Bobcat®

Service Manual

E35

Compact Excavator

B3Y211001 & Above

7311302enUS (07-19) (E)

Printed in U.S.A.

T4-K

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

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

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 Compact Excavator Operator Training Course is available through your local dealer or at **Bobcat.com/training** or **Bobcat.com**. This course is intended to provide rules and practices of correct operation of the Bobcat excavator. The course is available in English and Spanish versions.
- Service Safety Training Courses are available from your Bobcat dealer or at **Bobcat.com/training** or **Bobcat.com**. They provide information for safe and correct service procedures.
- The Bobcat compact excavator Safety Video is available from your Bobcat dealer or at **Bobcat.com/training** or **Bobcat.com**.

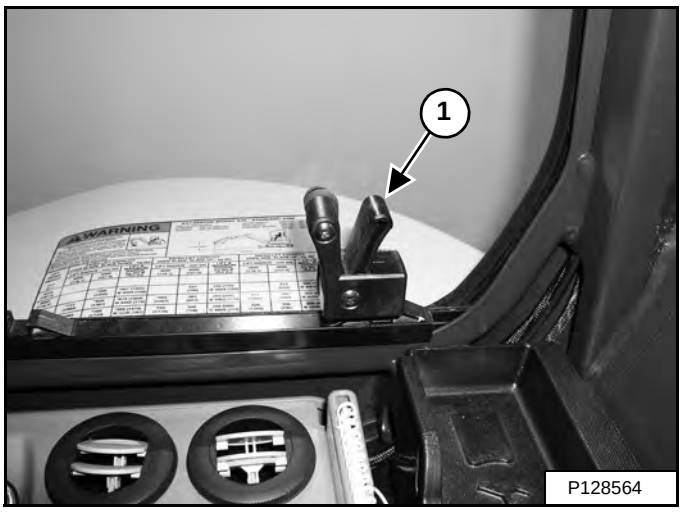
SI EXC-1016 SM

REMOTE START TOOL (SERVICE TOOL) KIT - 7217666 10-221-1
Description 10-221-1
Remote Start Tool (Service Tool) - 7022042 10-221-2
Excavator Service Tool Harness - 6689747 10-221-3
Computer Service Tool Harness - 6689746 10-221-4

Right Side Windows

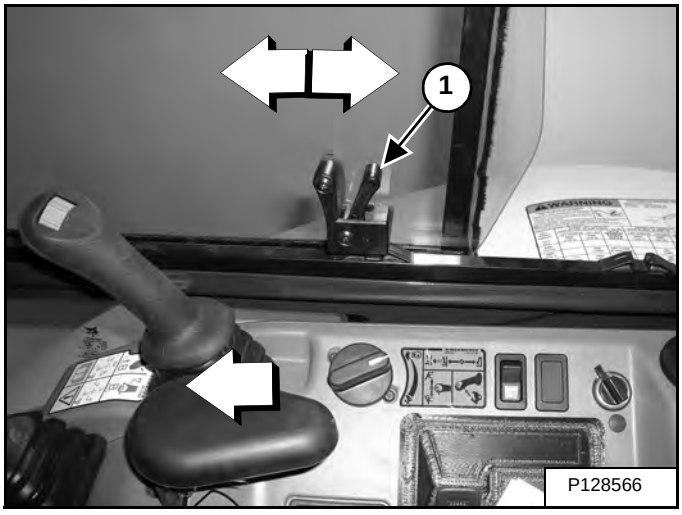
Opening The Right Rear Window

Figure 10-30-10



Pull up on the bottom latch (Item 1) **[Figure 10-30-10]**.

Figure 10-30-11



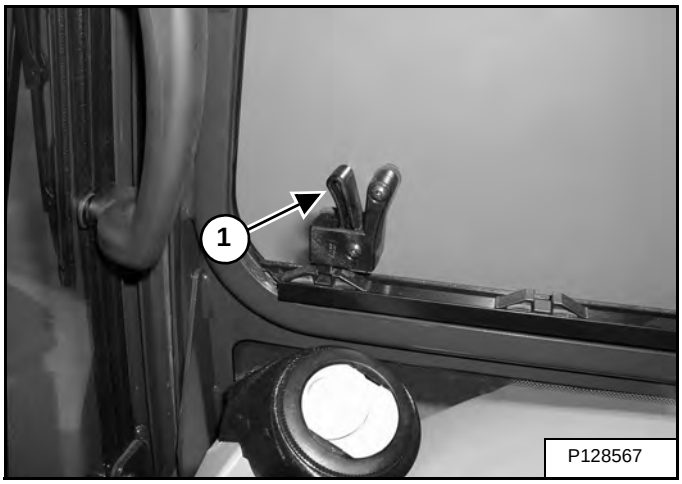
Pull the latch (Item 1) **[Figure 10-30-11]** forward to open the window to the desired position. Release the bottom latch and snap the lock back in place.

Closing The Right Rear Window

Pull up on the bottom latch (Item 1) **[Figure 10-30-10]** and push the latch back to close the window.

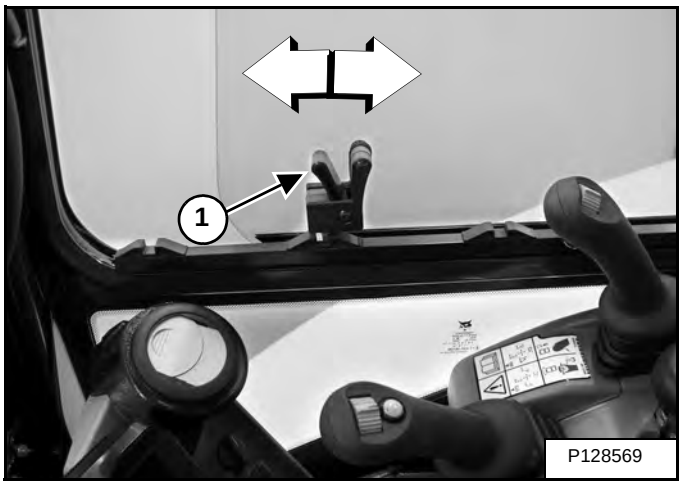
Opening The Right Front Window

Figure 10-30-12



Pull up on the bottom latch (Item 1) **[Figure 10-30-12]**.

Figure 10-30-13



Pull the latch (Item 1) **[Figure 10-30-13]** back to open the window to the desired position. Release the bottom latch and snap the lock back in place.

Closing The Right Front Window

Pull up on the bottom latch (Item 1) **[Figure 10-30-13]** and push the latch forward to close the window.

SERVICE SCHEDULE

Maintenance Intervals

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures.

The service schedule is a guide for correct maintenance of the Bobcat excavator.

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

Every 10 Hours (Before Starting The Excavator)

- **Engine Oil** - Check level and add as needed.
- **Engine Air Filters and Air System** - Check the condition indicator. Service only when required. Check for leaks and damaged components.
- **Engine Cooling System** - Check coolant level COLD and add premixed coolant as needed.
- **Seat Belt, Seat Belt Retractors, Seat Belt Mounting hardware** - Check the condition of seat belt and mounting hardware. Clean or replace seat belt retractors as needed. Clean dirt and debris from moving parts.
- **Control Console Lockout** - Check the control console lockout lever for proper operation.
- **Motion Alarm and Horn** - Check for proper function.
- **Operator Canopy / Cab** - Check the canopy / cab condition and mounting hardware.
- **Operator Cab and HVAC Filters** - Clean filters.
- **Indicators and Lights** - Check for correct operation of all indicators and lights.
- **Safety Signs** - Check for damaged signs (decals). Replace any signs that are damaged.
- **Hydraulic Fluid** - Check fluid level and add as needed.
- **Fuel Filter** - Drain water and sediment from filter.
- **Track Tension** - Check tension and adjust as needed.
- **Pivot Points** - Grease all machinery pivot points. Grease clamp (if equipped).
- **[X-Change / (for NA)] Attachment Coupler** - Check for damage or loose parts (if equipped).

First 50 Hours

- **Engine Oil and Filter** - Replace oil and filter.
- **Alternator and Starter** - Check connections.
- **Fuel Filter** - Replace filter.

Every 50 Hours

- **Swing Bearing** - Grease swing bearing and swing pinion. Service every 10 hours when operating in water.

SS EXC E32 - E60 S5-T4 B-K - 0319

FUEL SYSTEM

Fuel Specifications

NOTE: Contact your local fuel supplier to receive recommendations for your region.

At a minimum, low sulfur diesel fuel must be used in this machine. Low sulfur is defined as 500 mg/kg (500 ppm) sulfur maximum.

U.S. Standard (ASTM D975)

Use only clean, high quality diesel fuel, Grade Number 2-D or Grade Number 1-D.

Ultra low sulfur diesel fuel may also be used in this machine. Ultra low sulfur is defined as 15 mg/kg (15 ppm) sulfur maximum.

The following is one suggested blending guideline that should prevent fuel gelling during cold temperatures:

TEMPERATURE	GRADE 2-D	GRADE 1-D
Above -9°C (+15°F)	100%	0%
Down to -21°C (-5°F)	50%	50%
Below -21°C (-5°F)	0%	100%

NOTE: Biodiesel blend fuel may also be used in this machine. Biodiesel blend fuel must contain no more than five percent biodiesel mixed with ultra low sulfur petroleum based diesel. This biodiesel blend fuel is commonly marketed as B5 blended diesel fuel. B5 blended diesel fuel must meet ASTM specifications.

E.U. Standard (EN590)

Use only clean, high quality diesel fuel that meets the specifications listed below:

- Low sulfur diesel fuel defined as 500 mg/kg (500 ppm) sulfur maximum.
- Diesel fuel with cetane number of 51.0 and above.

Clean, high quality diesel fuel that meets the EN590 specification may also be used.

Biodiesel Blend Fuel

Biodiesel blend fuel has unique qualities that should be considered before using in this machine:

- Cold weather conditions can lead to plugged fuel system components and hard starting.
- Biodiesel blend fuel is an excellent medium for microbial growth and contamination which can cause corrosion and plugging of fuel system components.
- Use of biodiesel blend fuel may result in premature failure of fuel system components, such as plugged fuel filters and deteriorated fuel lines.
- Shorter maintenance intervals may be required, such as cleaning the fuel system and replacing fuel filters and fuel lines.
- Using biodiesel blended fuels containing more than five percent biodiesel can affect engine life and cause deterioration of hoses, tubelines, injectors, injector pump, and seals.

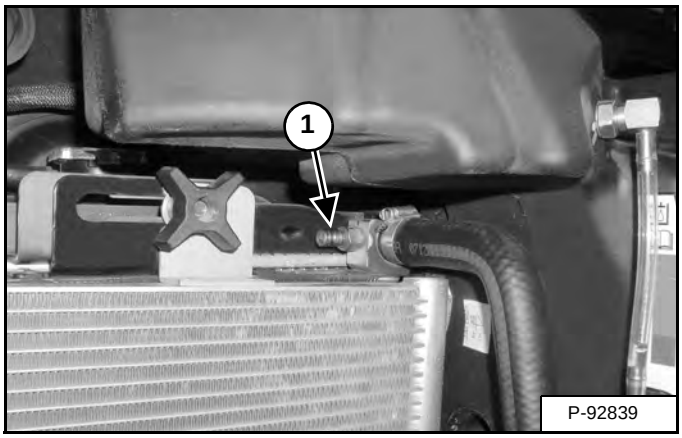
Apply the following guidelines if biodiesel blend fuel is used:

- Ensure the fuel tank is as full as possible at all times to prevent moisture from collecting in the fuel tank.
- Ensure that the fuel tank cap is securely tightened.
- Biodiesel blend fuel can damage painted surfaces, remove all spilled fuel from painted surfaces immediately.
- Drain all water from the fuel filter daily before operating the machine.
- Do not exceed engine oil change interval. Extended oil change intervals can cause engine damage.
- Before vehicle storage; drain the fuel tank, refill with 100% petroleum diesel fuel, add fuel stabilizer and run the engine for at least 30 minutes.

NOTE: Biodiesel blend fuel does not have long-term stability and should not be stored for more than 3 months.

Removing And Replacing Hydraulic Fluid (Cont'd)

Figure 10-130-9



There is also a port (Item 1) **[Figure 10-130-9]** on the hydraulic cooler for bleeding air. Install a diagnostic coupler and hose on this fitting and to allow air to be bled from the hydraulic system after the hydraulic fluid has been replaced.

Start the engine and operate the machine through the hydraulic functions. Stop the engine. Check the fluid level and add as needed.

SPARK ARRESTER MUFFLER

Cleaning Procedure

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

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.

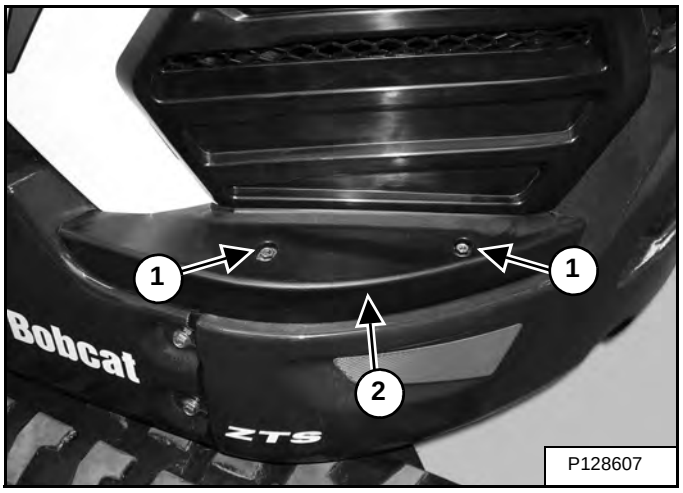
Failure to do so can cause injury or death.

W-2203-0595

Do not operate the excavator with a defective exhaust system.

Remove the fuel cap.

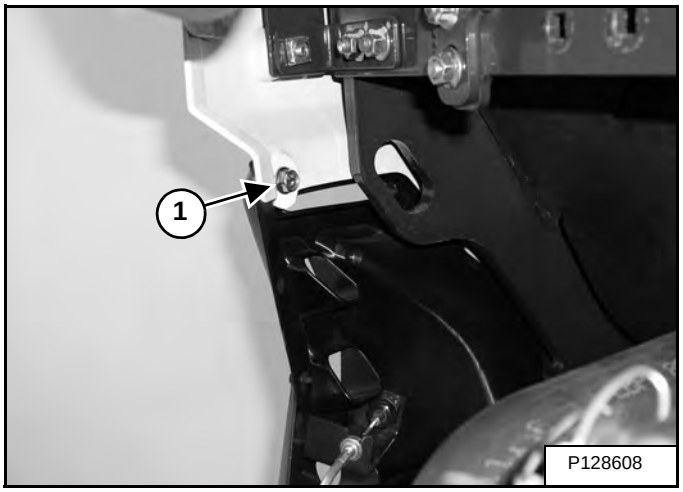
Figure 10-170-1



Remove the two bolts (Item 1) and remove the cover (Item 2) **[Figure 10-170-1]**.

