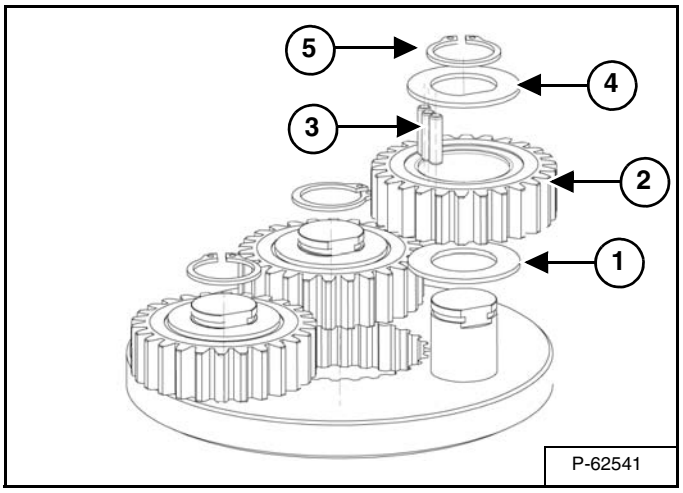
Assembly (Cont'd)

Figure 20-70-48



Install the external snap ring (Item 1) **[Figure 20-70-48]** in the motor reduction unit.

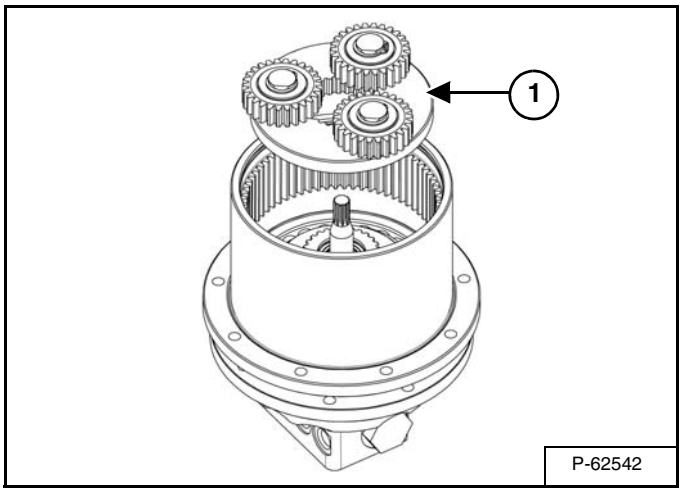
Figure 20-70-49



Install the thrust washers (Item 1), planetary gears (Item 2), needle bearing (Item 3) anti-rotation washers (Item 4) and external snap rings (Item 5) **[Figure 20-70-49]**.

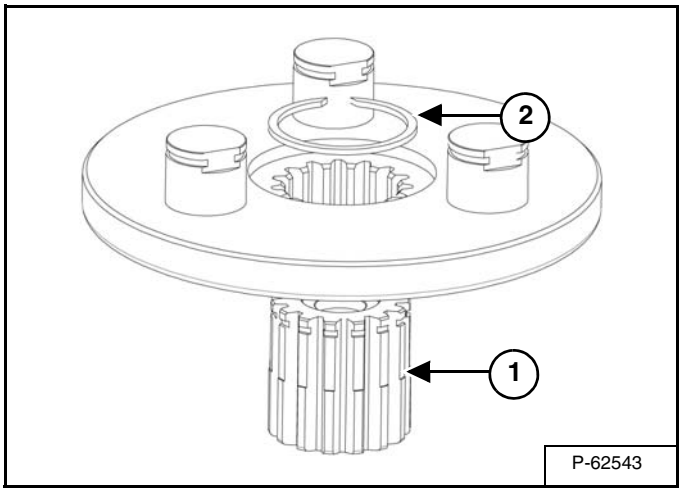
NOTE: Install the snap rings so the opening of the snap ring is towards the outside.

Figure 20-70-50



Install the planetary assembly (Item 1) **[Figure 20-70-50]**.

Figure 20-70-51



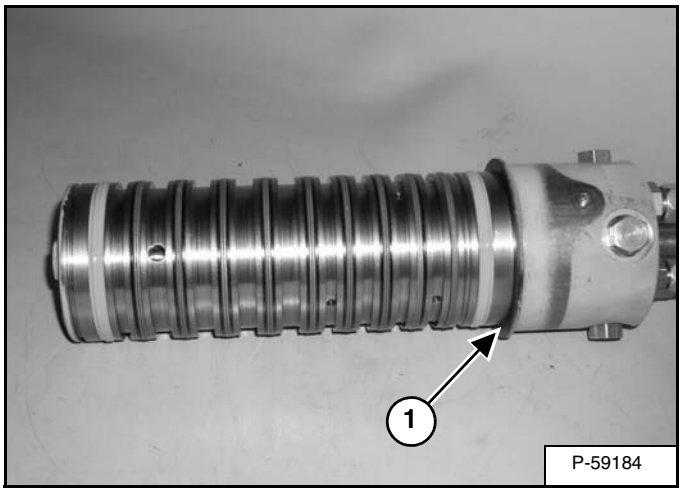
Install the sun gear (Item 1) into the planetary carrier and lock with the retaining ring (Item 2) **[Figure 20-70-51]**.

Assembly

Clean all parts in solvent and dry with compressed air.

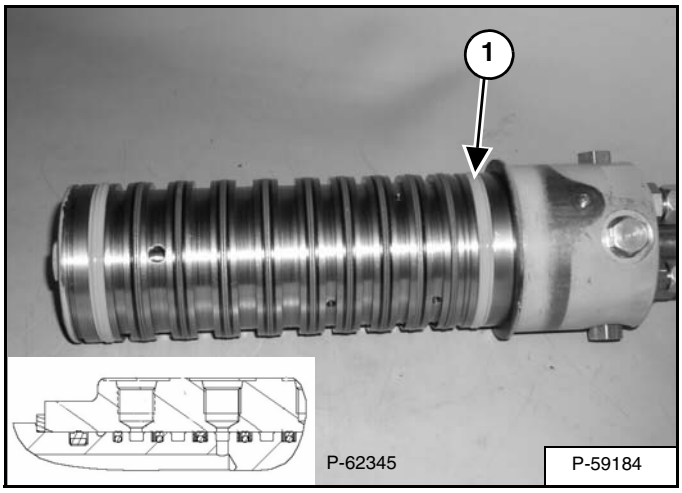
Inspect the rotor and housing for scratches or wear that could cause internal leakage. Always install new seals and back-up seals. Lubricate all seals and back-up seals with clean hydraulic fluid before installation.

Figure 20-80-18



Install the nylon washer (Item 1) **[Figure 20-80-18]**.

Figure 20-80-19

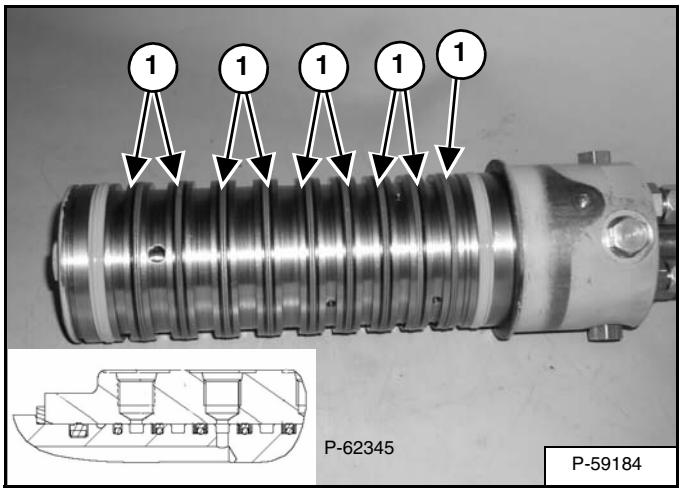


Heat the seals in hydraulic fluid for three minutes at 54°C (130°F).

Install the inner and outer seals (Item 1) **[Figure 20-80-19]**.

NOTE: The inner and outer seal are serviceable as one part number.

Figure 20-80-20



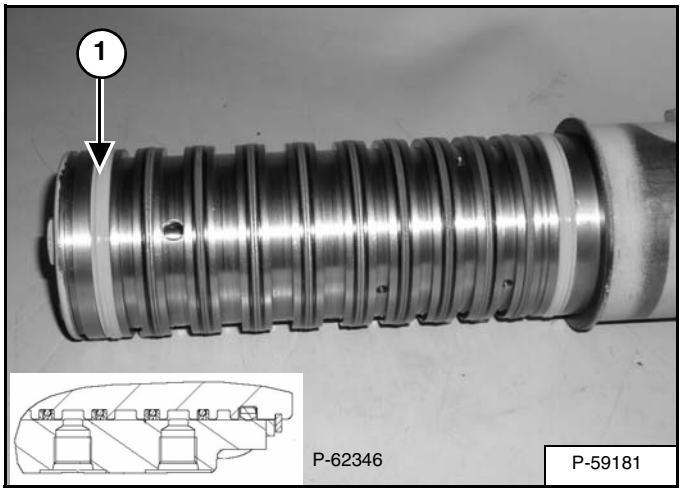
Install the O-rings under the seals (Item 1) **[Figure 20-80-20]**.

Heat the seals in hydraulic fluid for three minutes at 54°C (130°F).

Install the seals and back-up seals (Item 1) **[Figure 20-80-20]**.

NOTE: The seal and O-ring are serviceable as one part number.

Figure 20-80-21



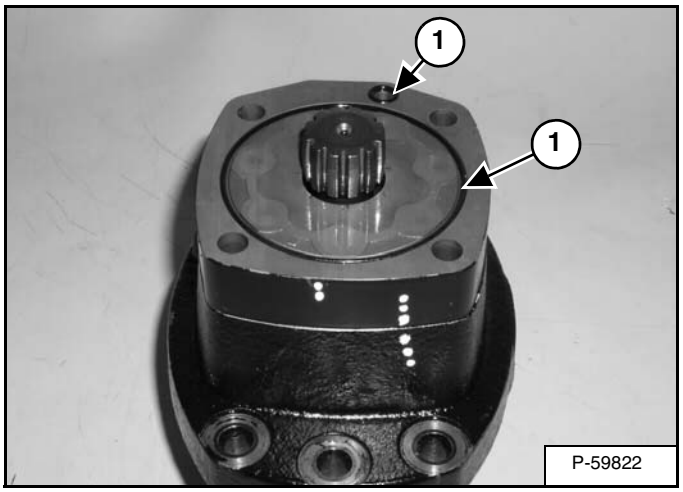
Heat the seals in hydraulic fluid for three minutes at 54°C (130°F).

Install the inner and outer seals (Item 1) **[Figure 20-80-21]**.

NOTE: The inner and outer seal are serviceable as one part number.

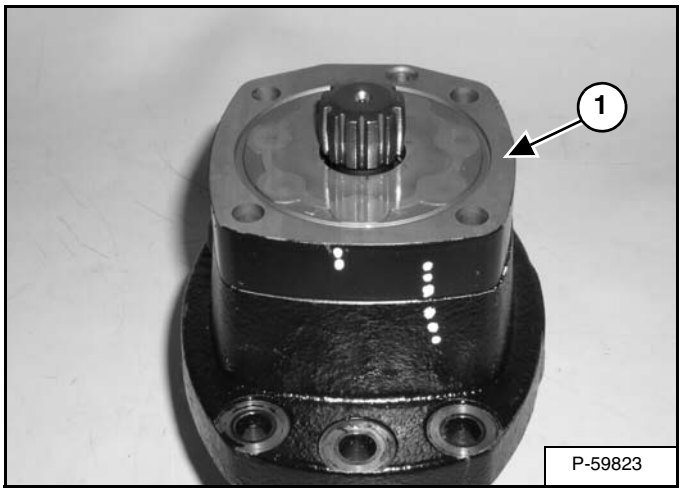
Disassembly (Cont'd)

Figure 20-90-19



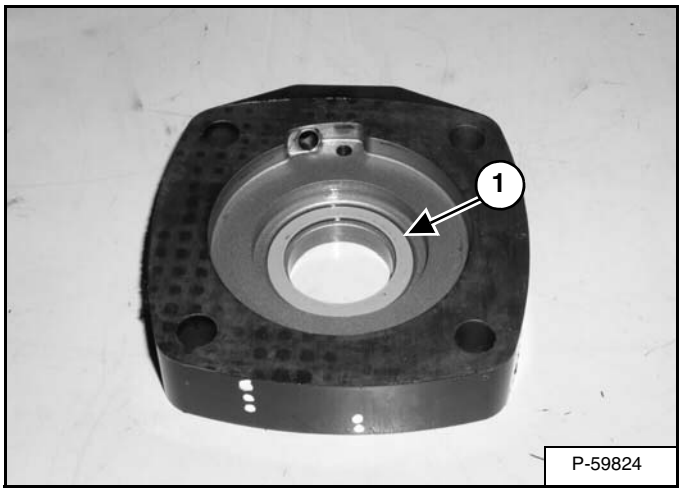
Remove the O-rings (Item 1) **[Figure 20-90-19]**.

Figure 20-90-20



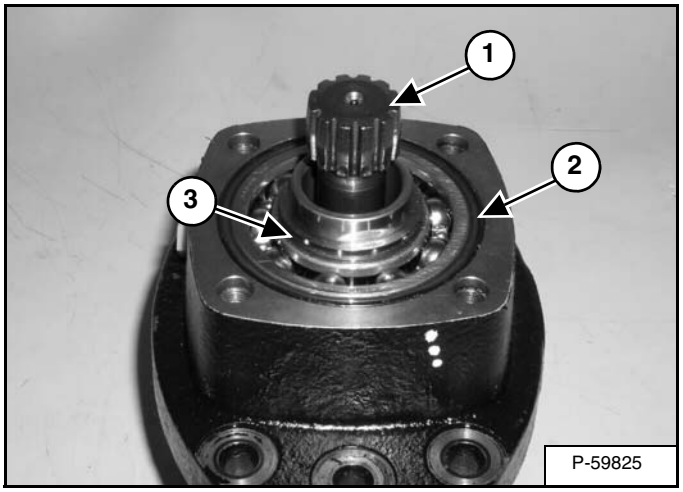
Remove the valve plate (Item 1) **[Figure 20-90-20]**.

Figure 20-90-21



Remove the seal (Item 1) **[Figure 20-90-21]**.

Figure 20-90-22



Remove the drive (Item 1). Remove the O-ring (Item 2) **[Figure 20-90-22]**.

Remove the retaining ring (Item 3) **[Figure 20-90-22]**.

CONTROL PATTERN SELECTOR VALVE

Removal And Installation

Figure 20-100-1

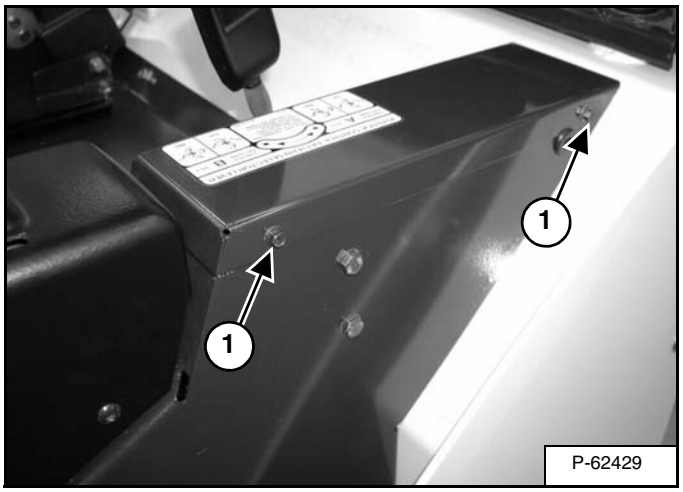
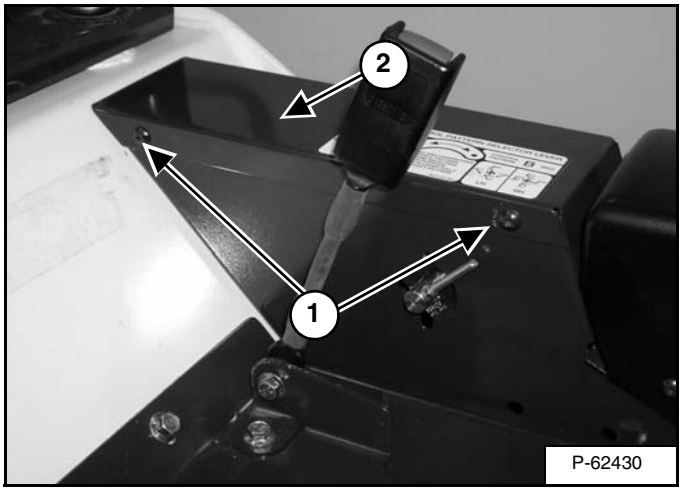


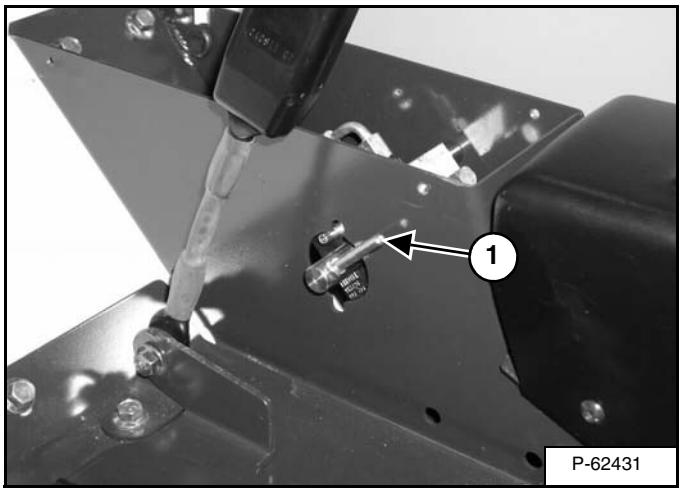
Figure 20-100-2



Remove the four screws (Item 1) **[Figure 20-100-1]** and **[Figure 20-100-2]** from the left console cover.

Remove the left console cover plate (Item 2) **[Figure 20-100-2]**.

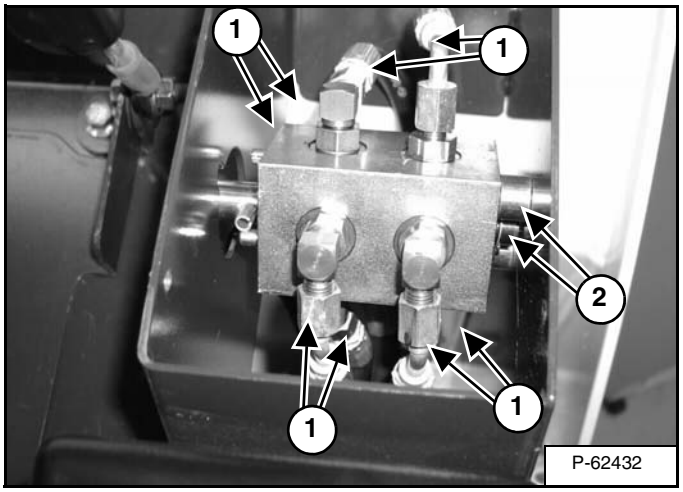
Figure 20-100-3



Remove the control pattern selector valve lever (Item 1) **[Figure 20-100-3]**.

Mark the eight hoses for ease of assembly.

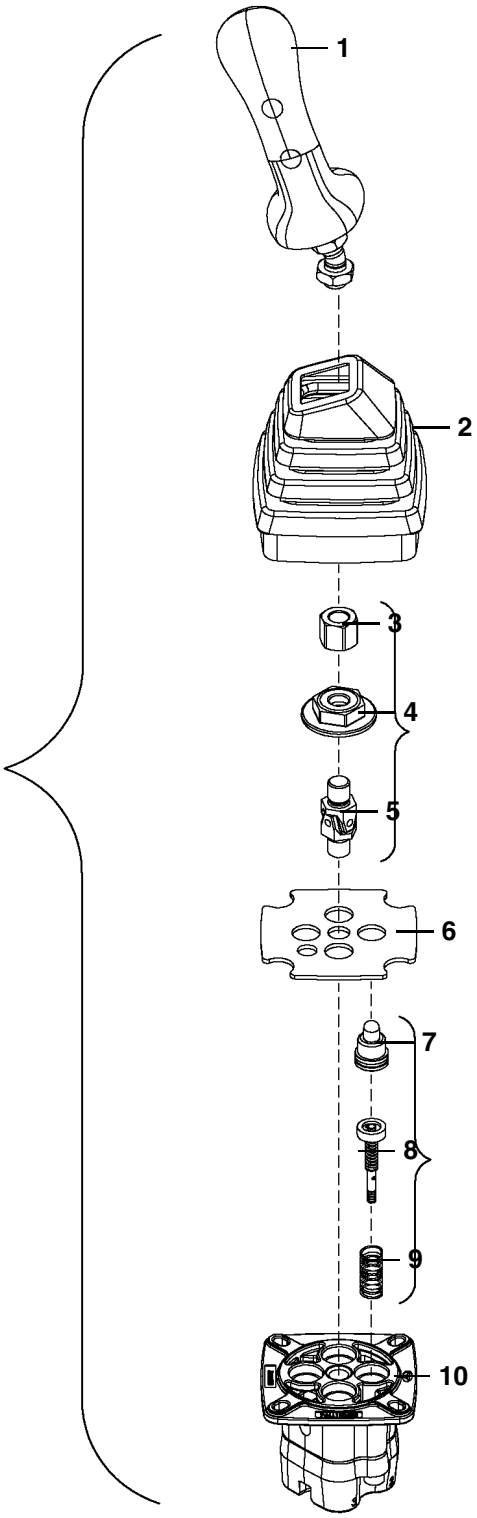
Figure 20-100-4



Remove the eight hoses (Item 1) **[Figure 20-100-4]** from the control pattern selector valve. Cap and plug the fittings and hoses.

Parts Identification

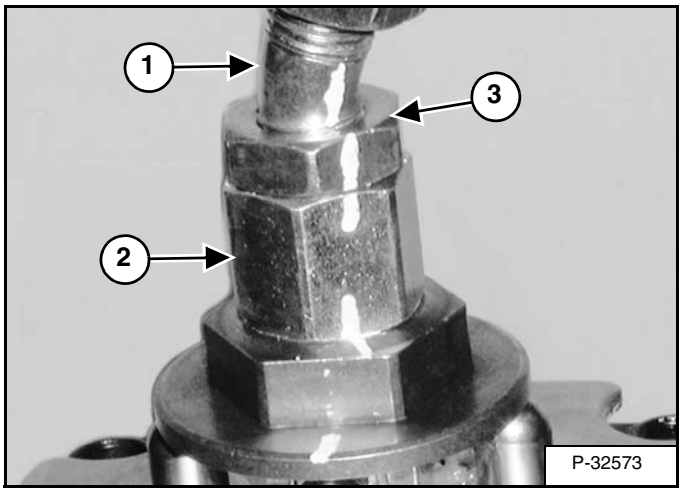
1. Handle
2. Dust Boot
3. Coupler
4. Actuator Control Plate
5. U-joint
6. Plate
7. Plunger Assembly
8. Spool
9. Spring
10. Housing



MS1353

Assembly (Cont'd)

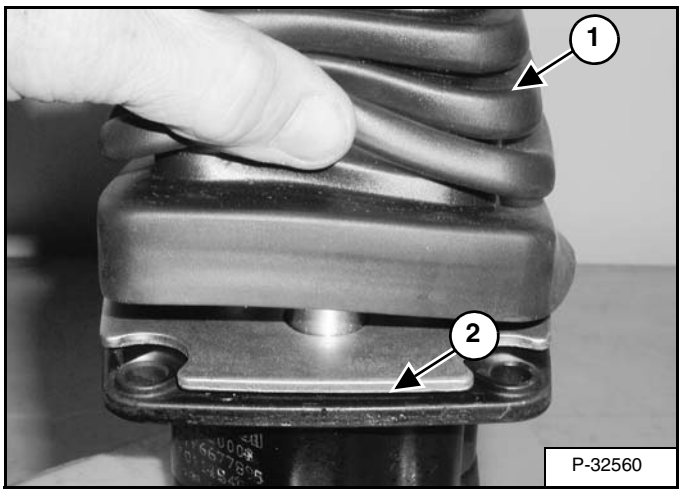
Figure 20-110-42



Install the connector (Item 1) **[Figure 20-110-42]**.

Align the connector with the coupler (Item 2) and tighten the nut (Item 3) **[Figure 20-110-42]**.

Figure 20-110-43

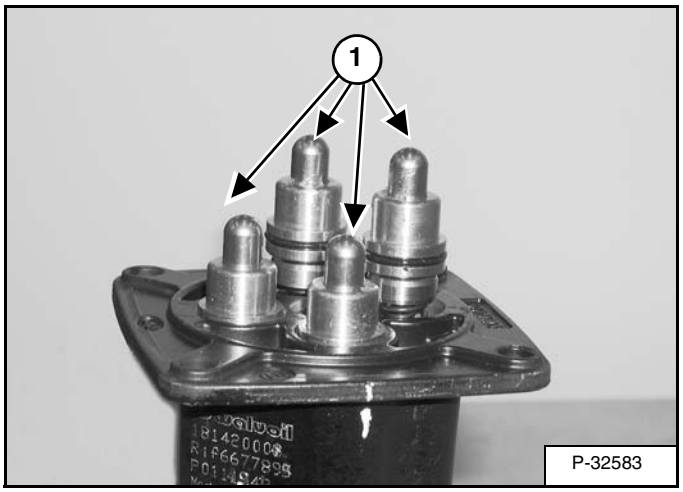


Install the tabs of the boot (Item 1) in between the joystick flange and mounting plate (Item 2) **[Figure 20-110-43]**.

Install the handle. (See Handle Removal And Installation on Page 20-110-3.)

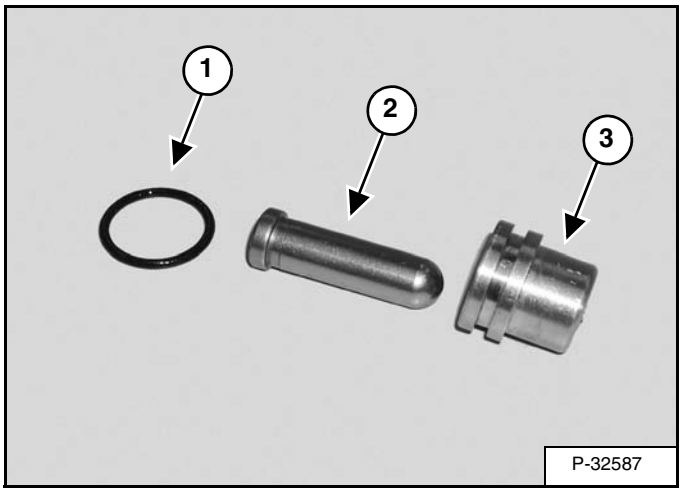
Disassembly (Cont'd)

Figure 20-111-23



Remove the plunger assemblies (Item 1) **[Figure 20-111-23]**.

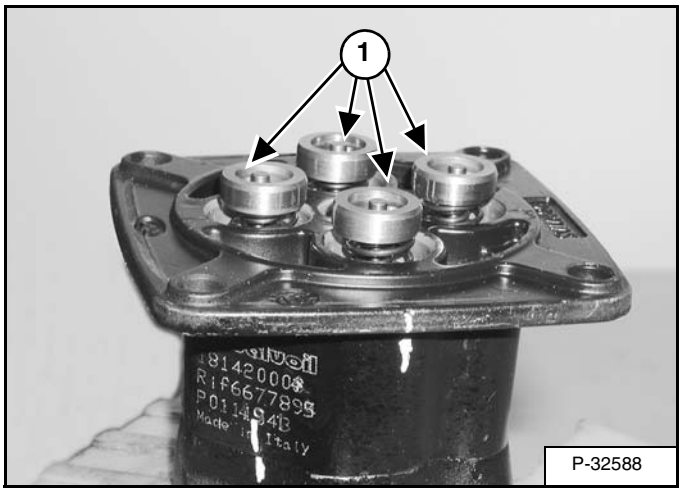
Figure 20-111-24



Remove the O-ring (Item 1) and plunger (Item 2) from the bushing (Item 3) **[Figure 20-111-24]**.

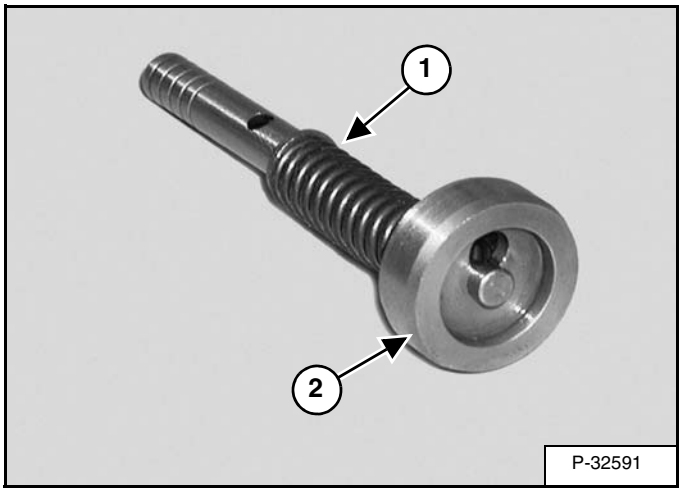
NOTE: Mark the spool assemblies for installation in their original location.

Figure 20-111-25



Remove the spool assemblies (Item 1) **[Figure 20-111-25]**.

Figure 20-111-26



Compress the spring (Item 1) and remove the seat (Item 2) **[Figure 20-111-26]**.