Open the tailgate. (See Opening And Closing on Page 10-50-1.)

Figure 10-170-2



Remove the bolt (Item 1) **[Figure 10-170-2]** and position the left hand screen out of the way.

Reinstall the fuel cap to keep debris from entering the fuel tank.

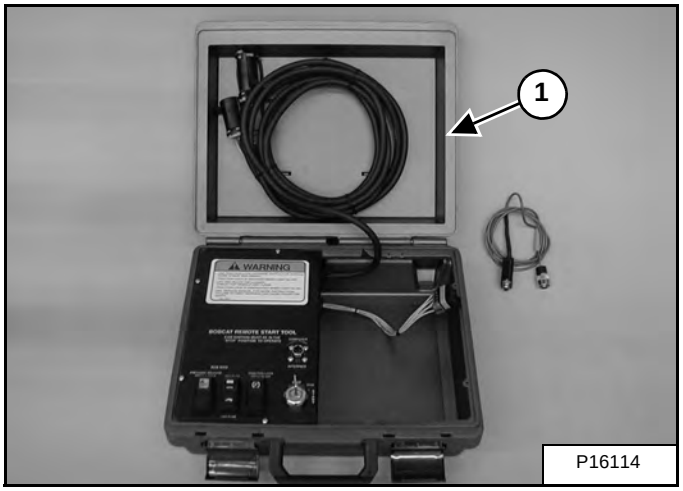
REMOTE START TOOL KIT - MEL1563

Remote Start Tool Kit - MEL1563

Tools that will be needed to complete the following steps are:

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

Figure 10-220-1

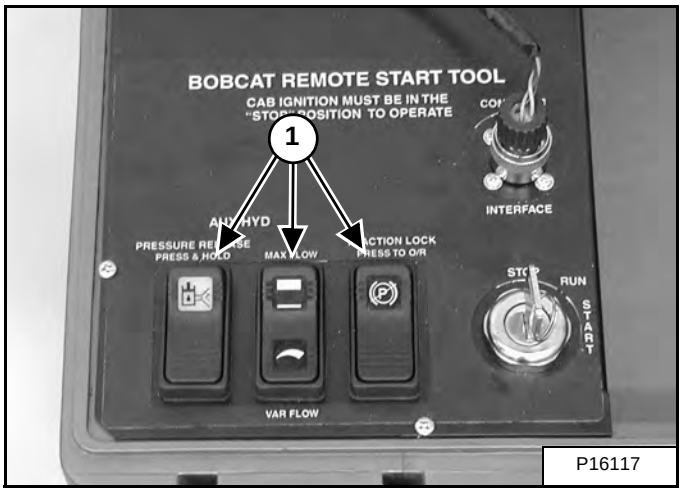


The Remote Start Tool (Item 1) **[Figure 10-220-1]** is used for excavators.

The Remote Start Tool is required when the service technician is checking the service codes.

Remote Start Tool is a link between the excavator and the Service PC.

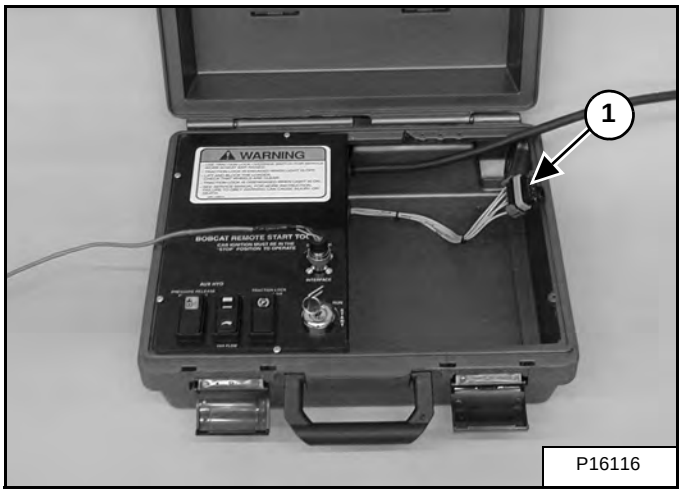
Figure 10-220-2



The three function buttons (Item 1) **[Figure 10-220-2]** are non-functional for excavators.

NOTE: Excavators can not be started by using the Remote Start Tool.

Figure 10-220-3



The 10-pin rectangular connector (Item 1) **[Figure 10-220-3]** is not used for an excavator application.

HYDRAULIC PUMP 20-50-1
Hydraulic Pump Work Sheet 20-50-1
Pump Testing 20-50-3
Description 20-50-11
Removal And Installation 20-50-11
Coupler Removal And Installation 20-50-12
Hydraulic Pump Startup 20-50-13
Gear Pump Disassembly And Assembly 20-50-14
Piston Pump Parts Identification 20-50-16
Piston Pump Disassembly And Assembly 20-50-17

MANIFOLD ASSEMBLY / ACCUMULATOR (WITHOUT ANGLE BLADE) 20-60-1
Description 20-60-1
Removal And Installation 20-60-1
Parts Identification 20-60-3
Disassembly And Assembly 20-60-4

MANIFOLD ASSEMBLY / ACCUMULATOR (WITH ANGLE BLADE) 20-61-1
Description 20-61-1
Removal And Installation 20-61-1
Parts Identification 20-61-3
Disassembly And Assembly 20-61-4

TRAVEL MOTOR 20-70-1
Description 20-70-1
Removal And Installation 20-70-1
Parts Identification Hydraulic Motor 20-70-2
Parts Identification Gear Reduction Hub 20-70-3
Disassembly 20-70-4
Assembly 20-70-18

SWIVEL JOINT (LATER MODELS) 20-80-1
Removal And Installation 20-80-1
Parts Identification Angle Blade Swivel 20-80-3
Parts Identification Straight Blade Swivel 20-80-4
Disassembly And Assembly 20-80-5

SWIVEL JOINT (EARLIER MODELS) 20-81-1
Removal And Installation 20-81-1
Parts Identification 20-81-3
Disassembly And Assembly 20-81-4

SWING MOTOR 20-90-1
Removal And Installation 20-90-1
Parts Identification 20-90-2
Disassembly And Assembly 20-90-3

Troubleshooting The Cylinder Circuit

PROBLEM	CAUSE	CORRECTION
Cylinder inoperable	Control console raised	Lower control console.
	Loose fittings or broken hoses	Repair or replace
	Low psi at joystick	Check, repair or replace pressure reducing valve
	Lever linkage incorrectly adjusted	Readjust
	Control console lockout switch	Readjust or replace
	Cylinder internal leakage excessive	Repair or replace
	Joystick manifold pressure reducing valve defective	Repair or replace
	Joystick internal leakage excessive	Repair or replace
Cylinder force insufficient	Lever linkage incorrectly adjusted	Readjust
	Main relief valve pressure to low	Readjust or replace
	Lever linkage incorrectly adjusted	Readjust
Cylinder speed too slow	Cylinder internal leakage excessive	Repair or replace
	Joystick manifold solenoid valve defective	Repair or replace
	Joystick manifold pressure reducing valve defective	Repair or replace
	Control valve internal leakage excessive	Repair or replace
	Low tie rod torque on 3 spool and 6 spool control valves	Tighten tie rods to correct torque
	Joystick internal leakage excessive	Repair or replace
	Low or dirty fluid	Add or replace the hydraulic fluid
	Main relief valve malfunctioning	Readjust or replace

CYLINDER (BOOM) (CONT'D)

Disassembly

Clean the outside of the cylinder before disassembly.

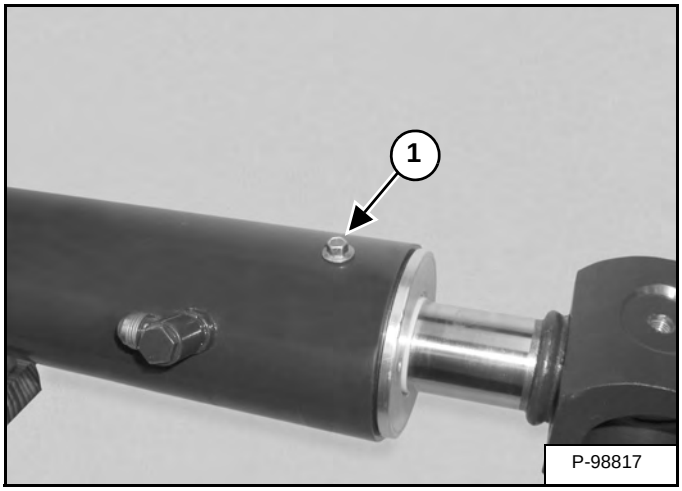
Use the following tools to disassemble the cylinder:

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.

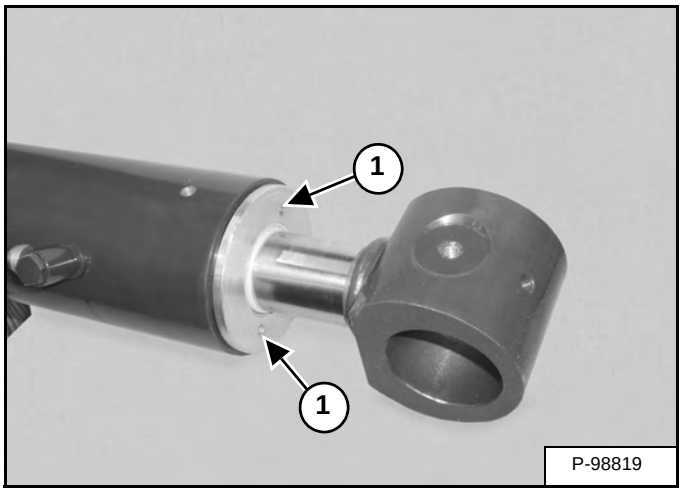
Put the base end of the cylinder in a vise.

Figure 20-20-16



Remove the bolt (Item 1) **[Figure 20-20-16]**.

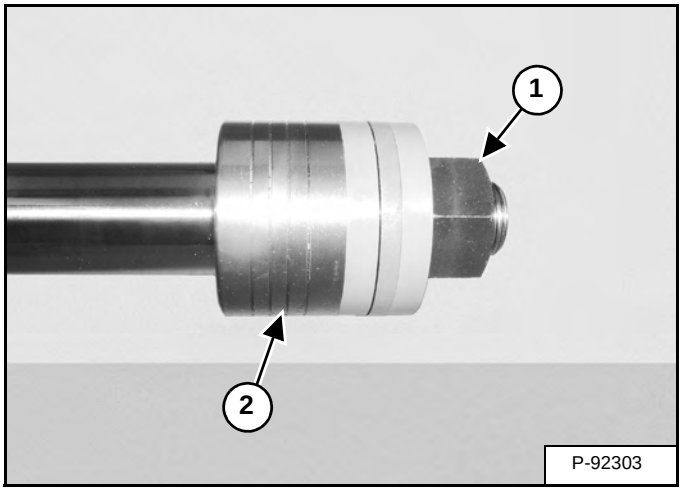
Figure 20-20-17



Insert the Adjustable Gland Nut Wrench into the holes (Item 1) **[Figure 20-20-17]** to loosen the head.

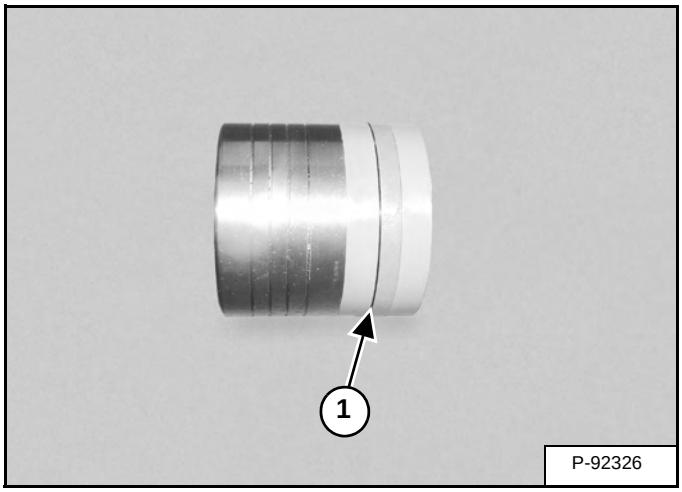
Remove the head and the rod assembly from the cylinder. Put the rod end in a vise.

Figure 20-20-18



Remove the nut (Item 1), piston (Item 2) **[Figure 20-20-18]** and head.

Figure 20-20-19



Remove the seal (Item 1) **[Figure 20-20-19]** from the piston.

NOTE: The seal is a two piece seal.

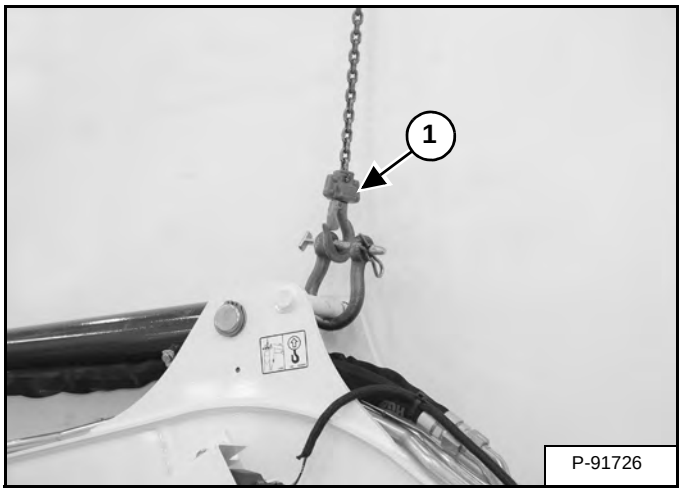
CYLINDER (ARM) (CONT'D)

Removal And Installation

Lower the work group to the ground.

With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-21-7

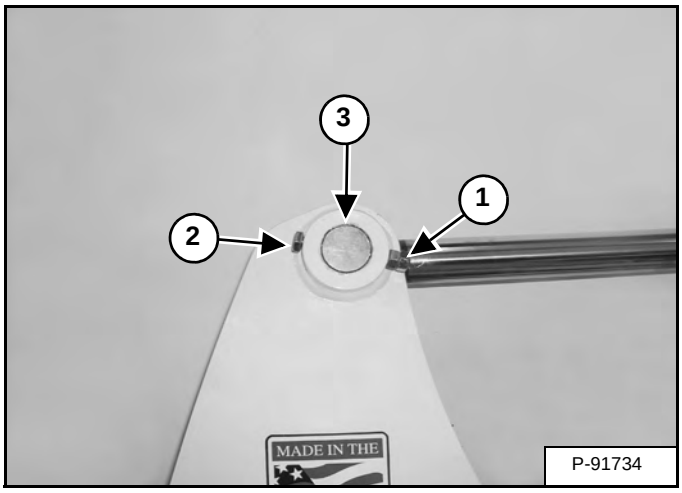


Support the boom with a chain hoist (Item 1) **[Figure 20-21-7]**.

Figure 20-21-8

Support the arm cylinder (Item 1) **[Figure 20-21-8]**.

Figure 20-21-9



Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-21-9]**.

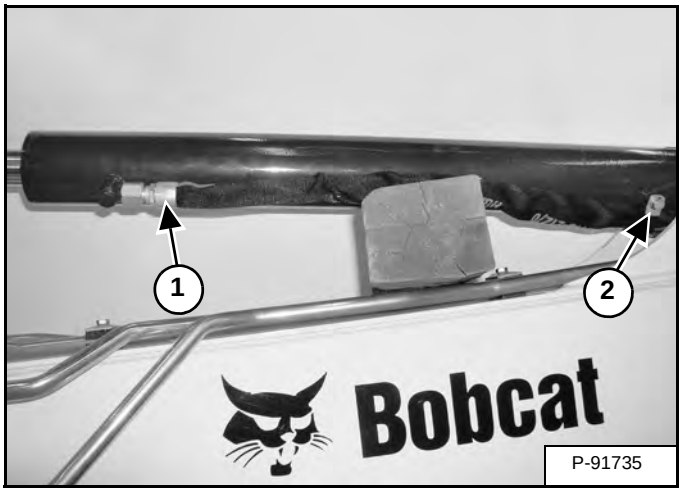
Remove the rod end pin (Item 3) **[Figure 20-21-9]**.

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 20-21-10



Remove the hose (Item 1) and hose clamp (Item 2) **[Figure 20-21-10]**.

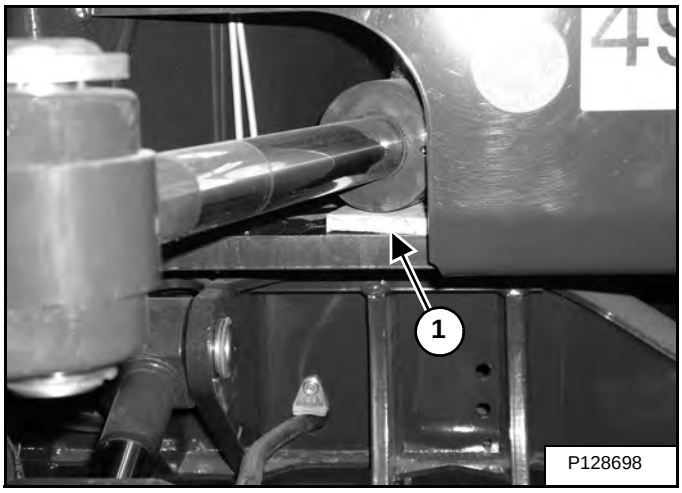
CYLINDER (BOOM SWING)

Testing

Lower the work group to the ground.

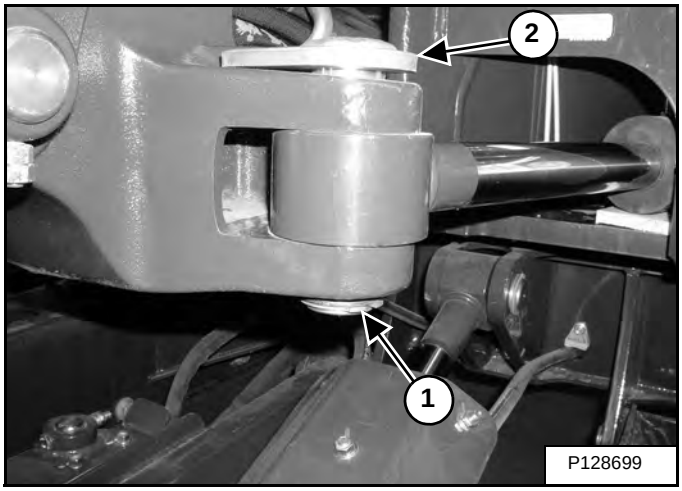
Remove the floor mat. (See Removal And Installation on Page 40-110-1.)

Figure 20-22-1



Place a block (Item 1) **[Figure 20-22-1]** under the rod end of the boom swing cylinder.

Figure 20-22-2



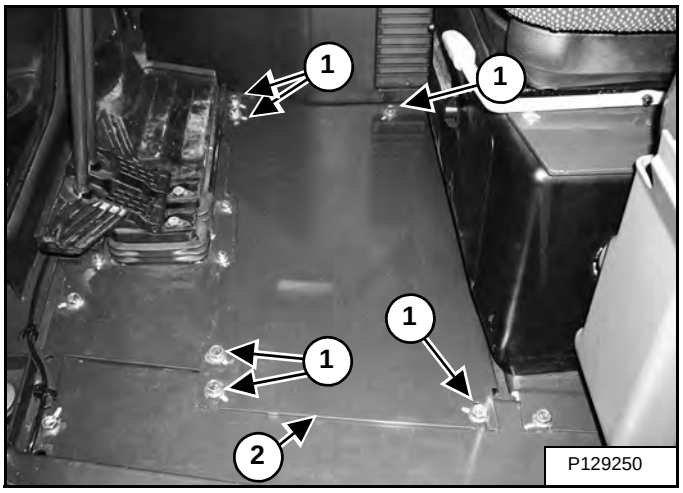
Remove the snap ring (Item 1) **[Figure 20-22-2]** and washer from the rod end pin of the cylinder.

Remove the pin (Item 2) **[Figure 20-22-2]**.

Start the engine and fully retract the cylinder rod.

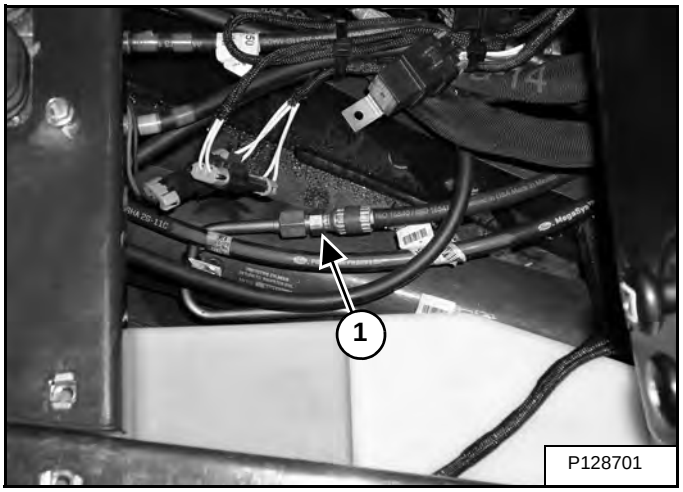
Stop the engine.

Figure 20-22-3



Remove the bolts (Item 1) and the center floor panel (Item 2) **[Figure 20-22-3]**.

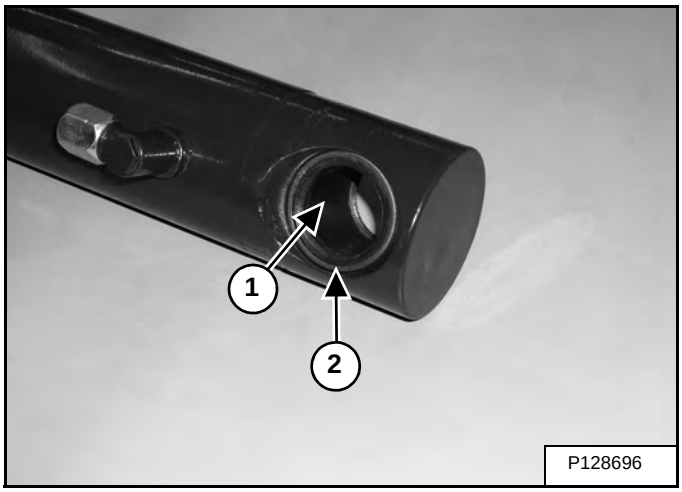
Figure 20-22-4



Remove the hose (Item 1) **[Figure 20-22-4]** from the base end of the cylinder.

Assembly (Cont'd)

Figure 20-22-33



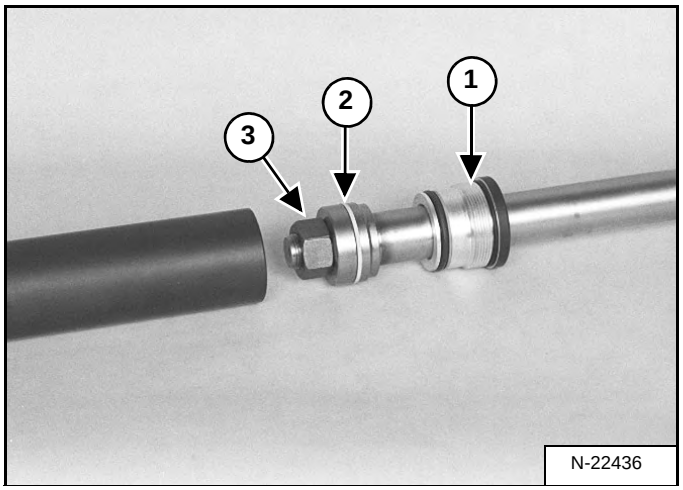
Install the bushing (Item 1) **[Figure 20-22-33]**.

NOTE: The bushing is a maintenance free bushing that does not need to be lubed.

Install the dust seal (Item 2) **[Figure 20-22-33]** on both sides of the cylinder base end.

Assembly (Cont'd)

Figure 20-23-26



Install the head (Item 1) and the piston (Item 2) **[Figure 20-23-26]** on the rod as shown.

NOTE: Clean and dry the rod threads. Install a NEW NUT with preapplied Loctite®.

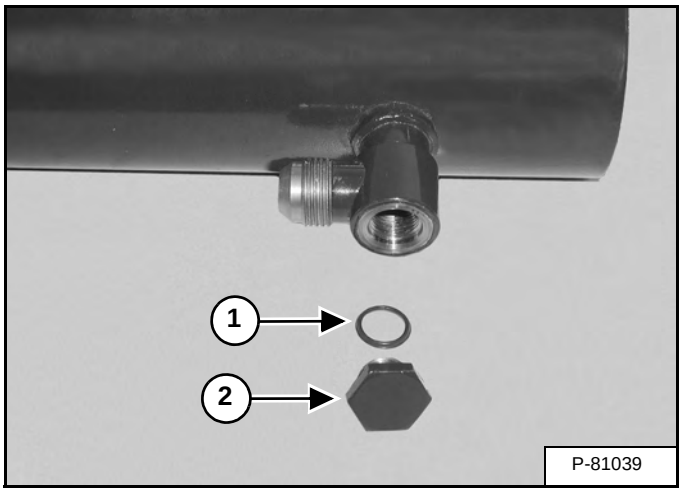
Grease the piston where the nut contacts the piston. Do not get grease on the threads.

Provide an adequate support for the cylinder before tightening.

Install the nut (Item 3) **[Figure 20-23-26]**.

Tighten the nut to 1491 N•m (1100 ft-lb) torque.

Figure 20-23-27

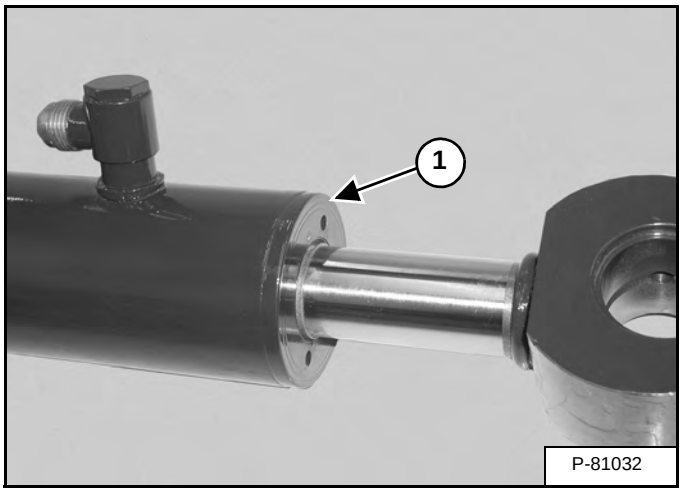


Install O-ring (Item 1) and plug (Item 2) **[Figure 20-23-27]**.

Tighten the plug to 50 N•m (37 ft-lb) torque.

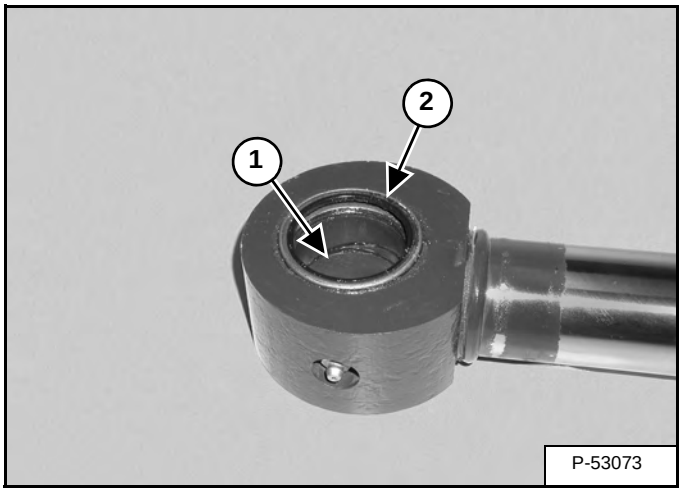
Put the base end of the cylinder in a vise.

Figure 20-23-28



Tighten the head **[Figure 20-23-28]** to 373 N•m (275 ft-lb) torque.

Figure 20-23-29

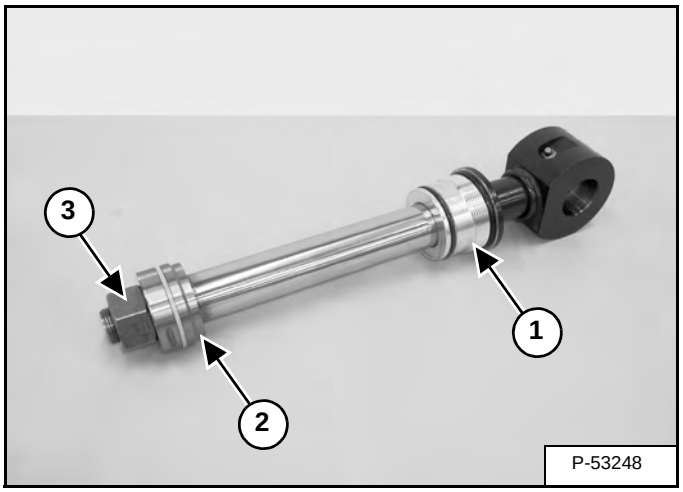


Install the bushing (Item 1) **[Figure 20-23-29]**. The bushing must be aligned with the grease channel in the rod end of the cylinder.