HYDRAULIC RESERVOIR

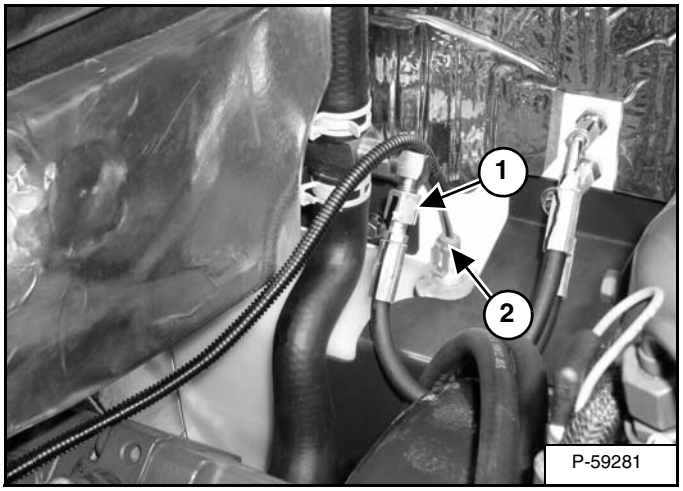
Removal And Installation

Open tailgate.

Drain hydraulic reservoir. (See Checking And Adding Hydraulic Oil on Page 10-120-1.)

Remove the muffler and extension. (See Removal And Installation on Page 60-20-1.)

Figure 20-130-1



Remove the hose (Item 1) **[Figure 20-130-1]** from the hydraulic reservoir tee fitting.

Disconnect the fuel level sender harness (Item 2) **[Figure 20-130-1]** from the fuel level sender.

Figure 20-130-2

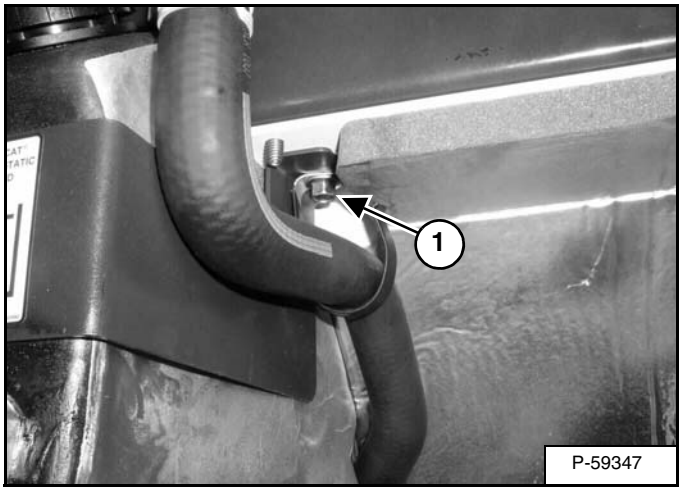
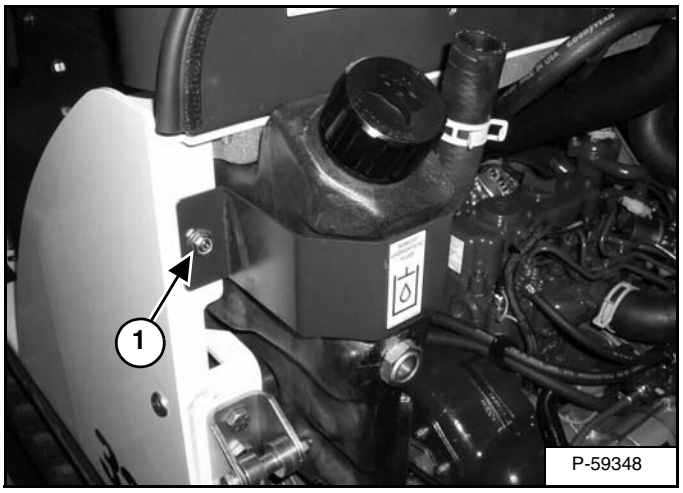
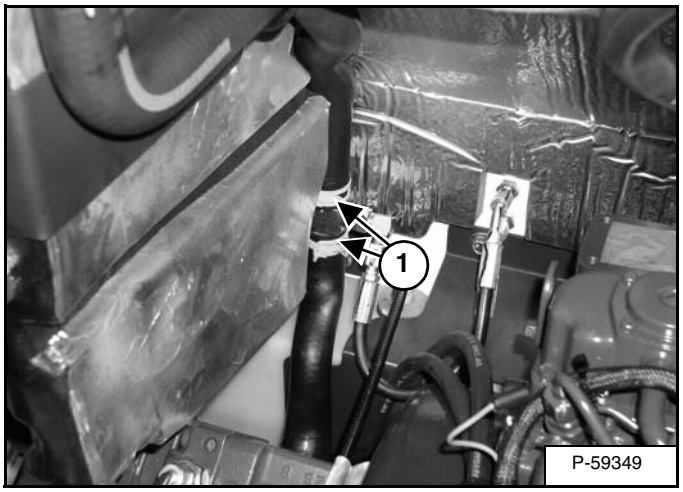


Figure 20-130-3



Remove the two bolts (Item 1) **[Figure 20-130-2]** and **[Figure 20-130-3]** from the hydraulic reservoir bracket.

Figure 20-130-4



Release the hose clamps (Item 1) **[Figure 20-130-4]** and remove hoses from tee fitting on reservoir.

Tilt hydraulic reservoir towards engine and slide reservoir out **[Figure 20-130-4]**.

UNDERCARRIAGE

Disassembly And Assembly (Cont'd)

DO NOT DISASSEMBLE OR REPAIR THE COIL SPRING ASSEMBLY (Item 2) [Figure 30-30-9].

⚠ WARNING

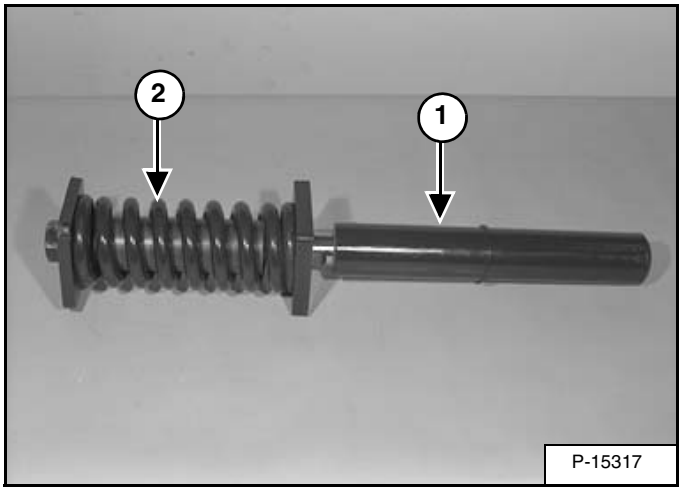
P-62574

AVOID INJURY OR DEATH

- **Spring loaded components under pressure can cause serious injury or death.**
- **Do not disassemble the coil spring assembly.**

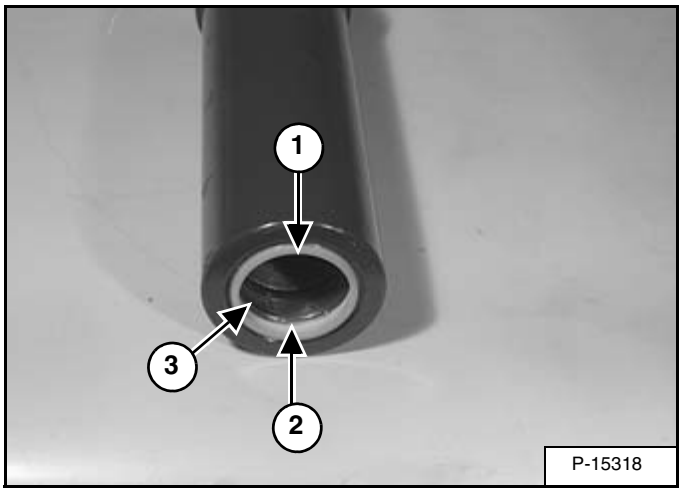
W-2617-1004

Figure 30-30-9



Remove the cylinder (Item 1) from the coil spring assembly (Item 2) **[Figure 30-30-9]**.

Figure 30-30-10

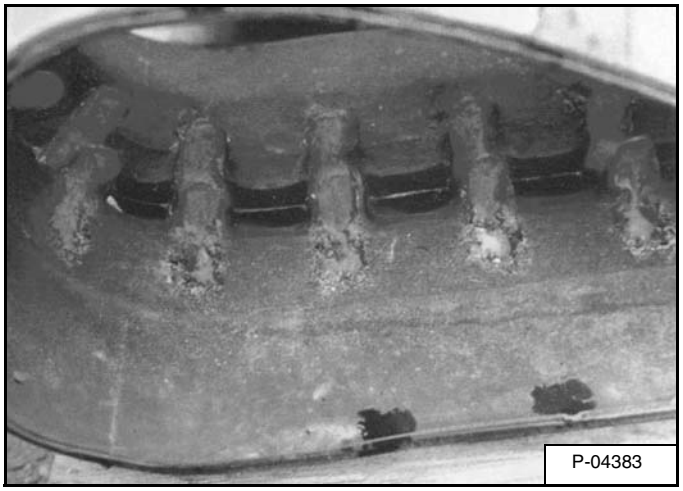


Remove the seal (Item 1), back-up ring (Item 2) and O-ring (Item 3) **[Figure 30-30-10]** from the cylinder.

Abrasion Of The Track Roller Side

Damage:

Figure 30-40-20



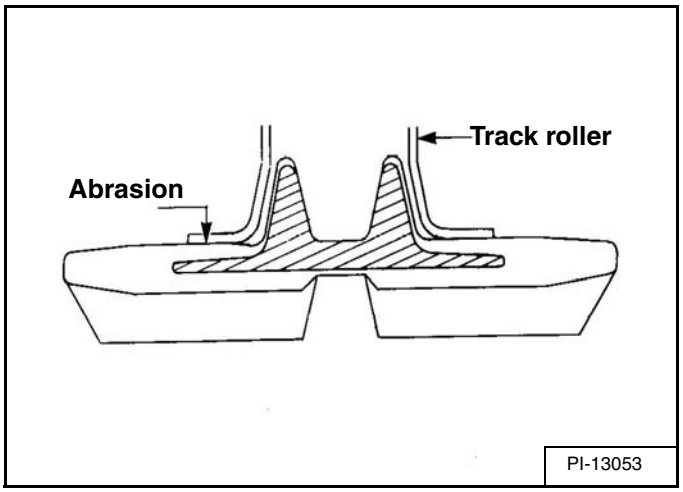
The rubber surface on which track rollers run is gradually abraded. It will result in the exposure of the embedded metals **[Figure 30-40-20]**.

Replacement:

It is recommended to replace the rubber track when more than half of the embedded metals are completely exposed.

Causes Of The Damage:

Figure 30-40-21



The abrasion of the track roller side rubber surface occurs because of sand and gravel being clogged between the rubber and the outside surface of the track rollers. The stress pushes the sand and gravel against the side of the rubber track to cause the abrasion **[Figure 30-40-21]**.

The level of abrasion is highly dependent on terrain conditions. A higher level of abrasion will occur when the rubber tracks are operated in fields covered with many stones and gravel. Small stones hardened with mud, stuck to the track rollers increase the abrasion level. After an extended period of abrasion, it will be more likely for exposed embedded metals to catch moisture through the inside steel cords, which can cause breakage of steel cords and separation of the metals from the rubber body.

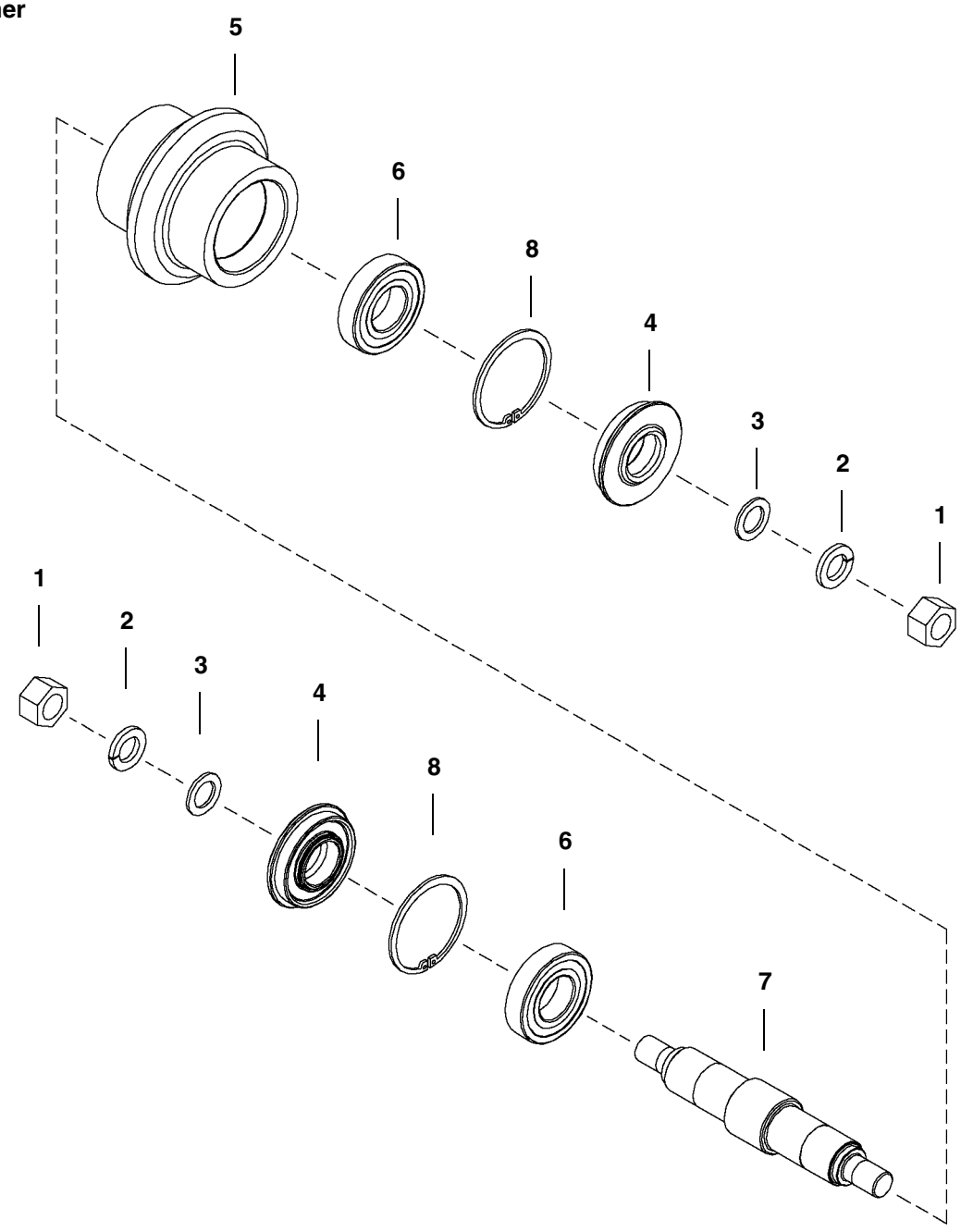
Prevention:

After operation in wet fields containing many small stones, wash off the mud that is stuck to the track rollers completely. When operating on gravel paths and stony grounds, machines should be driven slowly and the turning radius should be big enough to prevent stones and gravel from getting stuck to the track roller side rubber.