Install the dust seal (Item 2) **[Figure 20-23-29]** on both sides of the rod end.

Assembly (Cont'd)

Figure 20-24-24



Install the head (Item 1) and piston (Item 2) **[Figure 20-24-24]** on the rod.

NOTE: Clean and dry the rod threads. Install a NEW NUT with preapplied Loctite®.

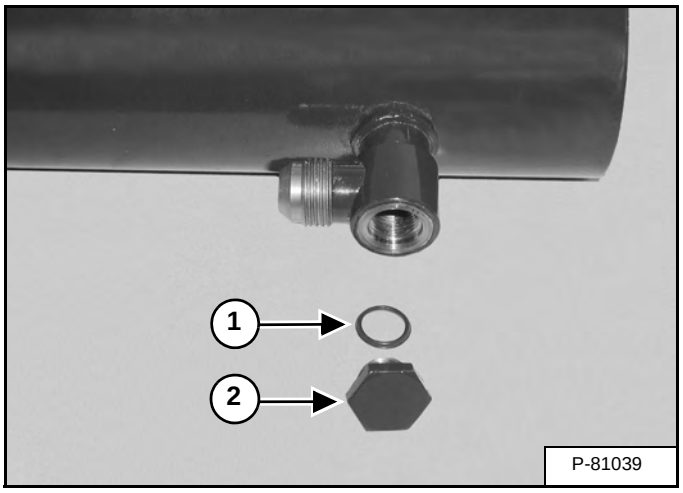
Grease the piston where the nut contacts the piston. Do not get grease on the threads.

Provide an adequate support for the cylinder before tightening.

Install the nut (Item 3) **[Figure 20-24-24]**.

Tighten the nut to 1491 N•m (1100 ft-lb) torque.

Figure 20-24-25

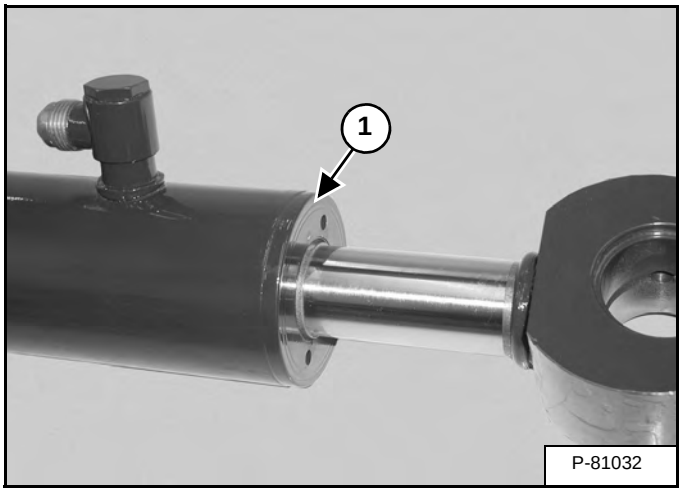


Install O-ring (Item 1) and plug (Item 2) **[Figure 20-24-25]**.

Tighten the plug to 20 N•m (15 ft-lb) torque.

Put the base end of the cylinder in a vise.

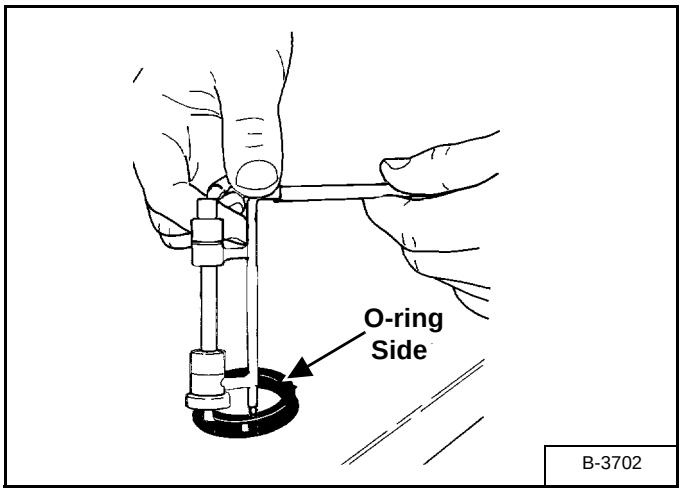
Figure 20-24-26



Tighten the head (Item 1) **[Figure 20-24-26]** to 373 N•m (275 ft-lb) torque.

Assembly (Cont'd)

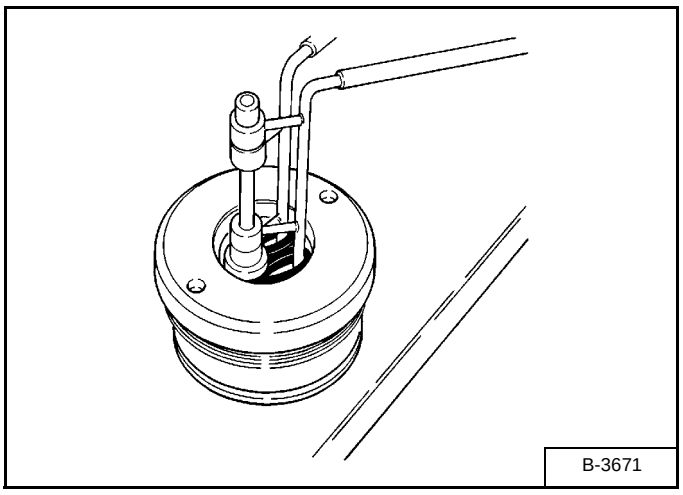
Figure 20-25-23



Install the oil seal on the rod seal tool **[Figure 20-25-23]**.

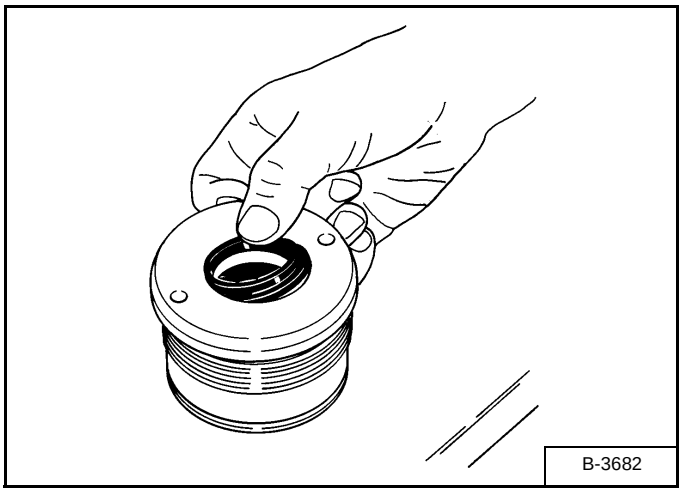
NOTE: The O-ring side of the oil seal goes toward the inside of the cylinder.

Figure 20-25-24



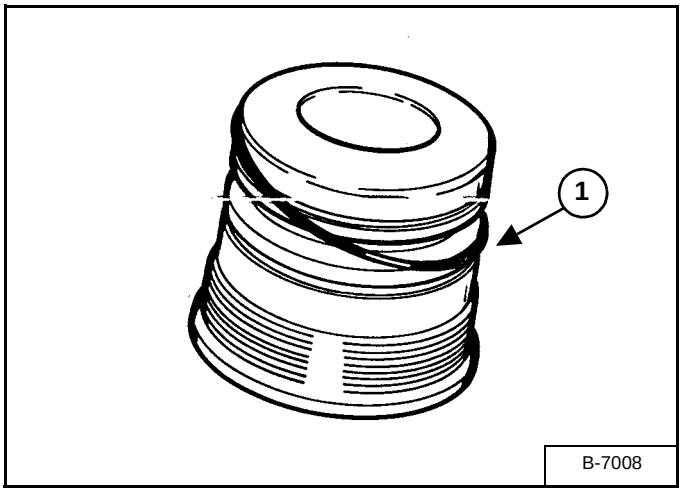
Install the oil seal in the head **[Figure 20-25-24]**.

Figure 20-25-25



Install the wiper seal with the lip toward the outside of the head **[Figure 20-25-25]**.

Figure 20-25-26



Install the O-ring (Item 1) **[Figure 20-25-26]** on the head.

Assembly

Clean all parts in solvent and dry with compressed air.

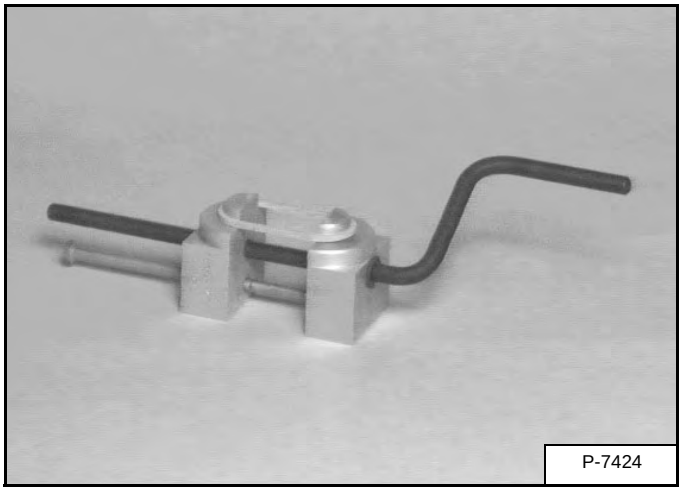
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

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

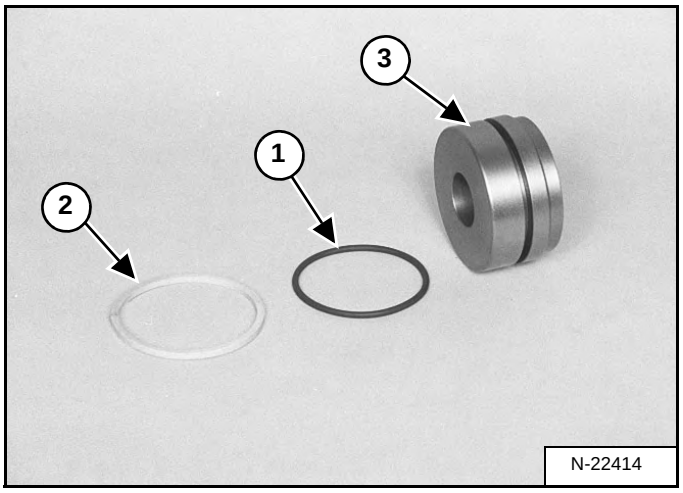
Figure 20-26-16



Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-26-16]**.

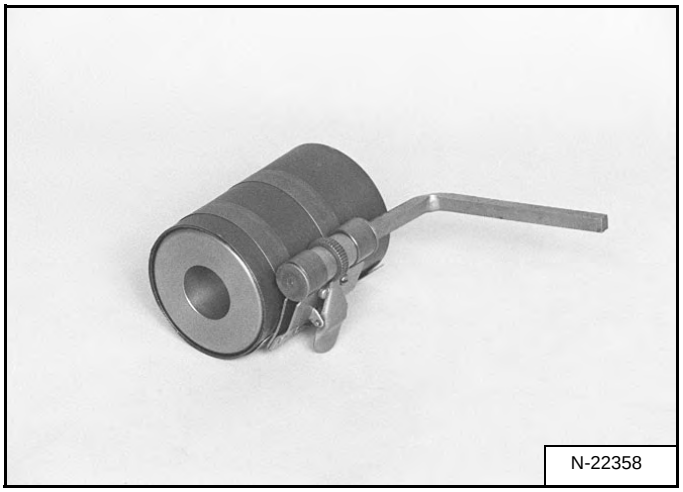
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-26-17



Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-26-17]**.

Figure 20-26-18



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-26-18]**.

Assembly

Clean all parts in solvent and dry with compressed air.

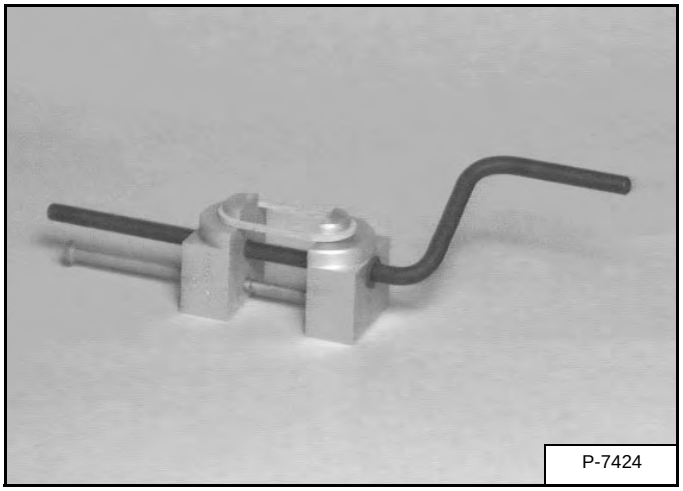
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

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

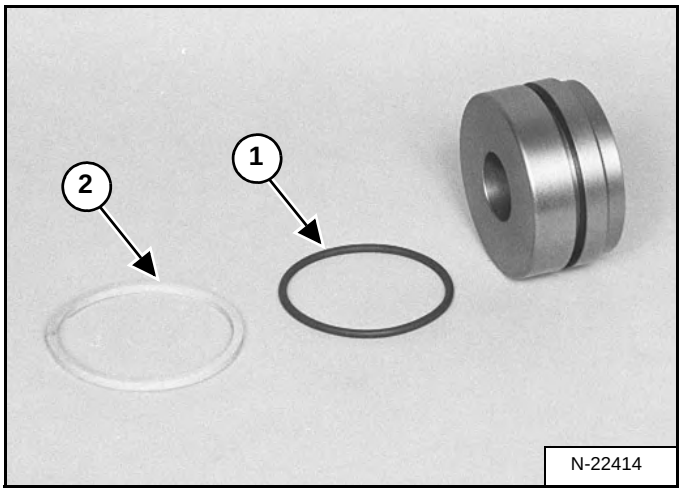
Figure 20-27-14



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-27-14]**.

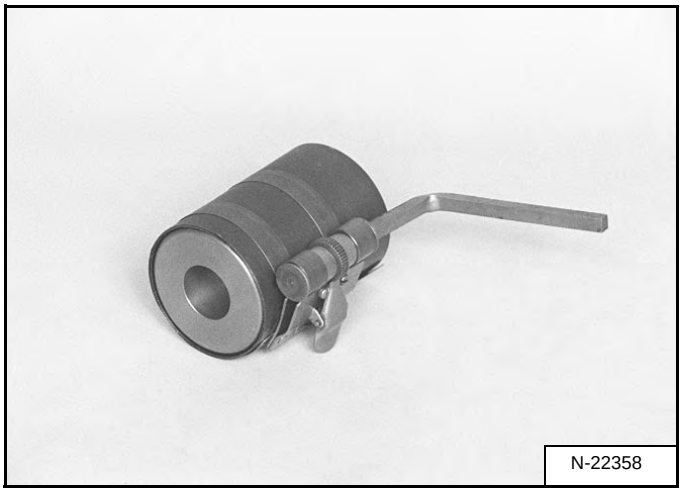
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-27-15



Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-27-15]** on the piston.

Figure 20-27-16



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-27-16]**.

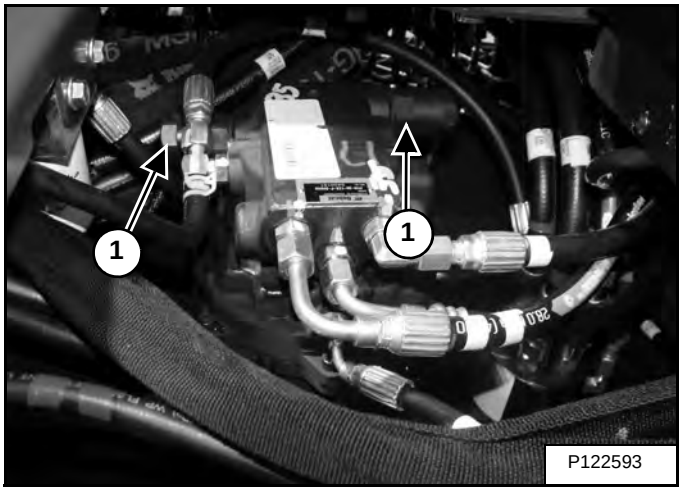
Removal And Installation

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-130-4.)

Remove the floor mat. (See Removal And Installation on Page 40-110-1.)

Remove the tool box. (See Removal And Installation on Page 40-230-1.)

Figure 20-32-4

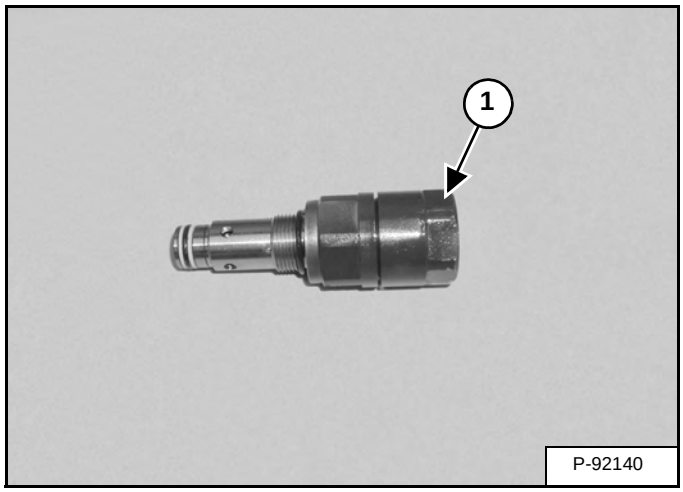


Mark and remove the crossport relief valves (Item 1) **[Figure 20-32-4]**.

NOTE: Install the valves in the original location.

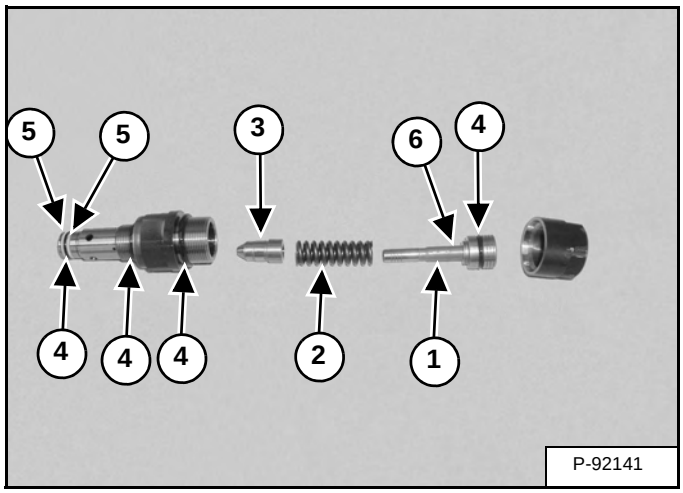
Disassembly And Assembly

Figure 20-32-5



Remove the cap (Item 1) **[Figure 20-32-5]**.

Figure 20-32-6



Remove the spool (Item 1), spring (Item 2) and poppet (Item 3). Remove the O-rings (Item 4) and back-up rings (Item 5) **[Figure 20-32-6]**.

NOTE: Shims (Item 6) [Figure 20-32-6] may be installed on the spool. Always install the same number of shims that were removed.

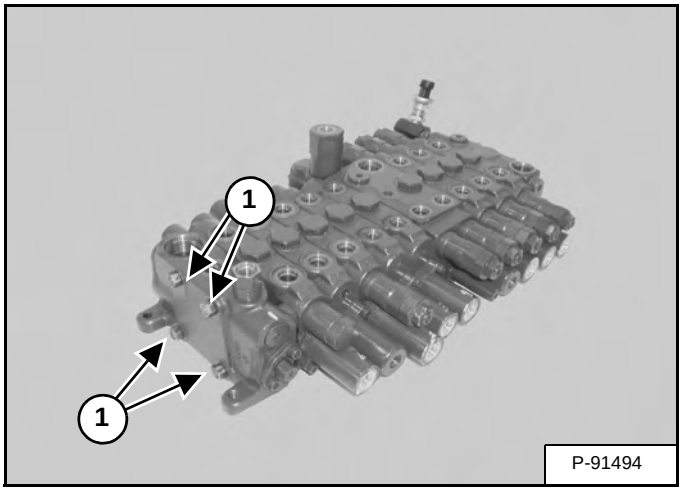
Disassembly

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.

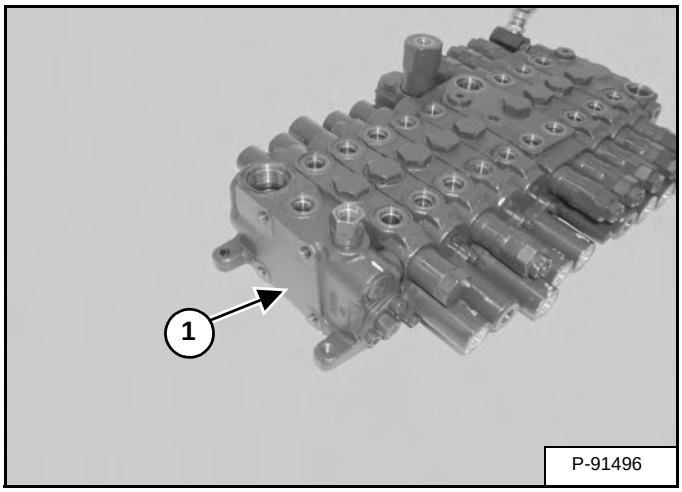
I-2003-0888

Figure 20-40-15



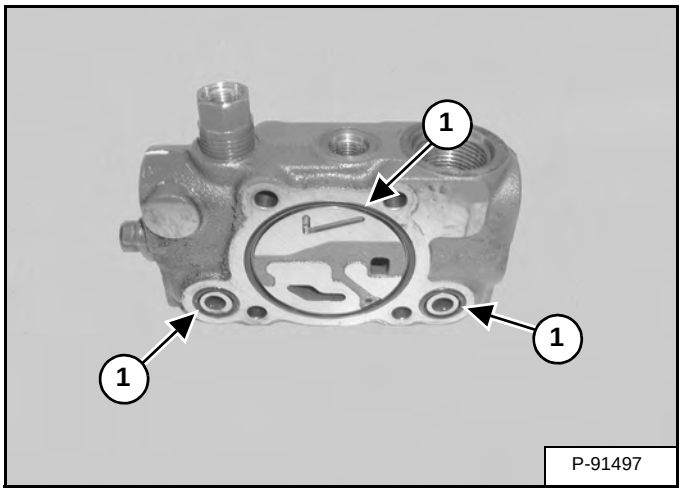
Remove the four nuts (Item 1) **[Figure 20-40-15]**.

Figure 20-40-16



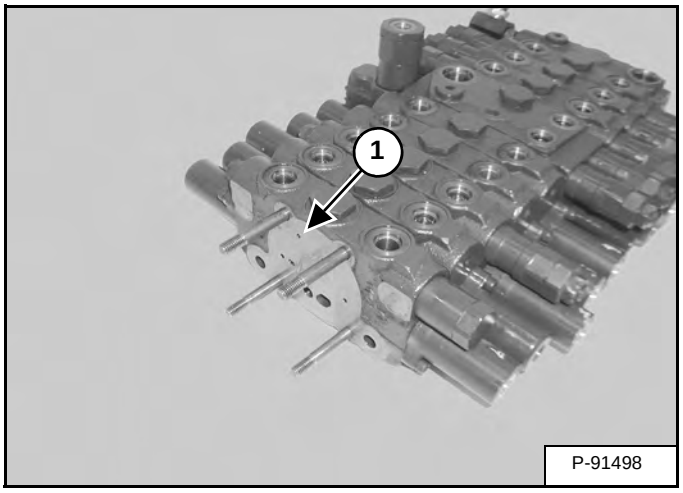
Remove the inlet (Item 1) **[Figure 20-40-16]**.

Figure 20-40-17



Remove the three O-rings (Item 1) **[Figure 20-40-17]**.

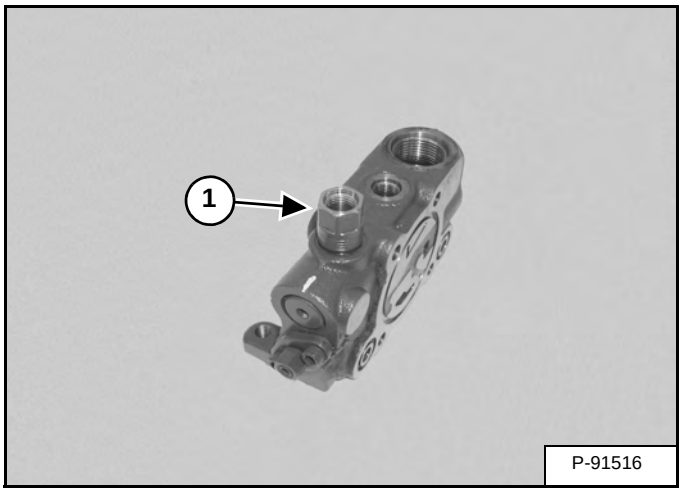
Figure 20-40-18



Remove the boom swing valve section (Item 1) **[Figure 20-40-18]**.

Inlet Valve Section Disassembly And Assembly

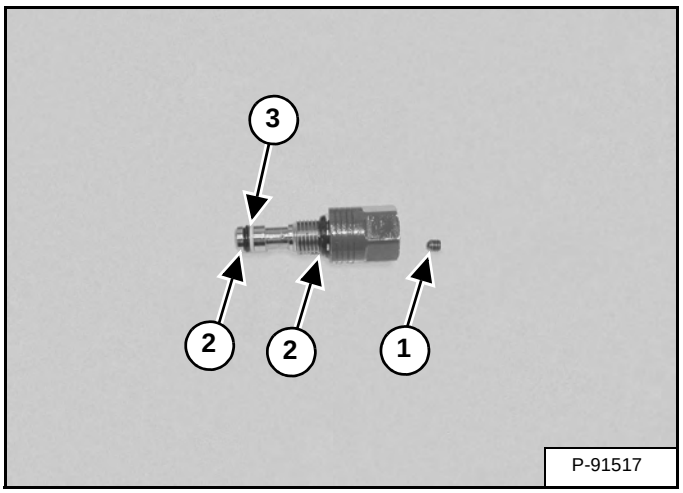
Figure 20-40-49



Remove the fitting (Item 1) **[Figure 20-40-49]**.

Installation: Tighten the fitting to 28,5 - 30 N•m (21 - 22 ft-lb) torque.

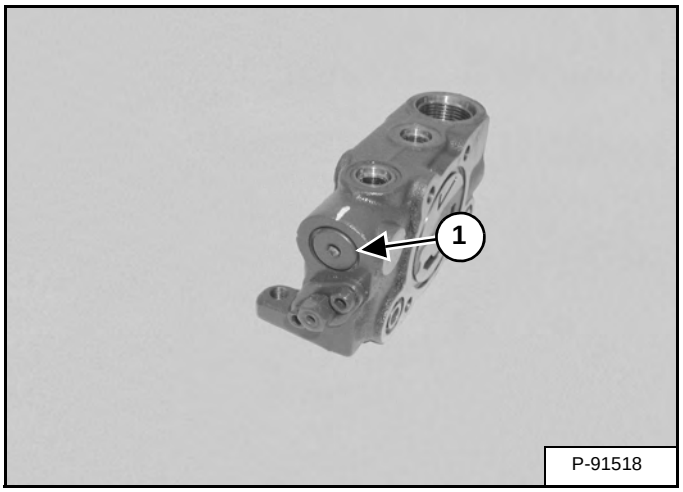
Figure 20-40-50



Remove the orifice (Item 1). Remove the O-rings (Item 2) and back-up ring (Item 3) **[Figure 20-40-50]**.

Installation: Tighten the orifice to 3 - 3,5 N•m (27 - 31 in-lb) torque.

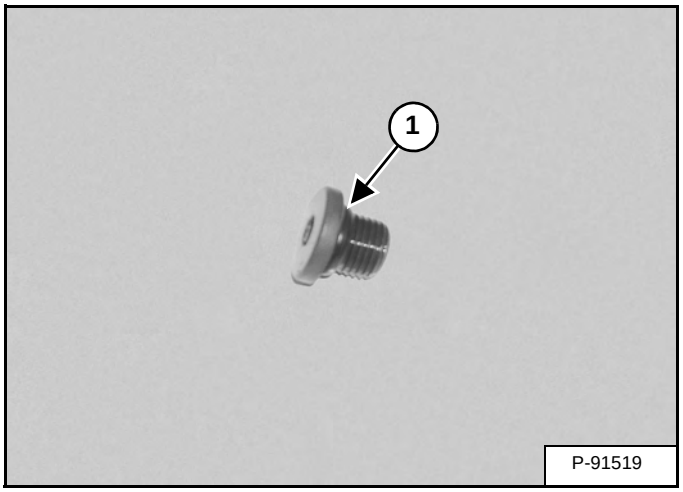
Figure 20-40-51



Remove the plug (Item 1) **[Figure 20-40-51]**.