TRACK ROLLER

Parts Identification

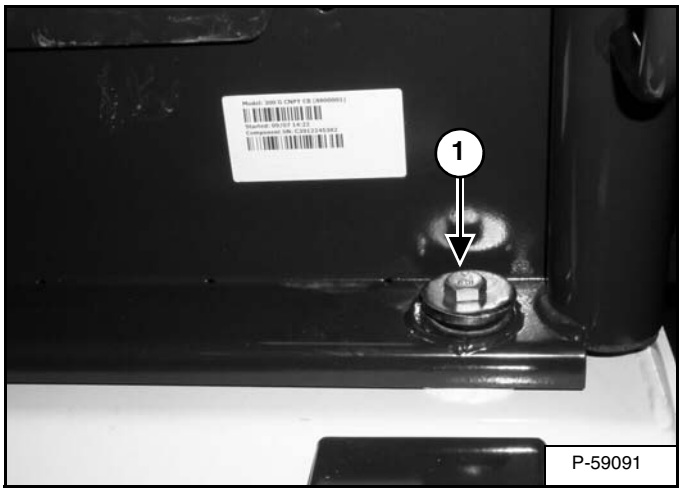
1. Nut
2. Lock Washer
3. Washer
4. Seal
5. Roller
6. Bearing
7. Shaft
8. Snap Ring



PE1914S

Removal And Installation (Cont'd)

Figure 40-20-5



Remove the bolt and washer (Item 1) **[Figure 40-20-5]** from the left rear of the canopy.

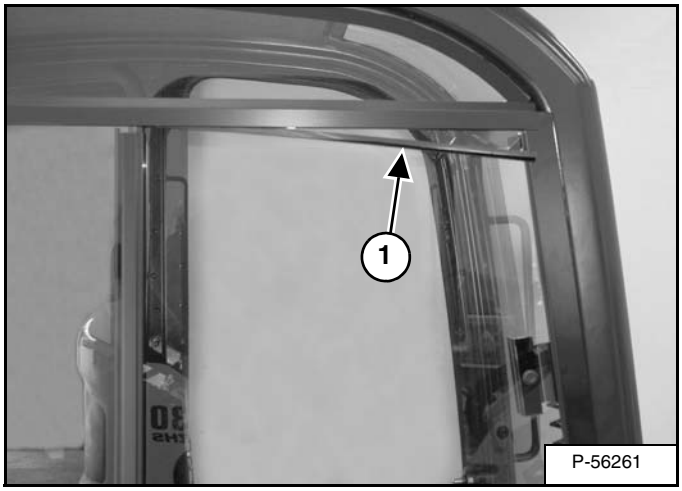
Installation: Tighten the bolt to 160 - 180 N•m (118 - 133 ft-lb) torque.

Remove the canopy from the upperstructure.

Right Side Rear Sliding Window Removal And Installation

Close and latch the front and rear sliding windows.

Figure 40-30-25



Use a pick to pull the felt (Item 1) **[Figure 40-30-25]** from the top window channel.

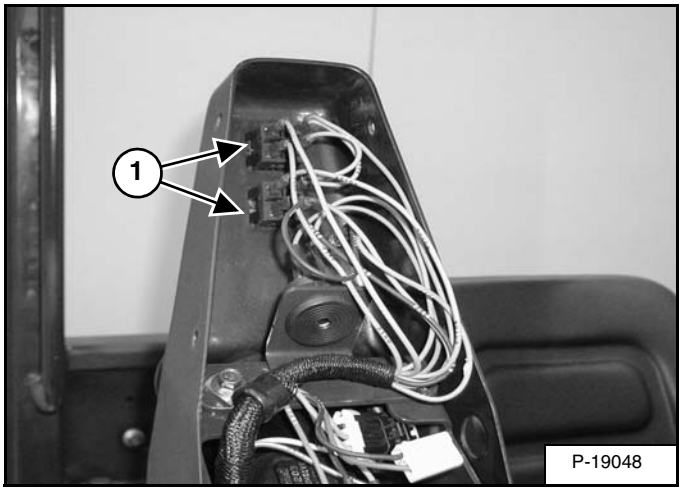
Unlatch the rear sliding window and slide the window open until it stops.

Figure 40-30-26

Lift the window up into the top channel and tilt the bottom edge out **[Figure 40-30-26]**. Remove the window from the cab.

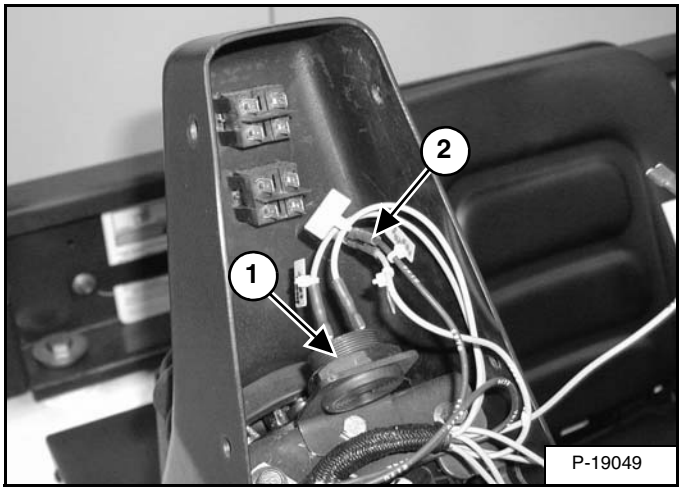
Console Cover Removal And Installation (ROPS Canopy) (Cont'd)

Figure 40-50-14



Mark and remove the wires from the indicator lamps (Item 1) **[Figure 40-50-14]**.

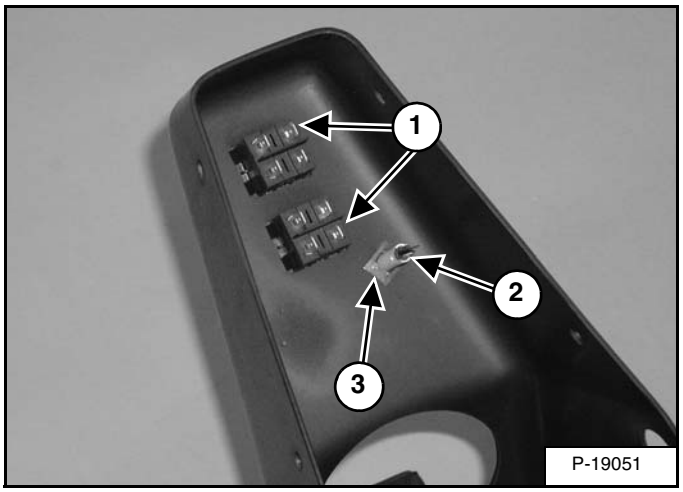
Figure 40-50-15



Mark and remove the wires from the horn (Item 1) and two-speed indicator (Item 2) **[Figure 40-50-15]**.

Lift the console cover over the control lever (joystick) handle.

Figure 40-50-16

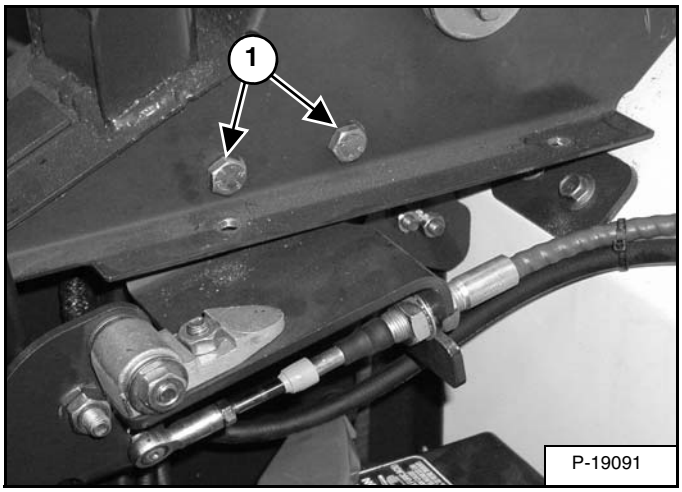


Remove the indicator lights (Item 1) **[Figure 40-50-16]** by squeezing together the mounting tabs on the indicator light and pushing the indicator out of the top of the console cover.

Remove the two-speed indicator (Item 2) by removing the retaining clip (Item 3) **[Figure 40-50-16]** and pushing the indicator out of the top of the console cover.

Console Base Removal And Installation (Cont'd)

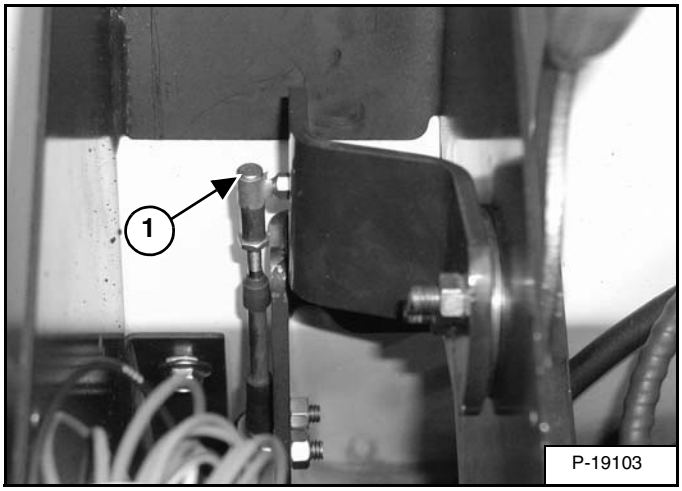
Figure 40-50-44



Remove the bolts and nuts (Item 1) **[Figure 40-50-44]** fastening the blade linkage assembly to the console base.

Remove the blade linkage assembly from the right console.

Figure 40-50-45



Disconnect the speed control cable (Item 1) **[Figure 40-50-45]**.

Figure 40-50-46

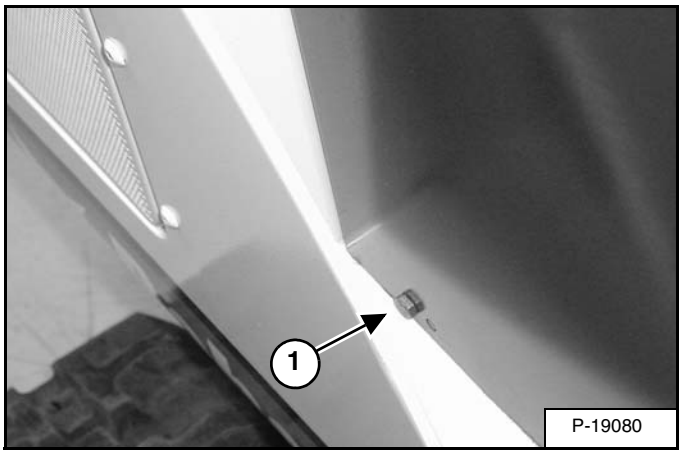
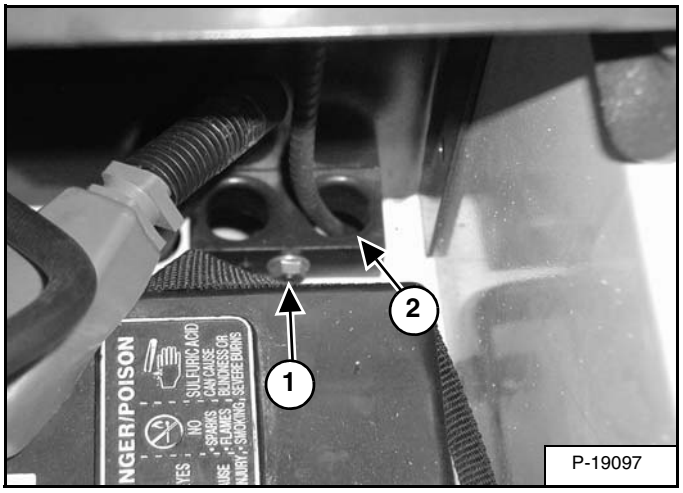


Figure 40-50-47



Remove the bolt and nut (Item 1) **[Figure 40-50-46]** and **[Figure 40-50-47]** holding the plastic block (Item 2) **[Figure 40-50-47]** to the inside console base.

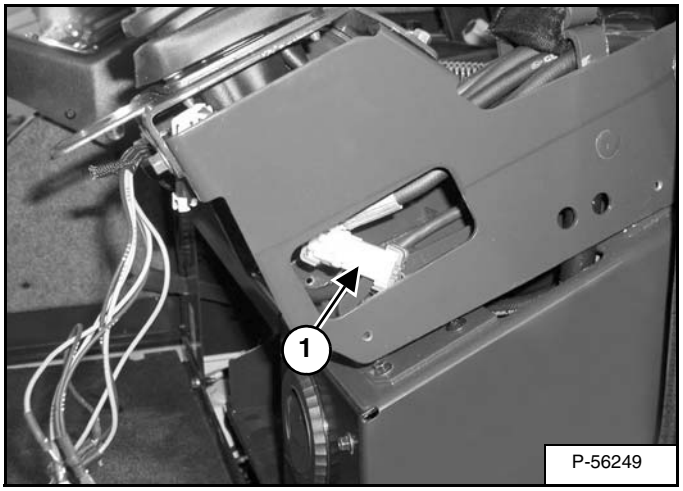
Upper Console Removal And Installation

Lower the boom / bucket and blade to the ground.

Remove the console cover. (See Console Cover Removal And Installation on Page 40-60-1.)

Remove the gas spring. (See Gas Spring Removal And Installation on Page 40-60-3.)

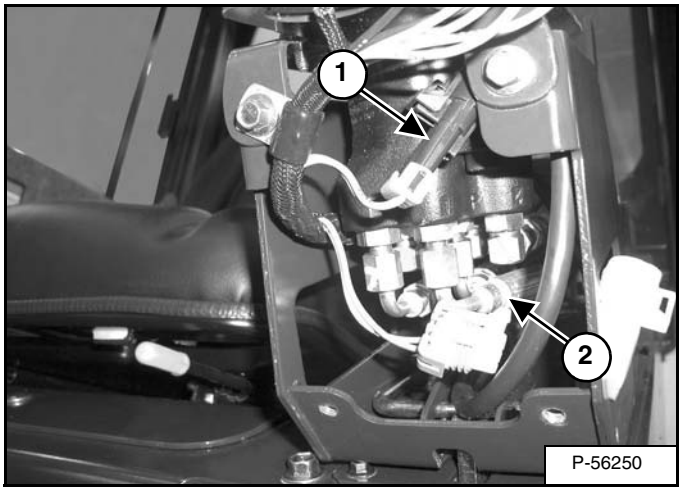
Figure 40-60-24



Disconnect the wire harness (Item 1) **[Figure 40-60-24]**.