Installation: Tighten the plug to 28,5 - 30 N•m (21 - 22 ft-lb) torque.

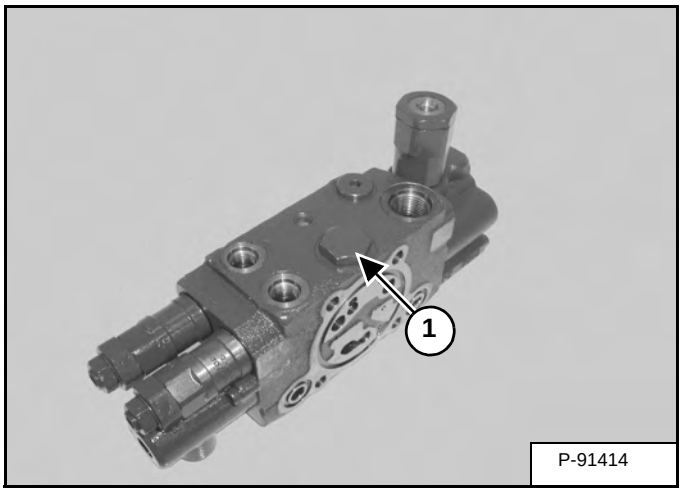
Figure 20-40-52



Remove the O-ring (Item 1) **[Figure 20-40-52]** from the plug.

Boom Valve Section Disassembly And Assembly

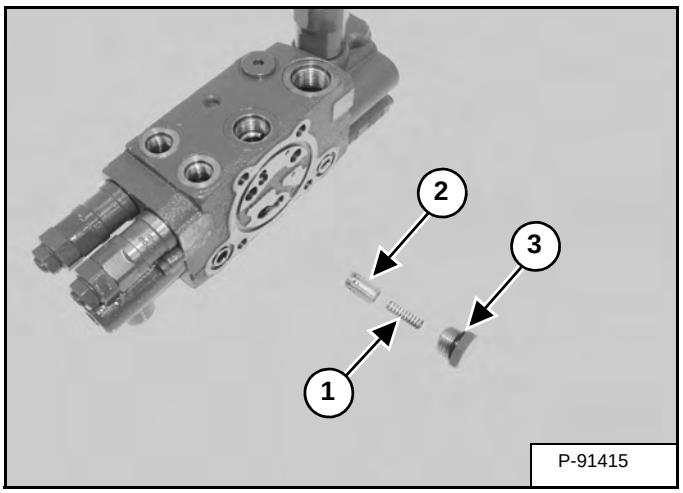
Figure 20-40-81



Remove the plug (Item 1) **[Figure 20-40-81]**.

Installation: Tighten the plug to 69 - 78 N•m (51 - 58 ft-lb) torque.

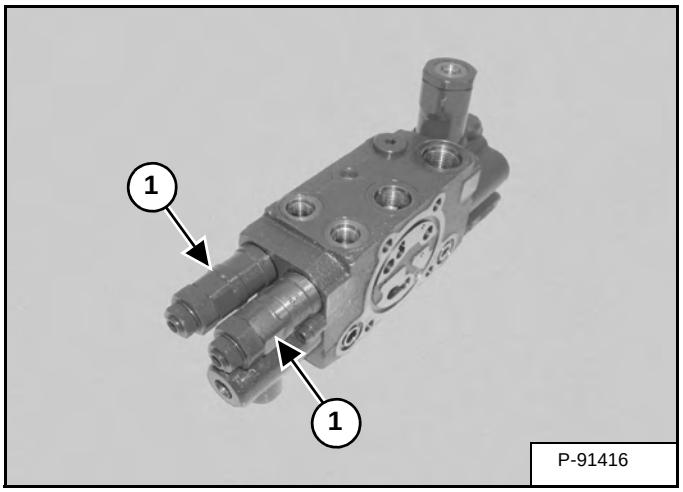
Figure 20-40-82



Remove the spring (Item 1) and compensator valve (Item 2). Remove the O-ring (Item 3) **[Figure 20-40-82]**.

NOTE: The compensator valve must be installed in the valve section it was removed from. Installing the incorrect compensator valve will cause poor hydraulic valve performance.

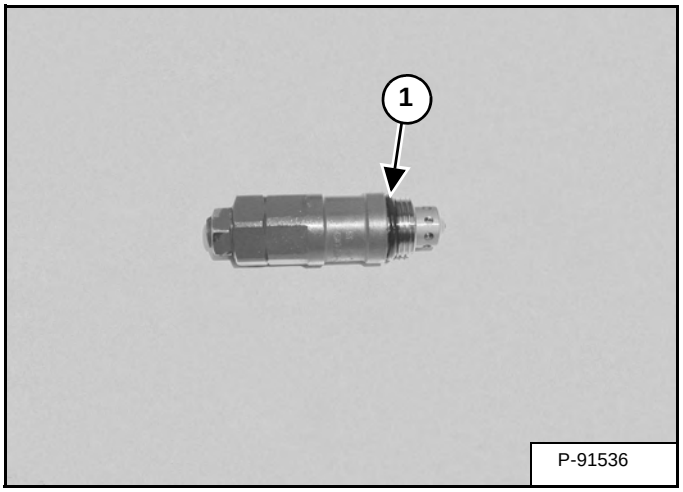
Figure 20-40-83



Remove the relief valves (Item 1) **[Figure 20-40-83]**.

Installation: Tighten the relief valves to 69 - 78 N•m (51 - 58 ft-lb) torque.

Figure 20-40-84



Remove the O-ring (Item 1) **[Figure 20-40-84]**.

Pump Testing

The testing of the piston pump must be done in the following order:

Pump Margin Pressure Adjustment
Main Relief Valve Adjustment
Torque Limiter Adjustment
Direct Gear Pump Test

Test Fitting Installation

The following tools will be needed to do the procedure:

MEL10003 - Hydraulic Tester
3447 kPa (34 bar) (500 psi) Gauge
34474 kPa (345 bar) (5000 psi) Gauge

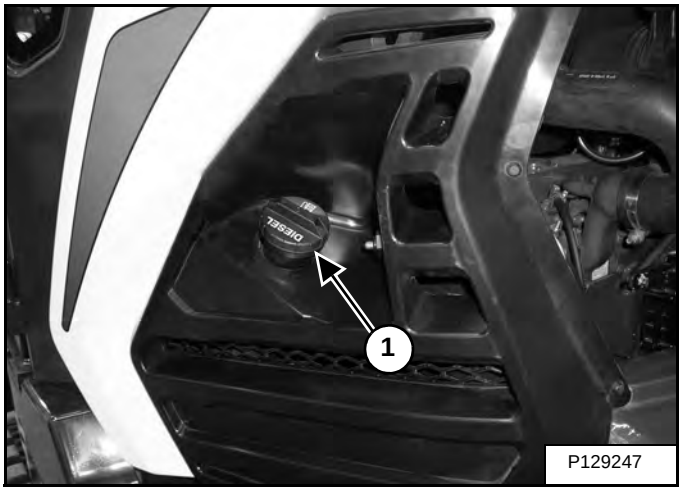
Adapter Hose - 71 mm (18 in) long hose with a test coupler on one end and -6 female jic swivel on the opposite end (obtain adapter hose locally).

Record the no load engine rpm, registered on the right hand operator panel display.

See high idle specification. (See Capacities on Page SPEC-10-13.)

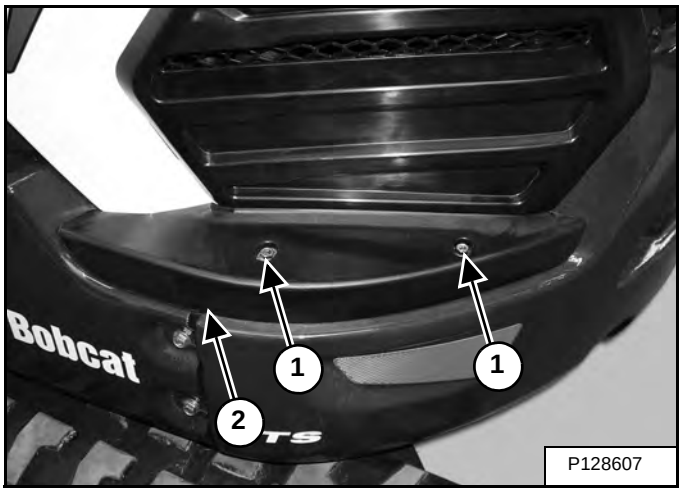
Stop the engine and adjust the engine rpm if necessary.

Figure 20-50-1



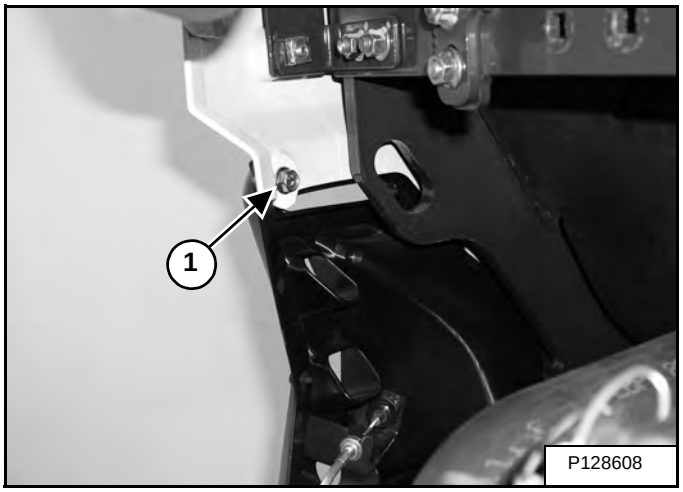
Remove the fuel cap (Item 1) **[Figure 20-50-1]**.

Figure 20-50-2



Remove the bolts (Item 1) and cover (Item 2) **[Figure 20-50-2]**.

Figure 20-50-3

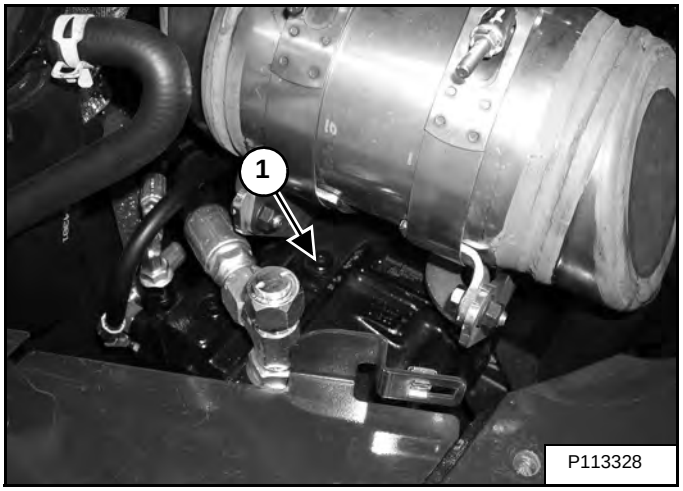


Remove the bolt (Item 1) **[Figure 20-50-3]**.

Hydraulic Pump Startup

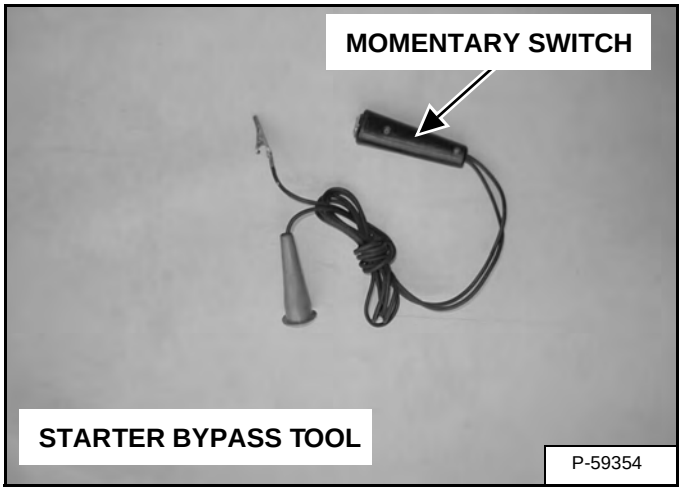
NOTE: This procedure is to prevent a dry startup of the hydraulic pump.

Figure 20-50-34



Loosen the case plug (Item 1) **[Figure 20-50-34]** until all the air is purged from the pump housing.

Figure 20-50-35



To crank the engine without starting, the machine key switch can be bypassed. Obtain a starter bypass tool from a local source which can be used as a universal connection to remotely crank the engine without starting **[Figure 20-50-35]**.

The starter bypass tool consists of two wires, each with a clamp. The momentary switch, when depressed, will allow current to pass through the circuit.

Figure 20-50-36

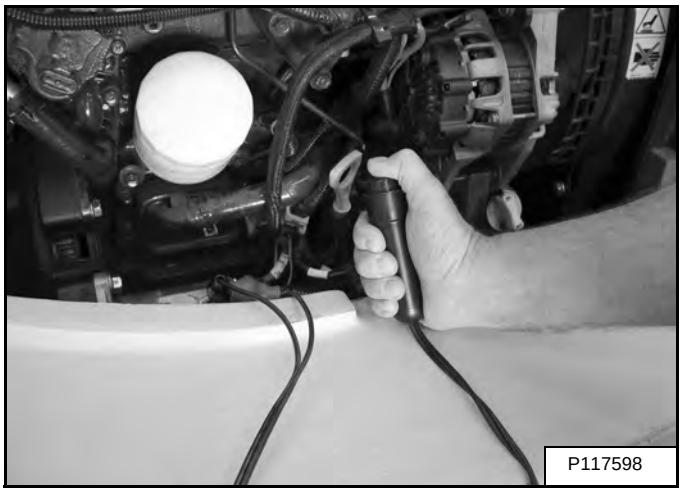
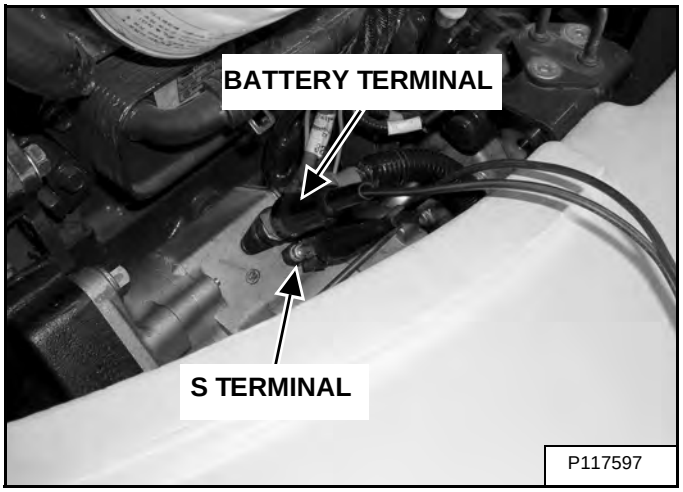


Figure 20-50-37



Connect the starter bypass tool to the starter solenoid battery terminal and S terminal. Crank the engine for 15 seconds, then stop for at least 30 seconds. Again, crank the engine for 15 seconds. Remove the starter bypass tool **[Figure 20-50-36]** and **[Figure 20-50-37]**.

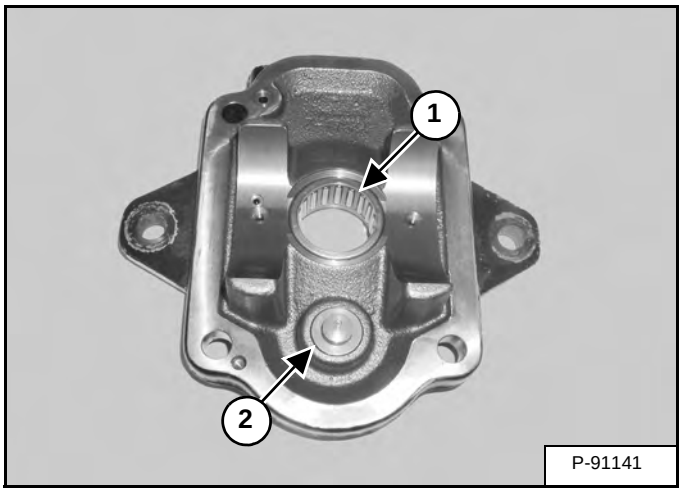
Start the excavator from the operator cab and run the engine at low idle for 1 - 2 minutes without operating the hydraulics.

After operating the engine at low idle, operate the hydraulic systems several times or until air is purged from the system. **Avoid running over the relief valve setting at the end of cylinder stroke.**

With the excavator parked on a level surface, check and fill the hydraulic reservoir as required. Check for hydraulic leaks. (See Removing And Replacing Hydraulic Fluid on Page 10-130-4.)

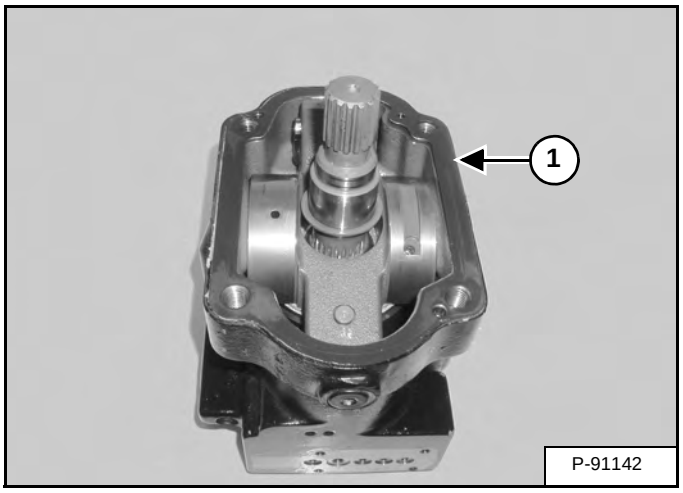
Piston Pump Disassembly And Assembly (Cont'd)

Figure 20-50-70



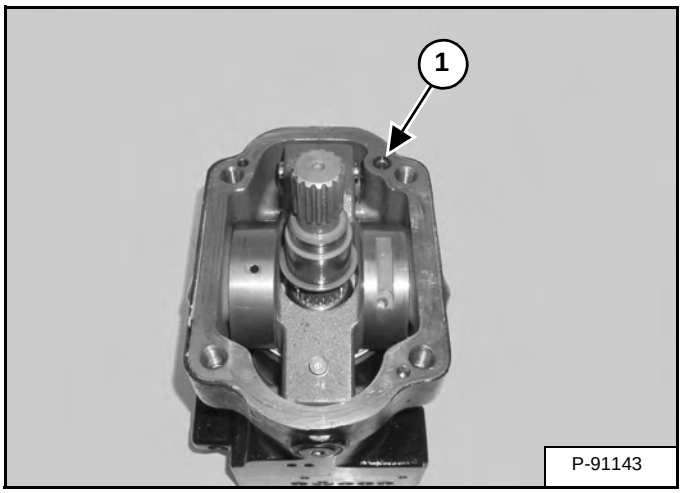
Remove the needle bearing (Item 1) and stop (Item 2) **[Figure 20-50-70]**.

Figure 20-50-71



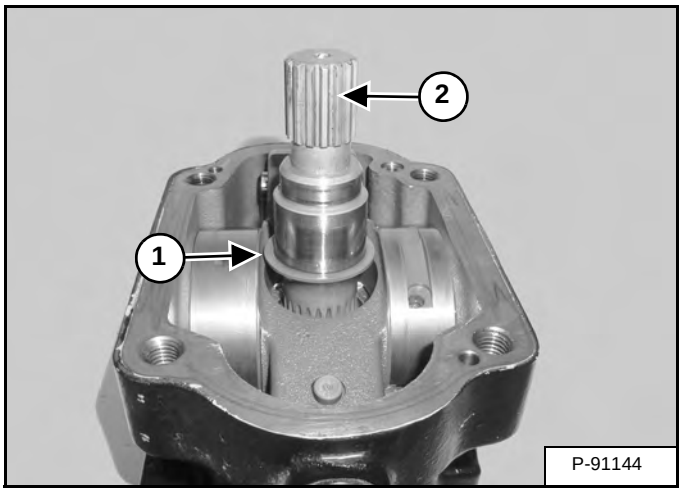
Remove the gasket (Item 1) **[Figure 20-50-71]**.

Figure 20-50-72



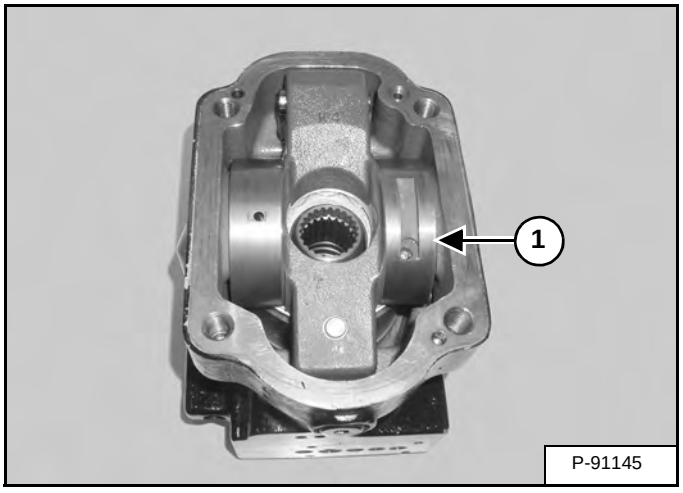
Remove the O-ring (Item 1) **[Figure 20-50-72]**.

Figure 20-50-73



Remove the thrust washer (Item 1) and shaft (Item 2) **[Figure 20-50-73]**.

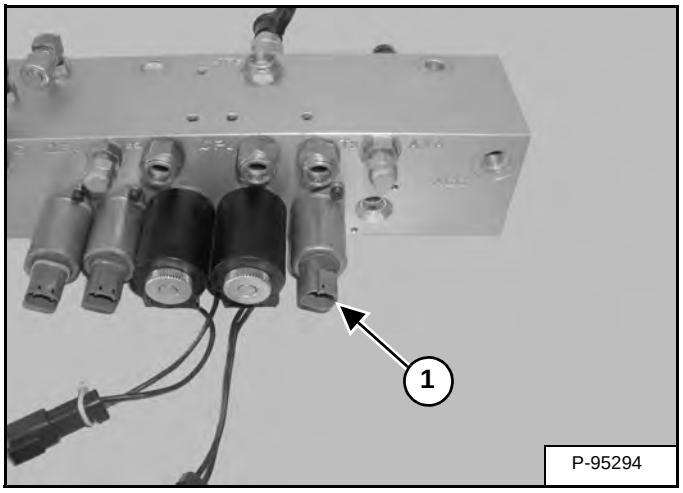
Figure 20-50-74



Remove the swash plate (Item 1) **[Figure 20-50-74]**.

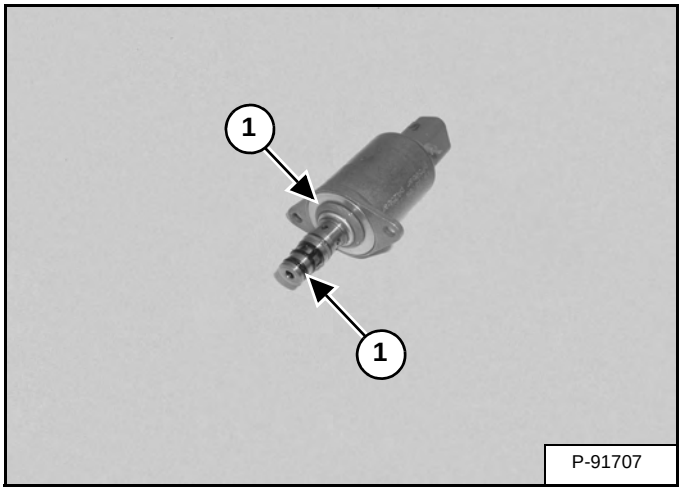
Disassembly And Assembly (Cont'd)

Figure 20-60-9



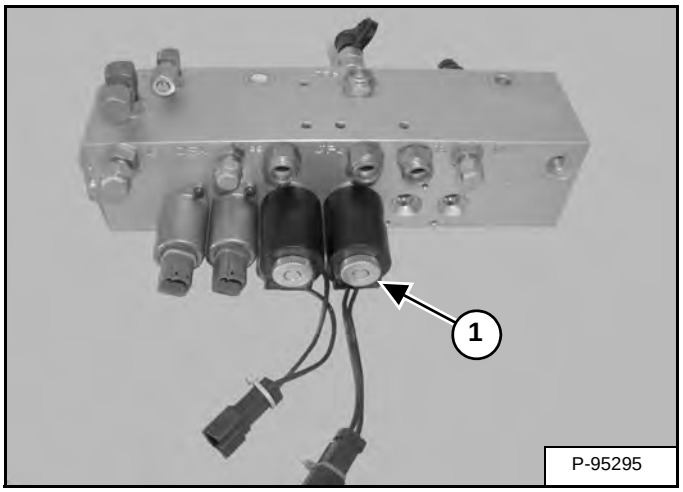
Repeat the procedure for the next solenoid (Item 1) **[Figure 20-60-9]**.

Figure 20-60-10



Remove the O-rings (Item 1) **[Figure 20-60-10]** from the solenoids.

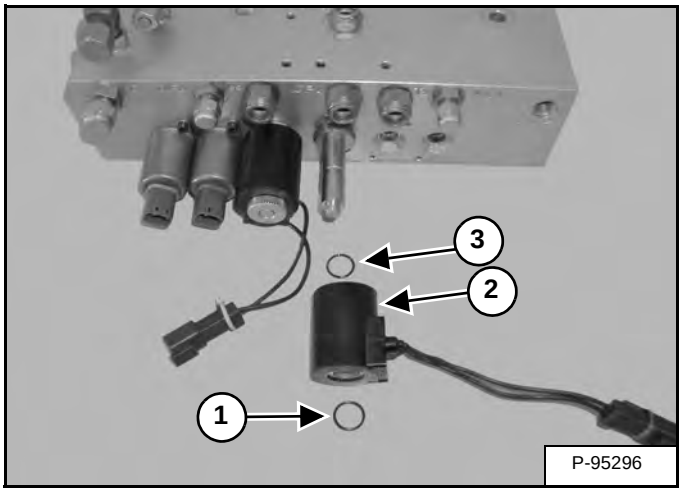
Figure 20-60-11



Remove the nut (Item 1) **[Figure 20-60-11]**.

Installation: Tighten the nut to 4,1 - 6,1 N•m (36 - 54 in-lb) torque.

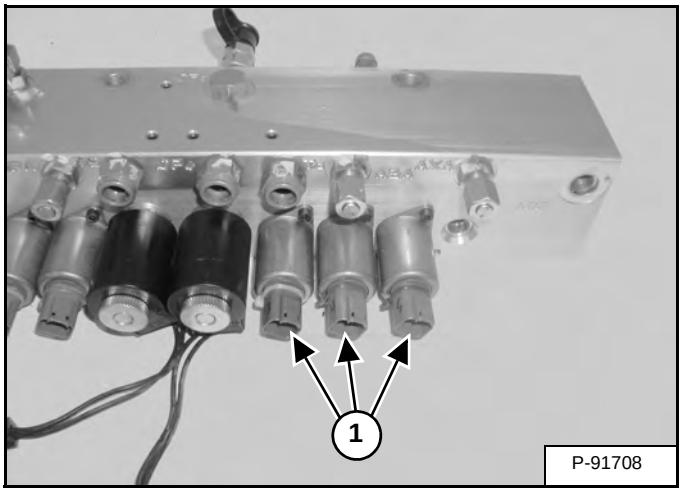
Figure 20-60-12



Remove the O-ring (Item 1), coil (Item 2) and O-ring (item 3) **[Figure 20-60-12]**.

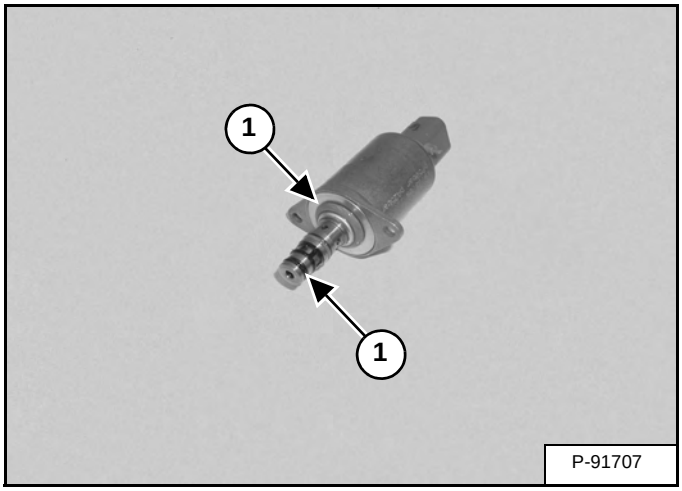
Disassembly And Assembly (Cont'd)

Figure 20-61-9



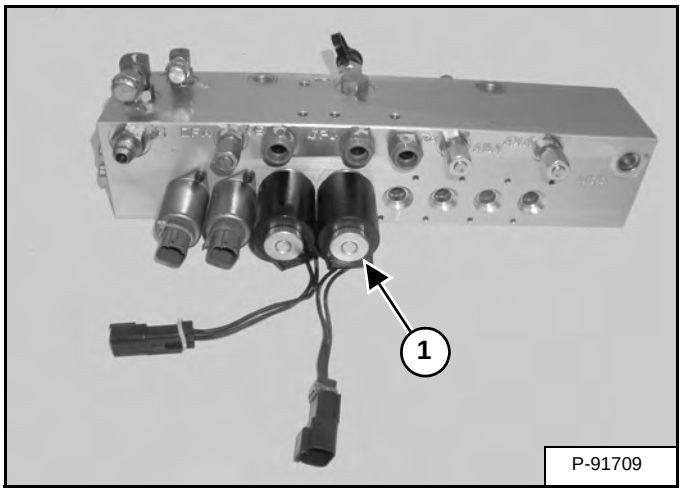
Repeat the procedure for the three solenoid (Item 1) **[Figure 20-61-9]**.