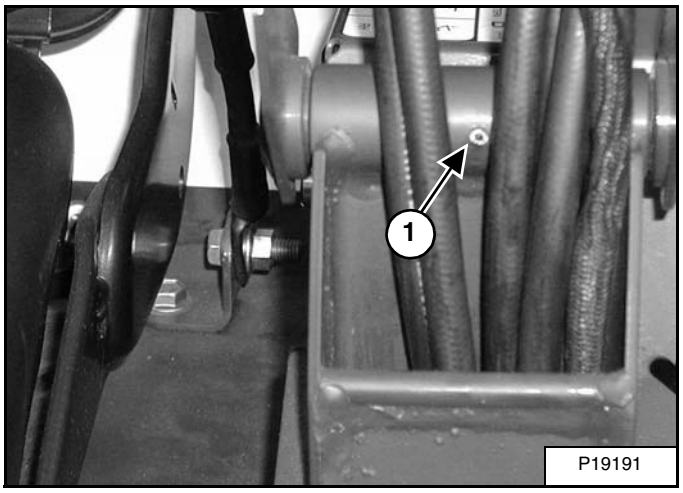
Raise and support the console.

Figure 40-60-25



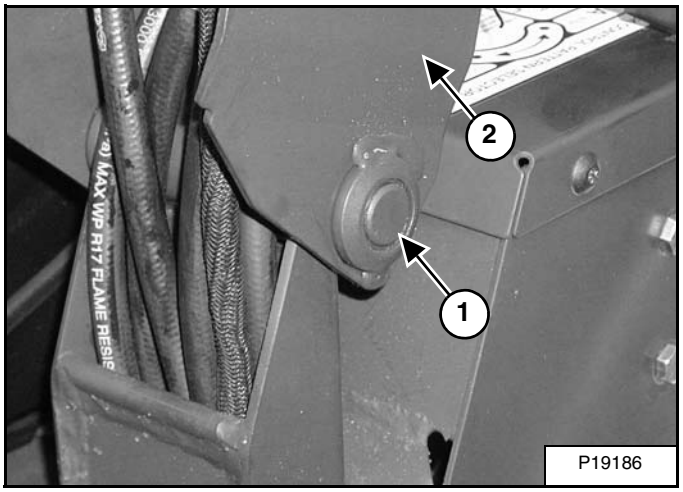
Disconnect the wire harness (Item 1) and remove the hoses (Item 2) **[Figure 40-60-25]** from the control lever (joystick).

Figure 40-60-26



Drive the roll pin (Item 1) **[Figure 40-60-26]** through the pivot shaft towards the back of the console base.

Figure 40-60-27

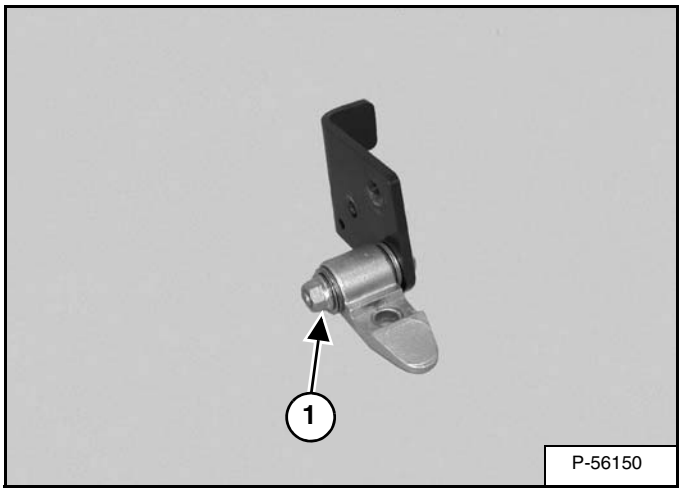


Drive the pivot shaft (Item 1) through and remove the upper console (Item 2) **[Figure 40-60-27]**.

NOTE: Feed the hoses and wire harness through the upper console during removal to avoid hose and harness damage.

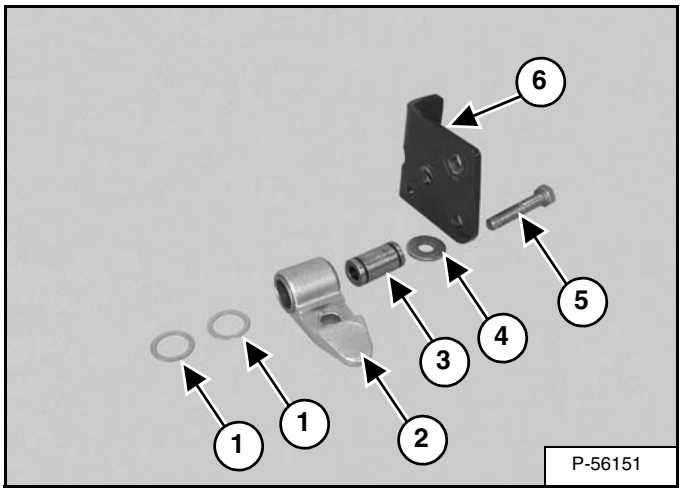
Disassembly And Assembly (Cont'd)

Figure 40-80-8



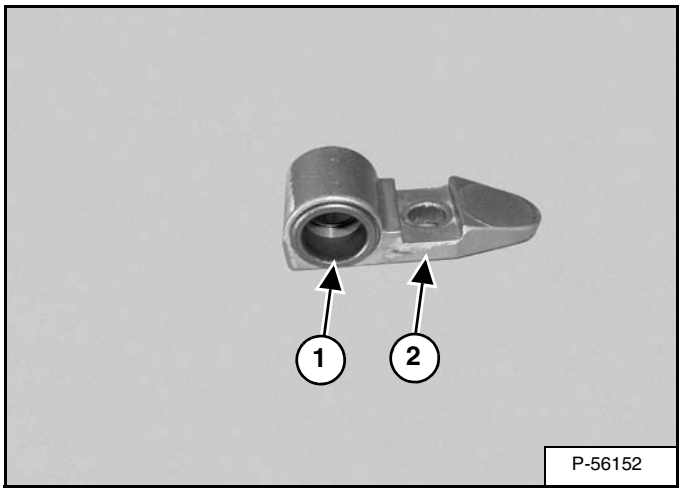
Remove the nut (Item 1) **[Figure 40-80-8]**.

Figure 40-80-9



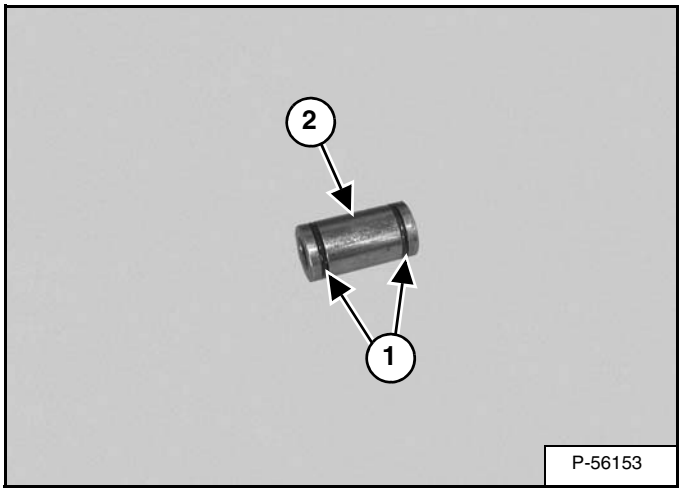
Remove the washers (Item 1), bellcrank (Item 2), sleeve (Item 3), washer (Item 4) and bolt (Item 5) from the pivot mount (Item 6) **[Figure 40-80-9]**.

Figure 40-80-10



Remove the bushing (Item 1) from the bellcrank (Item 2) **[Figure 40-80-10]**. (Both Sides)

Figure 40-80-11



Remove the O-rings (Item 1) from the sleeve (Item 2) **[Figure 40-80-11]**.

LEFT PEDAL

Removal And Installation

Remove the floor mat and floor panels. (See Removal And Installation on Page 40-140-1.)

Figure 40-120-1

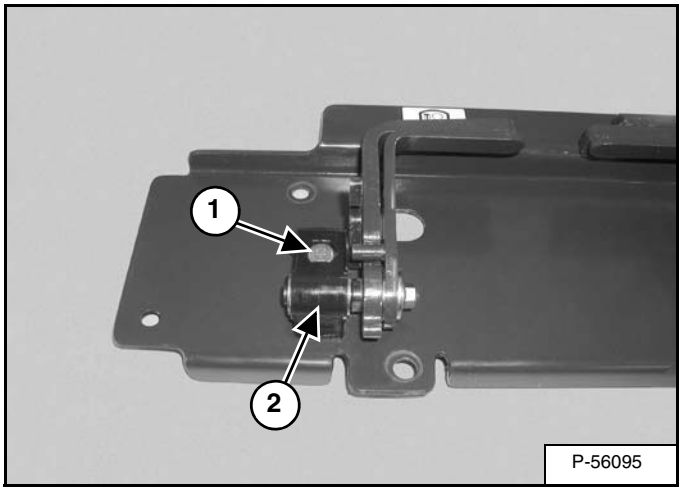
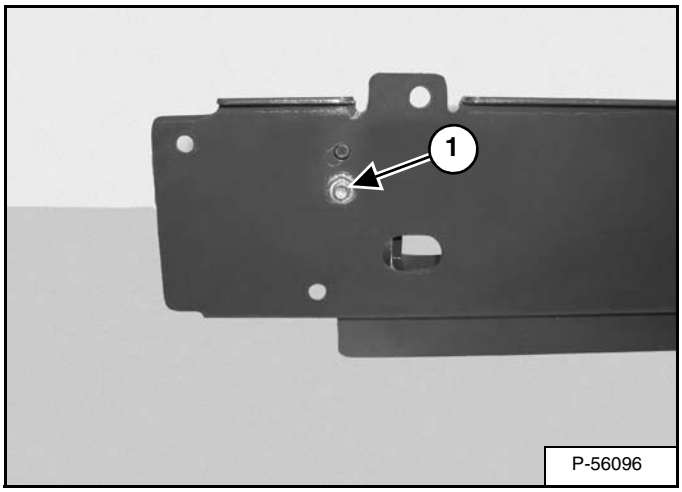


Figure 40-120-2



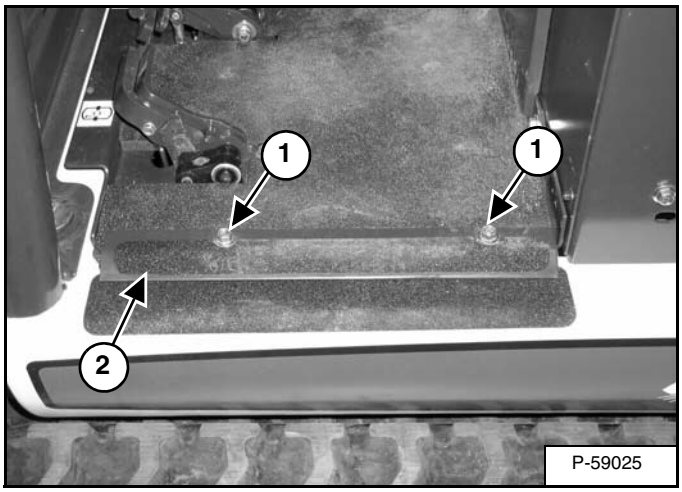
Remove the bolt and nut (Item 1) **[Figure 40-120-1]** and **[Figure 40-120-2]**.

Remove the pedal assembly (Item 2) **[Figure 40-120-1]** from the floor panel.

FLOOR MAT AND FLOOR PANELS

Removal And Installation

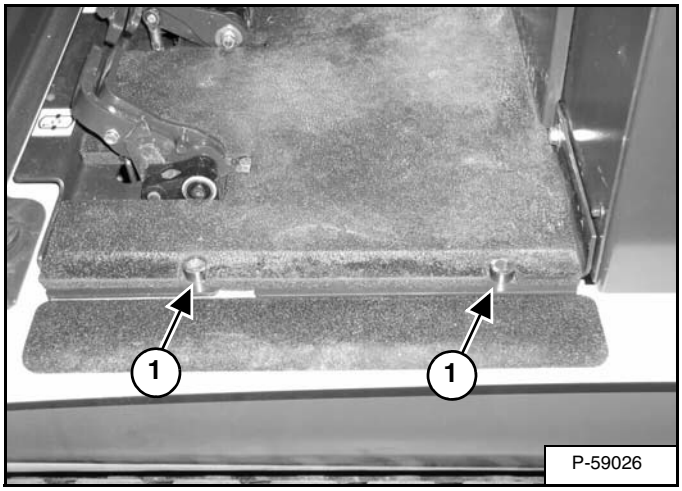
Figure 40-140-1



Remove the bolts (Item 1) **[Figure 40-140-1]** in both floor mat retaining plates.

Remove the floor mat retaining plate (Item 2) **[Figure 40-140-1]** from both sides.

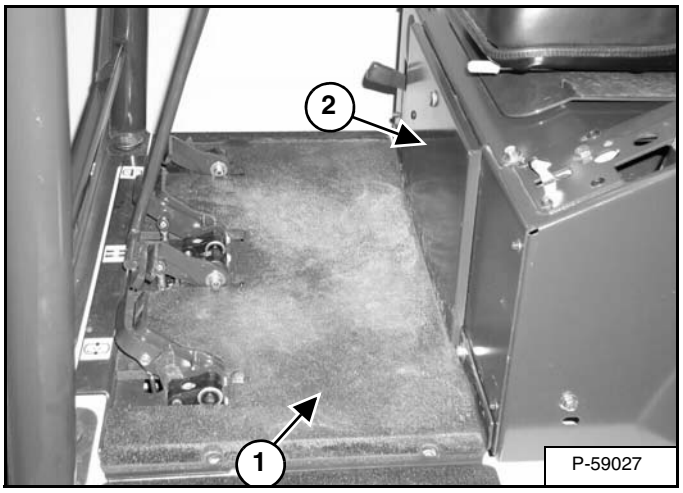
Figure 40-140-2



Remove the spacers (Item 1) **[Figure 40-140-2]** from both sides of the floor mat.

NOTE: Excavators that are equipped with a cab have a floor mat retainer plate only on the door side.

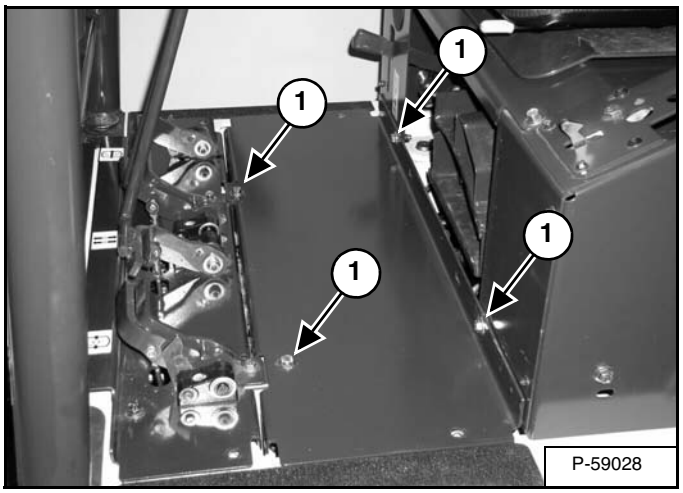
Figure 40-140-3



Remove the floor mat (Item 1) **[Figure 40-140-3]**.

Remove the cover (Item 2) **[Figure 40-140-3]**.

Figure 40-140-4



Remove the bolts (Item 1) **[Figure 40-140-4]** from the rear floor panel.

Remove the rear floor panel.

SWING FRAME

Removal And Installation

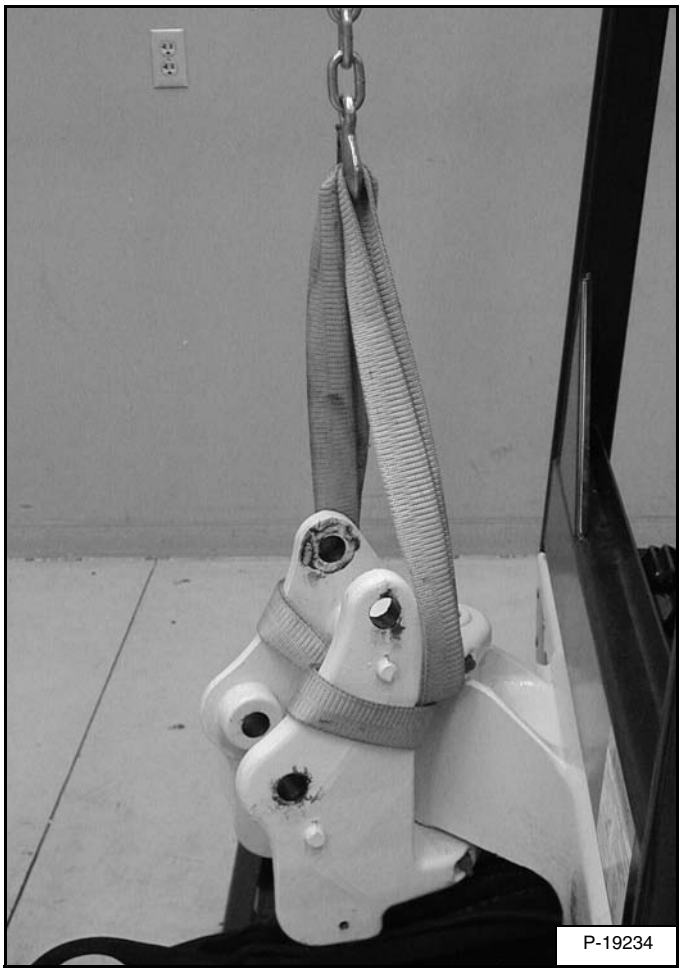
Rotate the upperstructure until the blade is to the rear of the excavator.

Remove the bucket. (See Removal And Installation on Page 40-210-1.)

Remove the arm. (See Removal And Installation on Page 40-200-1.)

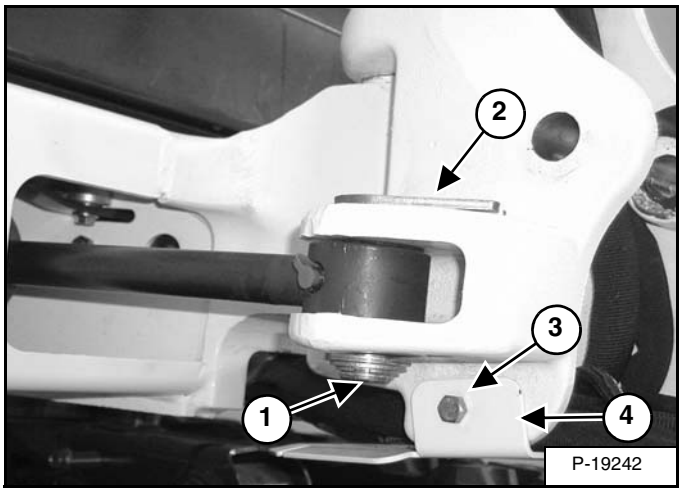
Remove the boom. (See Removal And Installation on Page 40-190-1.)

Figure 40-180-1



Install a chain hoist on the swing frame **[Figure 40-180-1]**.

Figure 40-180-2

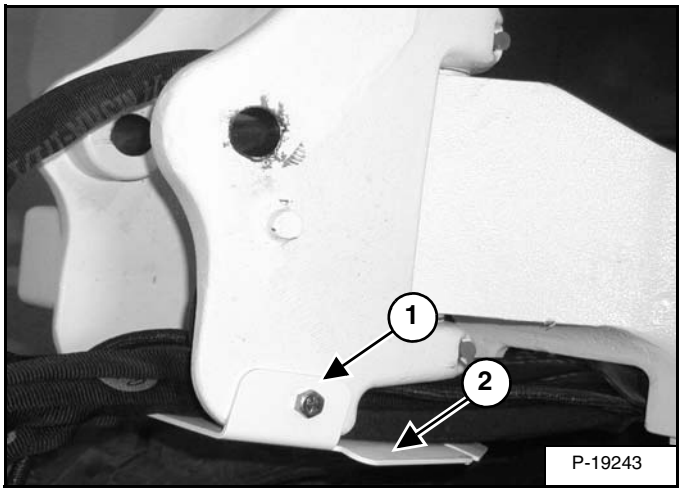


Remove the snap ring and washer (Item 1) **[Figure 40-180-2]** from the cylinder pivot pin.

Remove the pivot pin (Item 2) **[Figure 40-180-2]**.

Remove the bolt (Item 3) from the hose cover plate (Item 4) **[Figure 40-180-2]**.

Figure 40-180-3



Remove the bolt (Item 1) from the hose cover plate (Item 2) **[Figure 40-180-3]**.

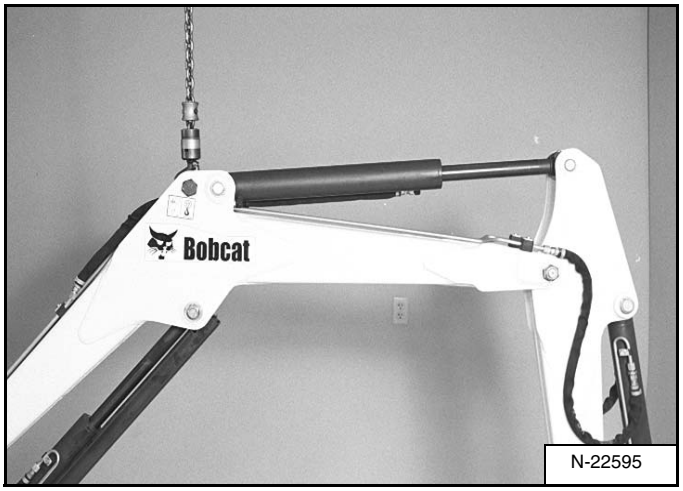
Remove the hose cover plate.

ARM

Removal And Installation

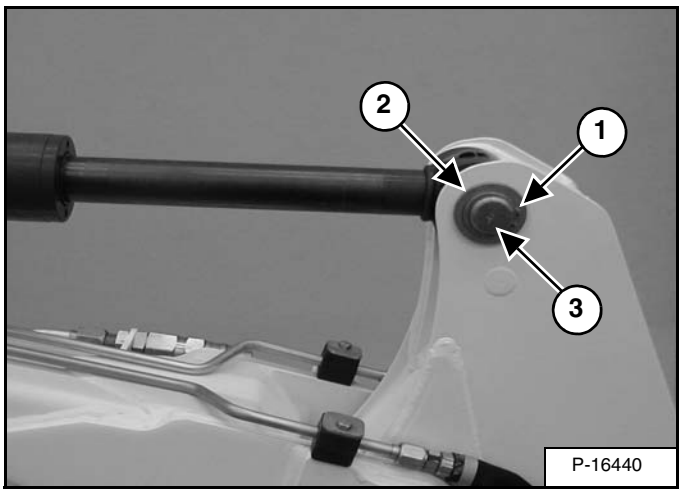
Remove the bucket. (See Removal And Installation on Page 40-210-1.)

Figure 40-200-1



Support the boom with a chain hoist **[Figure 40-200-1]**.

Figure 40-200-2



Remove the snap ring (Item 1) and washer (Item 2) **[Figure 40-200-2]** from the rod end pivot pin.

Remove the pivot pin (Item 3) **[Figure 40-200-2]**.

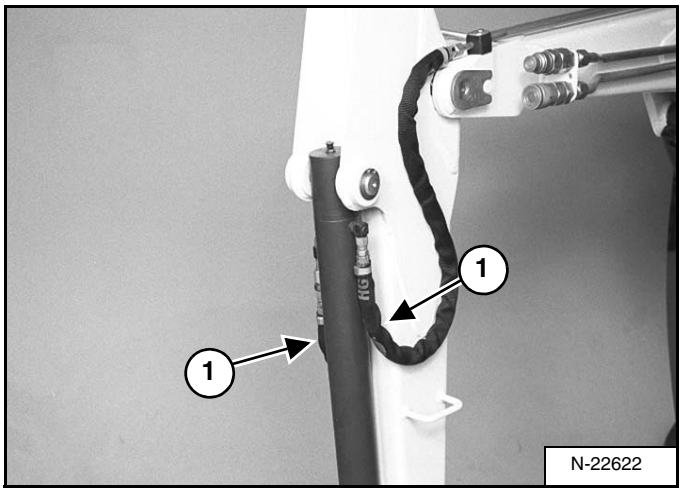
Remove the rod end of the cylinder from the arm.

IMPORTANT

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

I-2003-0888

Figure 40-200-3



Remove the hoses (Item 1) **[Figure 40-200-3]** from the bucket cylinder.

Removal And Installation (Cont'd)

⚠ WARNING

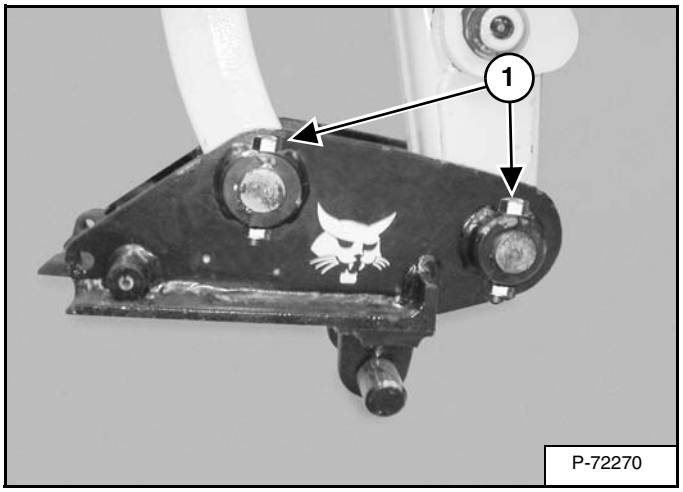
AVOID INJURY OR DEATH

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

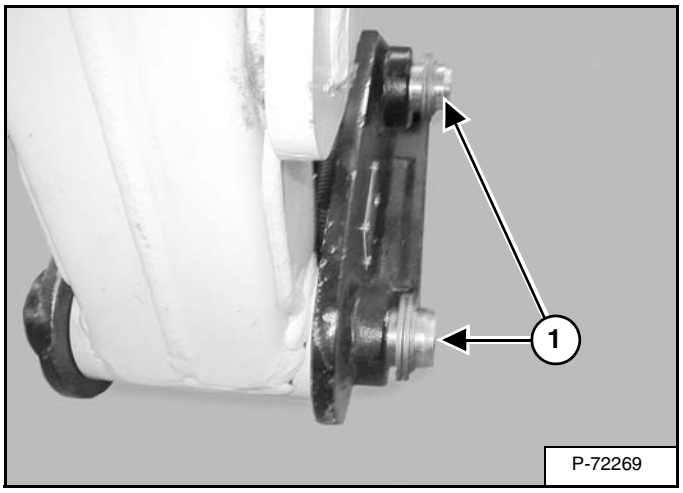
Figure 40-230-4



Remove the bolts (Item 1) **[Figure 40-230-4]** and nuts.

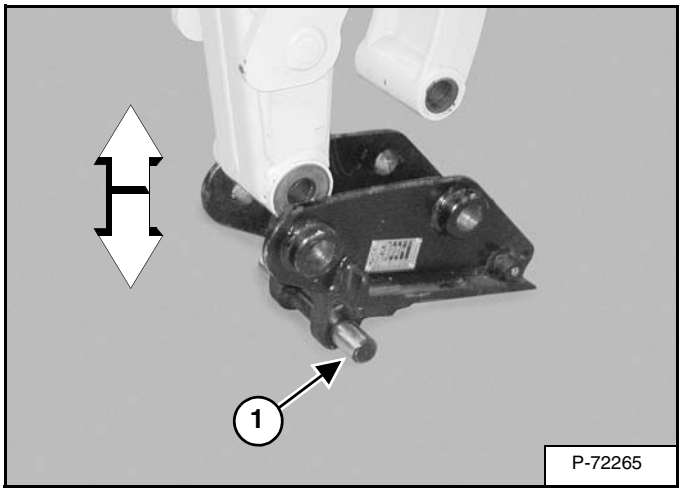
Installation: Align the holes of the connecting pins with the holes in the coupler. Install the two bolts (Item 1) **[Figure 40-230-4]** and nuts. Tighten the nuts securely against the couple.

Figure 40-230-5



Remove pins (Item 1) **[Figure 40-230-5]**.

Figure 40-230-6



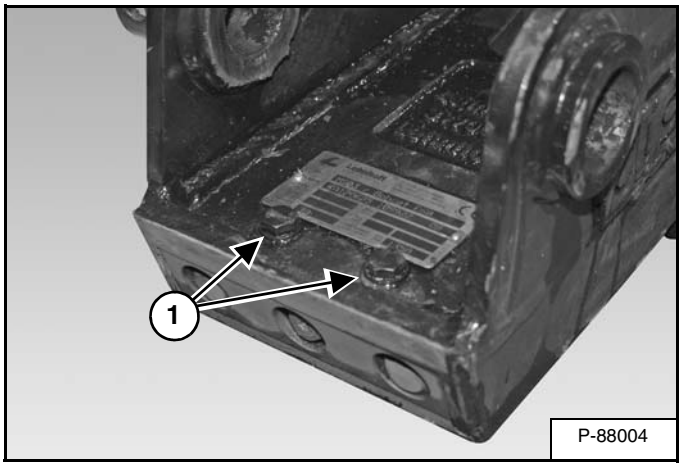
Raise the arm and bucket link until the coupler is free **[Figure 40-230-6]**.

Installation: Align the arm and bucket link with the coupler **[Figure 40-230-6]**. Lower the arm and bucket link into the coupler.

NOTE: Place the coupler on the ground with the mounting pin (Item 1) [Figure 40-230-6] facing towards the excavator.

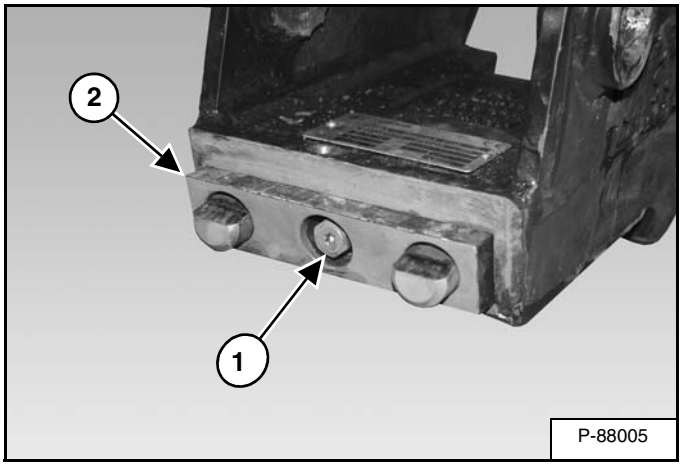
Disassembly And Assembly (MS03)

Figure 40-231-8



Remove the two bolts (Item 1) **[Figure 40-231-8]** and lock washers.

Figure 40-231-9



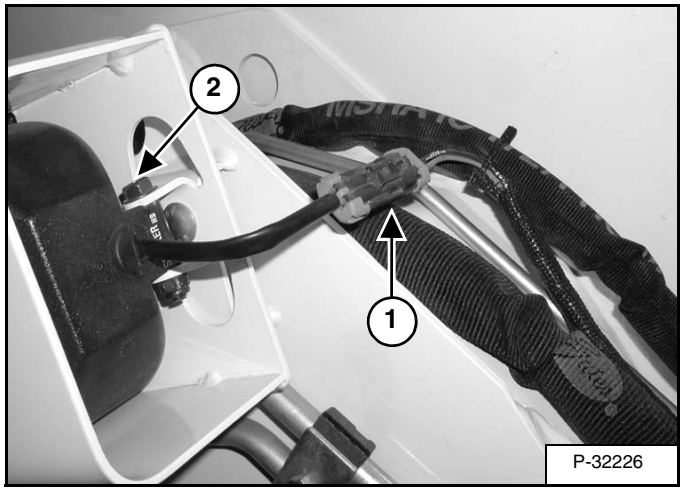
Turn the threaded spindle (Item 1) counterclockwise until the locking mechanism (Item 2) **[Figure 40-231-9]** is free from the housing.

ELECTRICAL SYSTEM AND ANALYSIS


Bobcat®

Boom Light Removal And Installation (Earlier Models)

Figure 50-50-5

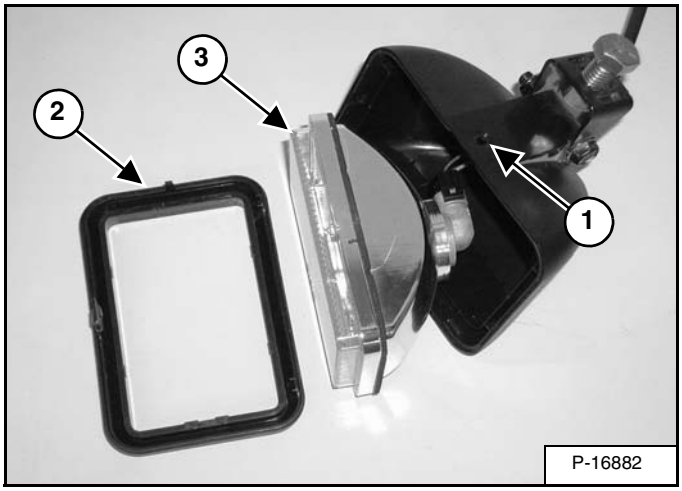


Disconnect the wire harness (Item 1) **[Figure 50-50-5]**.

Remove the nut and bolt (Item 2) **[Figure 50-50-5]**.

Boom Light Disassembly And Assembly (Earlier Models)

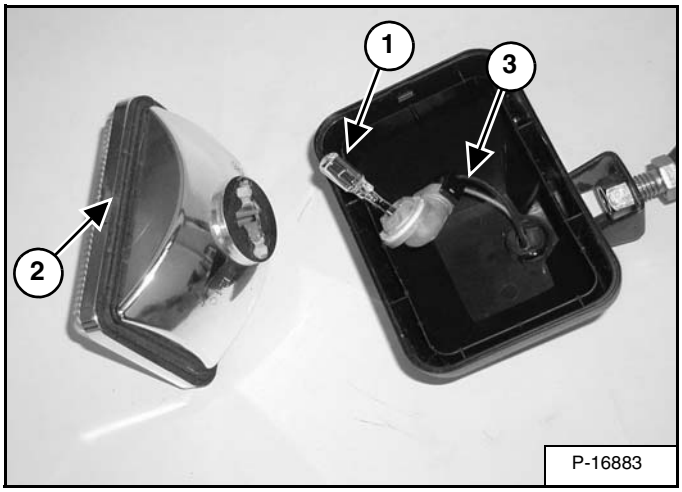
Figure 50-50-6



Remove the screw (Item 1) **[Figure 50-50-6]** from the side of the light.

Remove the cover (Item 2) and lens assembly (Item 3) **[Figure 50-50-6]**.

Figure 50-50-7



Remove the light bulb assembly (Item 1) from the lens assembly (Item 2) **[Figure 50-50-7]**.

Disconnect the wire connector (Item 3) **[Figure 50-50-7]** from the light bulb assembly.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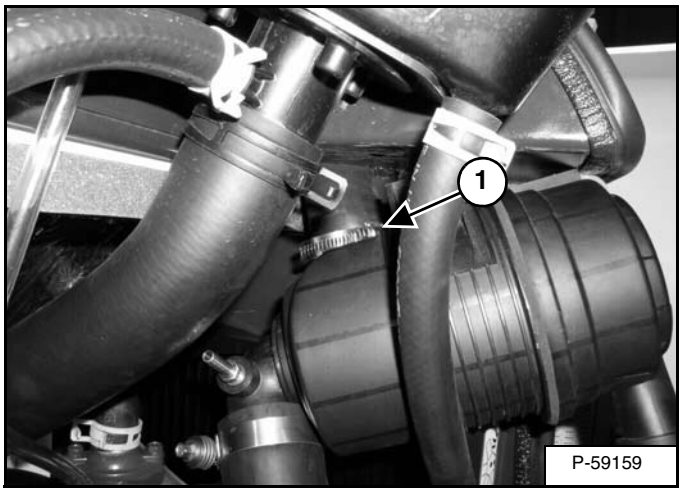
Removal And Installation (Cont'd)

Figure 60-30-5

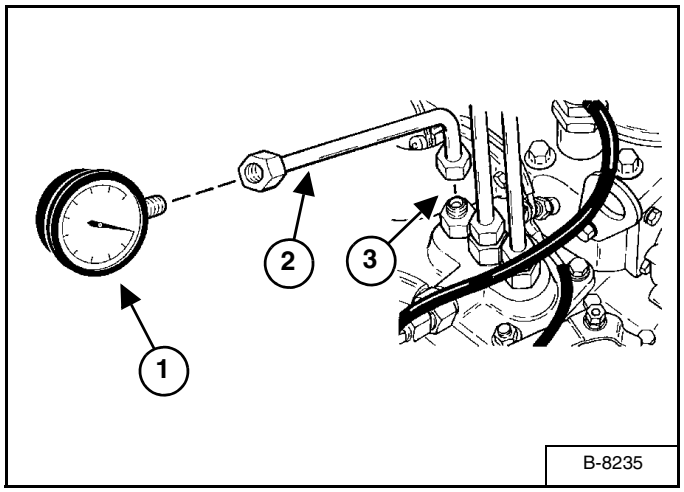


Loosen the hose clamp (Item 1) **[Figure 60-30-5]** and remove hose from the top of the air cleaner.

Remove the air cleaner and intake hose assembly from the excavator.

Fuel Injection Pump Check (Cont'd)

Figure 60-50-8



Connect a pressure gauge (Item 1) to the long leg of the test tubeline (Item 2) **[Figure 60-50-8]** and tighten.

Connect the short leg of the tubeline to the fitting at the fuel injection pump (Item 3) **[Figure 60-50-8]**.

Set the speed control lever to the maximum engine speed position to allow full fuel delivery.

Fuel Tighteness of Pump Element

With the starter, rotate the engine to increase the pressure to 13727 kPa (137 bar) (1991 psi).

If the pressure cannot be reached, replace the pump with a new one or send to a Kubota-authorized pump service shop.

Fuel Tightness of Delivery Valve

Manually turn the flywheel to raise the pressure to approx. 13727 kPa (137 bar) (1991 psi). Now turn the flywheel back about 1/2 turn (to keep the plunger free), and clock the time taken for the pressure to drop from 13727 - 12748 kPa (137 - 127 bar) (1991 - 1849 psi).

The pressure should hold at 13727 kPa (137 bar) (1991 psi), for at least 5 seconds or more.

If the time is less than the allowable limit, replace the pump with a new one, or send to a Kubota-authorized pump service shop.

Fuel Injection Pump Removal And Installation

IMPORTANT

Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

I-2028-0289

Clean the injection pump and area around it with a cleaning solvent or steam cleaning.

IMPORTANT

Never steam clean or put cold water on an injection pump while the engine is running or while it is hot. If you do it will cause serious damage to the injection pump.

I-2135-0997

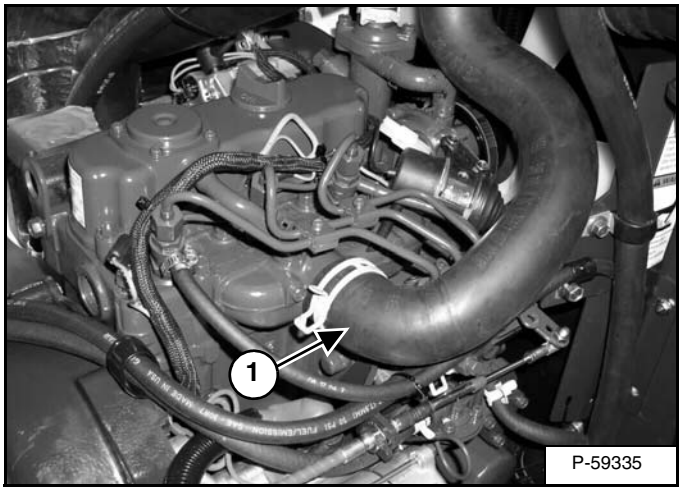
IMPORTANT

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

I-2029-0289

Clean around the injection pump.

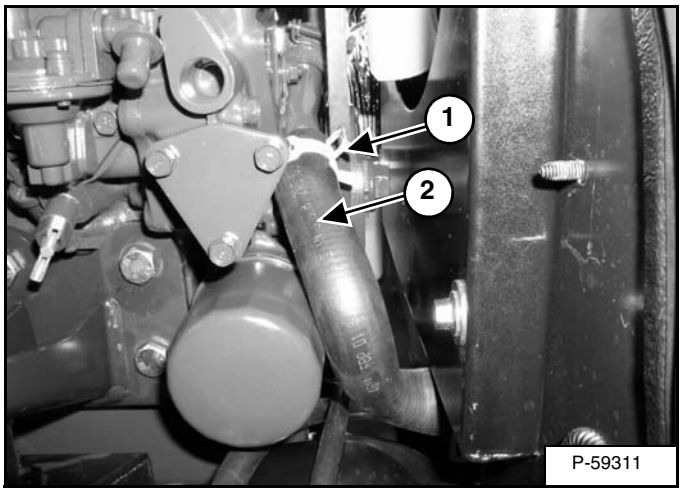
Figure 60-50-9



Remove the air intake hose (Item 1) **[Figure 60-50-9]** and cap.

Removal And Installation (Cont'd)

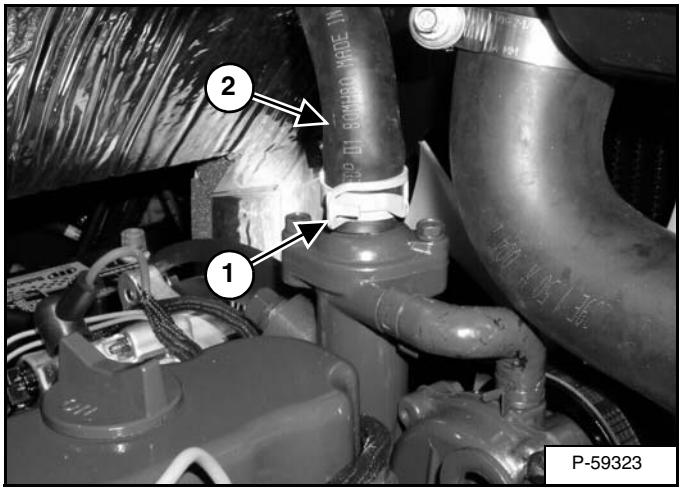
Figure 60-60-3



Slide the hose clamp (Item 1) **[Figure 60-60-3]** away from the end of the lower radiator hose.

Remove the lower radiator hose (Item 2) **[Figure 60-60-3]** and cap.

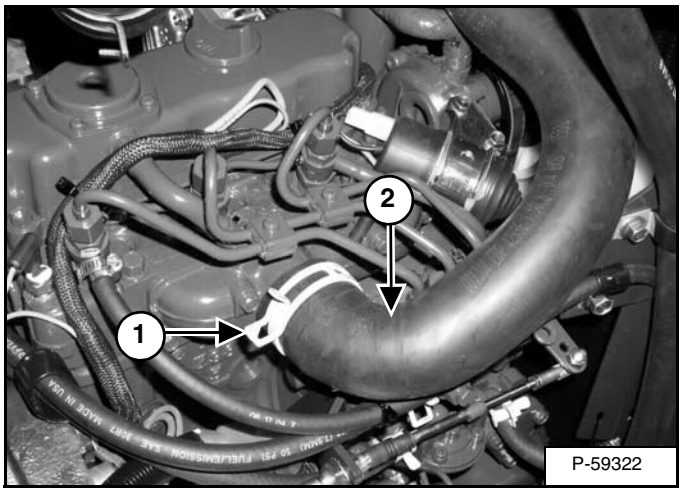
Figure 60-60-4



Slide the hose clamp (Item 1) **[Figure 60-60-4]** away from the end of the upper radiator hose.

Remove the upper radiator hose (Item 2) **[Figure 60-60-4]** and cap.

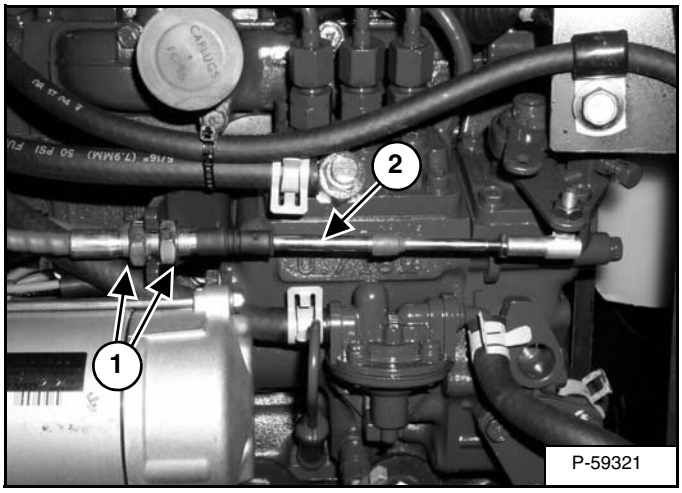
Figure 60-60-5



Slide the hose clamp (Item 1) **[Figure 60-60-5]** away from the end of the air in-take hose.

Remove the air in-take hose (Item 2) **[Figure 60-60-5]** and cap.

Figure 60-60-6



Loosen the nuts (Item 1) **[Figure 60-60-6]** fastening the throttle cable to the bracket.

Disconnect the throttle linkage (Item 2) **[Figure 60-60-6]** from the throttle bracket.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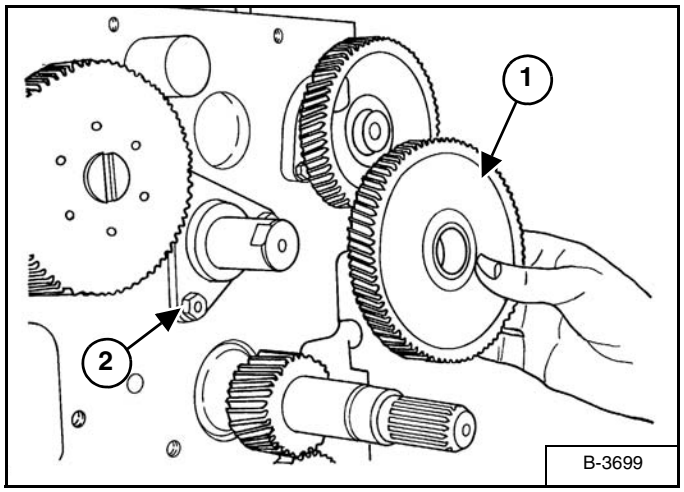
Idler Gear And Camshaft Removal And Installation (Cont'd)

Figure 60-80-31

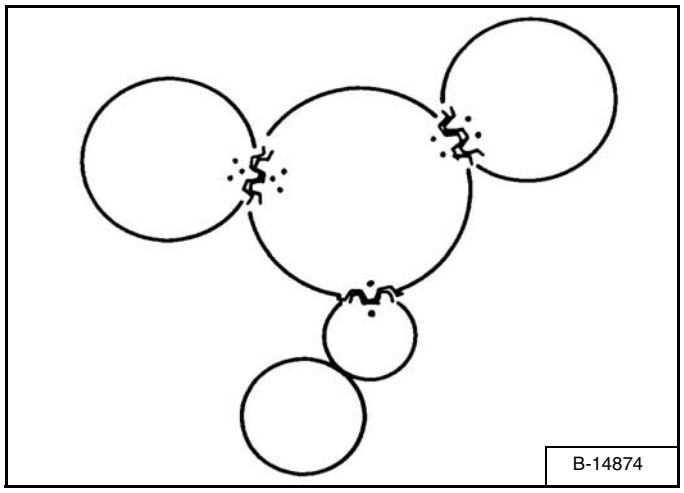


Remove the idler gear (Item 1) **[Figure 60-80-31]**.

Remove idler gear mounting screws (Item 2) **[Figure 60-80-31]**.

Installation: Tighten screws to 10 - 11 N•m (7 - 8 ft-lb) torque.

Figure 60-80-32

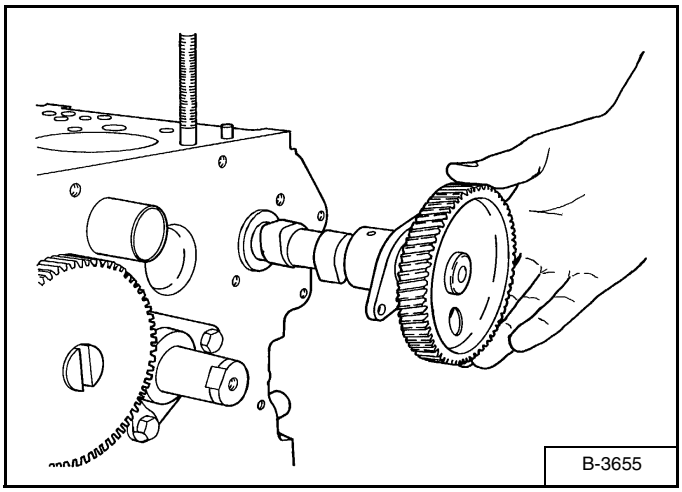


Installation: Make sure the timing marks are in correct alignment when installing the timing gears **[Figure 60-80-32]**.

Align the holes on the camshaft gear with the camshaft retainer plate bolts.

Remove the bolts.

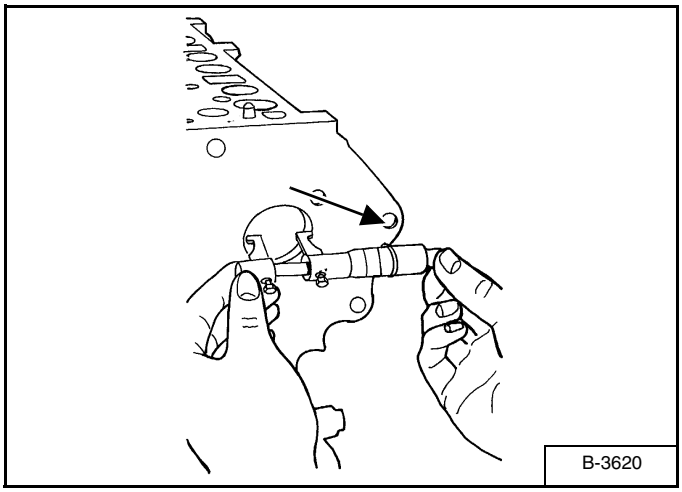
Figure 60-80-33



Remove the camshaft from the engine block **[Figure 60-80-33]**.

Installation: Tighten the camshaft retainer bolts to 18 - 21 N•m (14 - 15 ft-lb) torque.

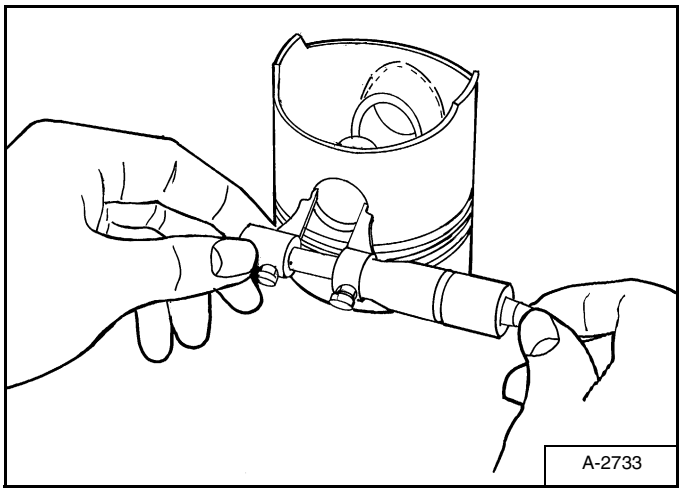
Figure 60-80-34



Measure the camshaft bearing in the engine block **[Figure 60-80-34]**.

Piston And Connecting Rod, Servicing

Figure 60-80-58

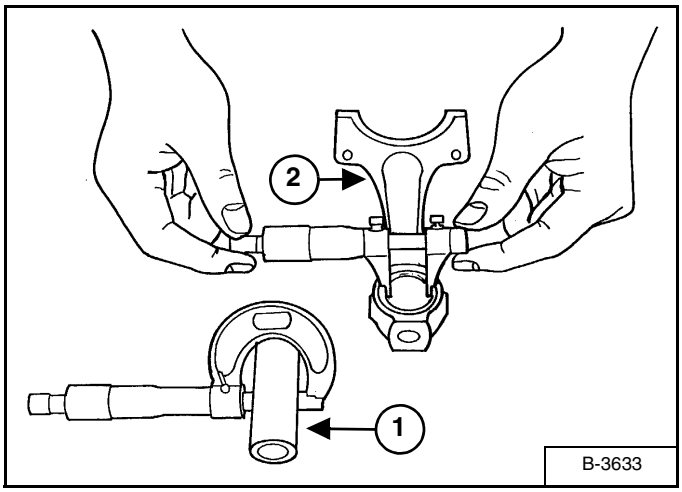


Measure the I.D. of the piston pin bore in both horizontal and vertical direction **[Figure 60-80-58]**.

If the measurement exceeds the allowable limit, replace the piston.

Piston Pin Bore I.D.	20,00 - 20,013 mm
	(0.7874 - 0.7879 in)
Allowable Limit	20,05 mm (0.789 in)

Figure 60-80-59



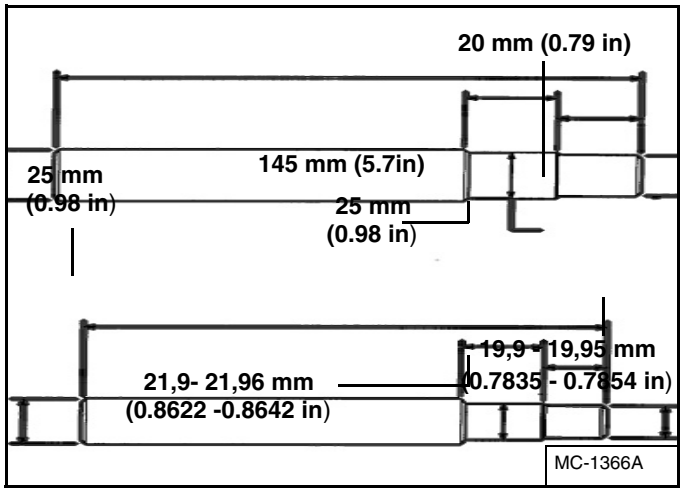
Measure the O.D. of the piston pin (Item 1) **[Figure 60-80-59]**.

Measure the I.D. of the connecting rod small end (Item 2) **[Figure 60-80-59]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the bushing. If it still exceeds the specifications, replace the piston pin.

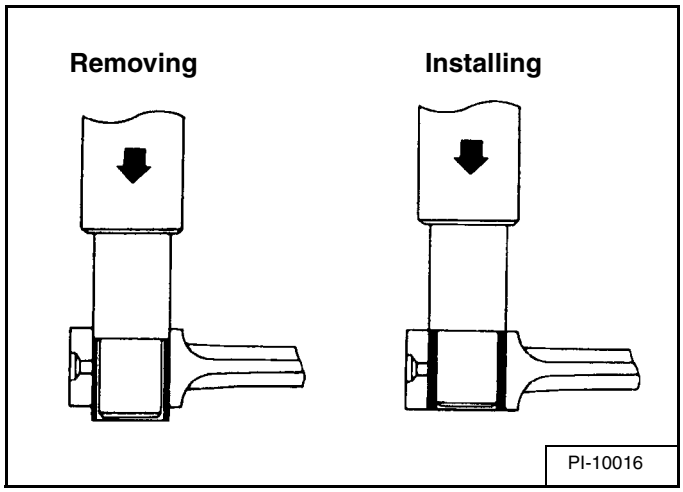
Piston Pin O.D.	20,002 - 20,011 mm (0.7875 - 0.7878 in)
Bushing I.D.	20,025 - 20,04 mm (0.7884 - 0.7890 in)
Oil Clearance between Piston Pin Bushing	0,014 - 0,038 mm (0.0006 - 0.0015 in)
Allowable Limit	0,10 mm (0.004 in)

Figure 60-80-60



To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 60-80-60]**.

Figure 60-80-61



Use a press and special driver tool to remove the small end bushing **[Figure 60-80-61]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 60-80-61]**.


Bobcat®

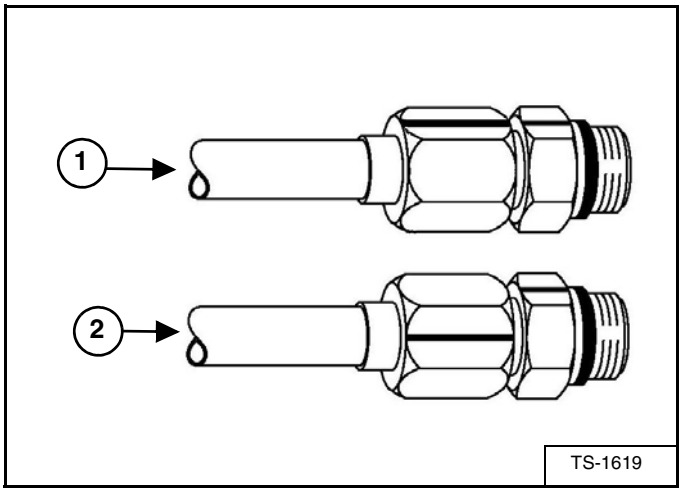
Electrical

Alternator	12 volts, 40 amp, open frame with internal regulator
Battery	12 volt negative ground 530 CCA @ -18°C (0°F), 75 minute reserve capacity
Starter	12 volt 1,4 kW (1.9 hp) Reduction Drive
Lights (2)	37.5 watts each

Flare Fitting

Use the following procedure to tighten the flare fitting:

Figure SPEC-40-3



Tighten the nut until it makes contact with the seat. Make a mark across the *flats* of both the male and female parts of the connection (Item 1) **[Figure SPEC-40-3]**.

Use the chart below to find the correct tightness needed (Item 2) **[Figure SPEC-40-3]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

FLARE FITTING TIGHTENING TORQUE					
WRENCH SIZE	**TUBELINE OUTSIDE DIAMETER**	**THREAD SIZE**	**TORQUE N•M (FT-LB)**	**NEW ROTATE NO. OF HEX FLATS**	**RE-ASSEMBLY ROTATE NO. OF HEX FLATS**
5/8"	5/16"	1/2" - 20	17 (23)	2-1/2	1
11/16"	3/8"	9/16" - 18	22 (30)	2	1
7/8"	1/2"	3/4" - 16	40 (54)	2	1
1"	5/8"	7/8" - 14	60 (81)	1-1/2	1
1-1/4"	3/4"	1-1/16" - 12	84 (114)	1	3/4
1-3/8"	1"	1-5/16" - 12	118 (160)	3/4	3/4

CONVERSIONS (CONT'D)

U.S. To Metric Conversion Chart

	TO CONVERT	INTO	MULTIPLY BY
LINEAR MEASUREMENT	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
AREA	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
VOLUME	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
WEIGHT	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
PRESSURE	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton–Meter	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9