Figure 20-61-10



Remove the O-rings (Item 1) **[Figure 20-61-10]** from the solenoids.

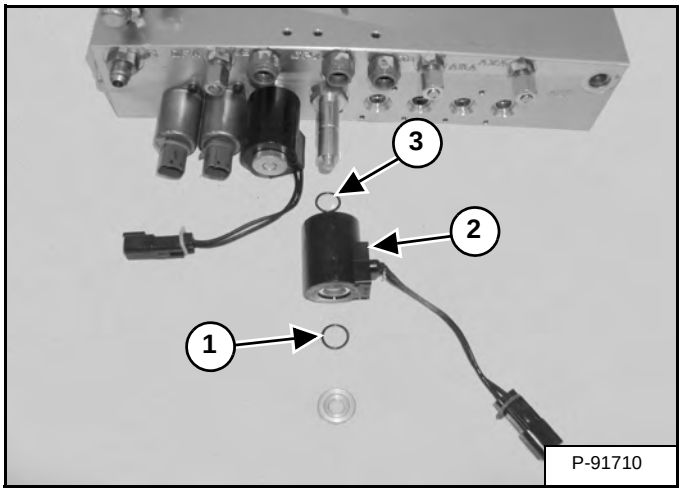
Figure 20-61-11



Remove the nut (Item 1) **[Figure 20-61-11]**.

Installation: Tighten the nut to 4,1 - 6,1 N•m (36 - 54 in-lb) torque.

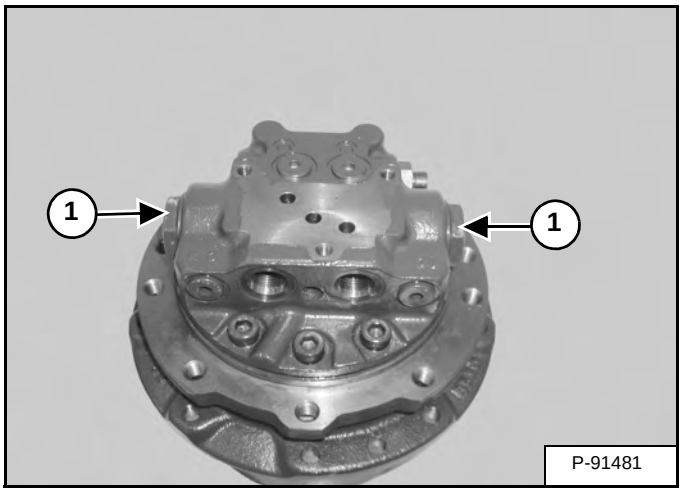
Figure 20-61-12



Remove the O-ring (Item 1), coil (Item 2) and O-ring (item 3) **[Figure 20-61-12]**.

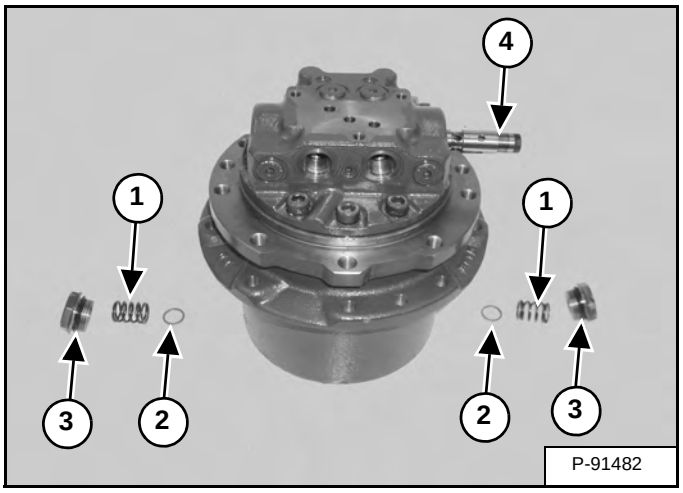
Disassembly (Cont'd)

Figure 20-70-8



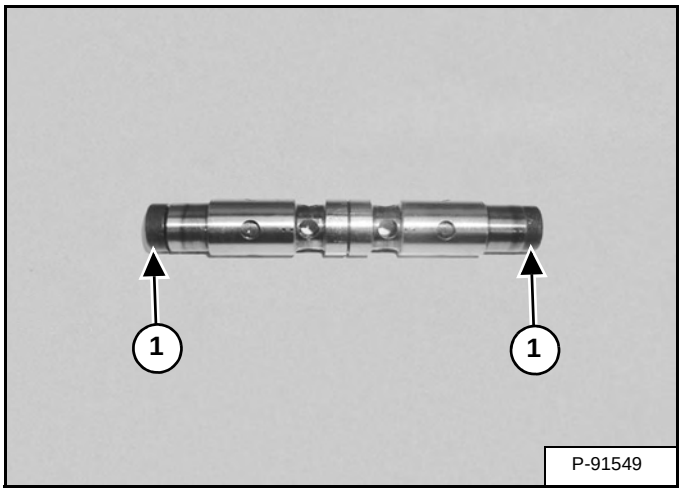
Remove the plugs (Item 1) **[Figure 20-70-8]**.

Figure 20-70-9



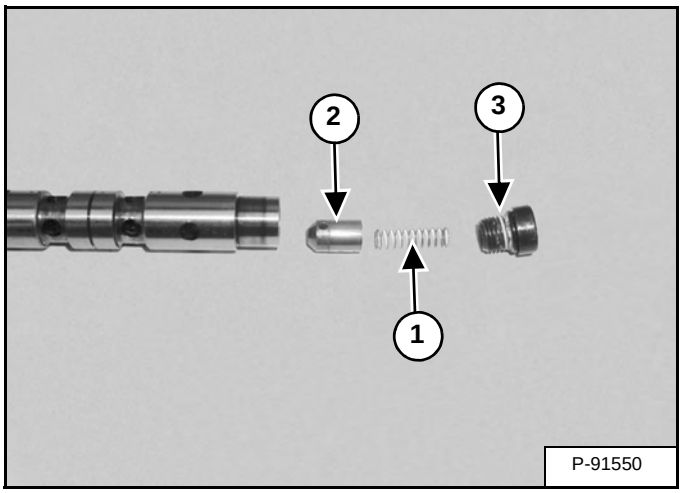
Remove the springs (Item 1) and spring seats (Item 2). Remove the O-rings (Item 3) from the plugs. Remove the spool (Item 4) **[Figure 20-70-9]** from the housing.

Figure 20-70-10



Heat the plugs (Item 1) **[Figure 20-70-10]** to melt the thread adhesive and remove the plugs from both ends of the spool.

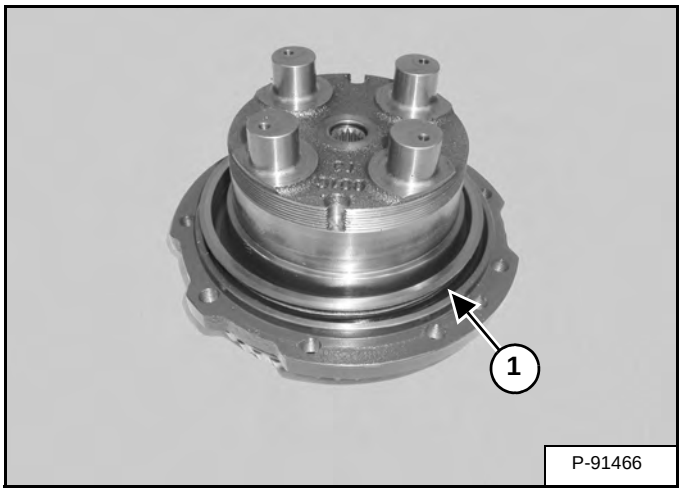
Figure 20-70-11



Remove the spring (Item 1) and check valve (Item 2) from both ends of the valve. Remove the O-ring (Item 3) **[Figure 20-70-11]** from both plugs.

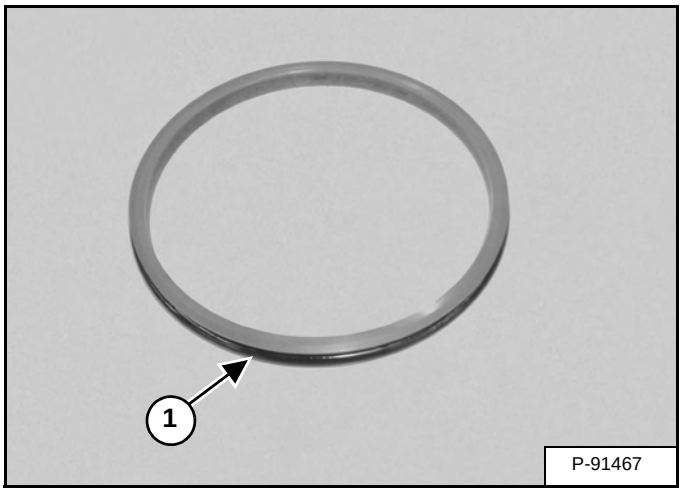
Disassembly (Cont'd)

Figure 20-70-48



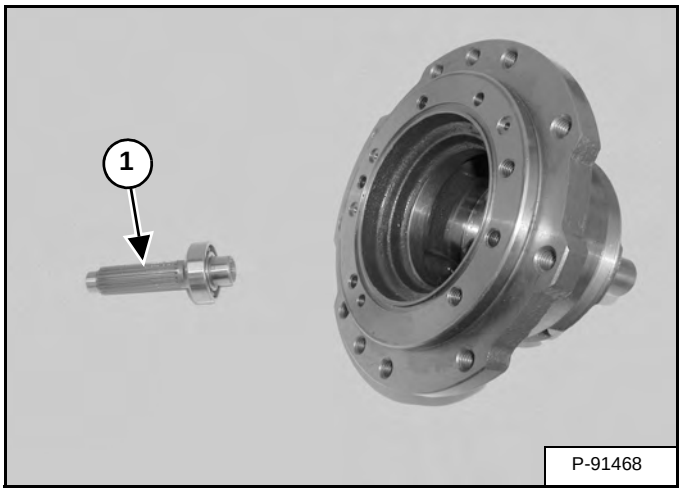
Remove the floating seal (Item 1) **[Figure 20-70-48]**.

Figure 20-70-49



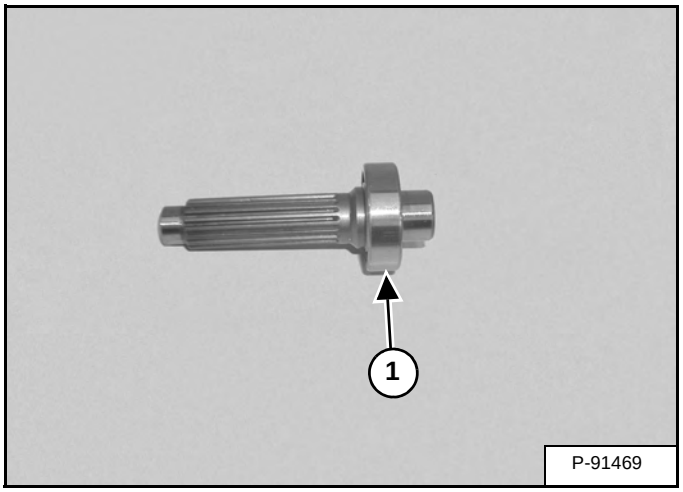
Remove the O-ring (Item 1) **[Figure 20-70-49]** from the seal ring.

Figure 20-70-50



Remove the shaft / bearing assembly (Item 1) **[Figure 20-70-50]**.

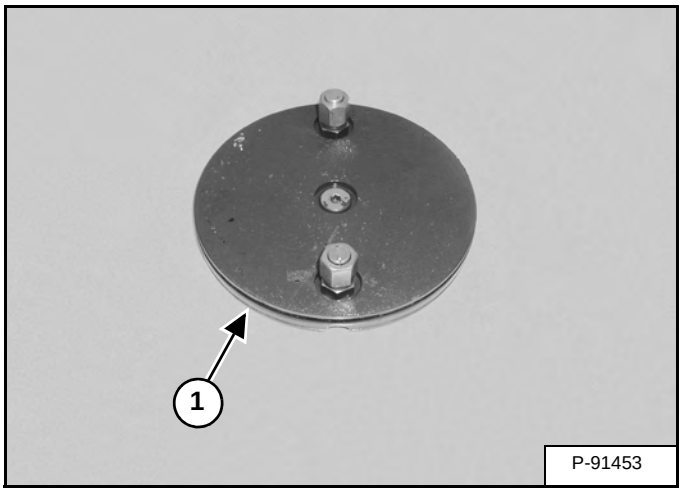
Figure 20-70-51



Remove the bearing (Item 1) **[Figure 20-70-51]** from the shaft.

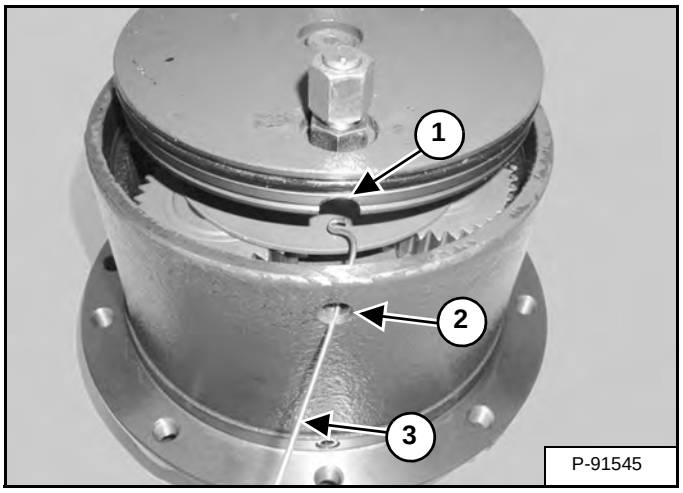
Assembly (Cont'd)

Figure 20-70-85



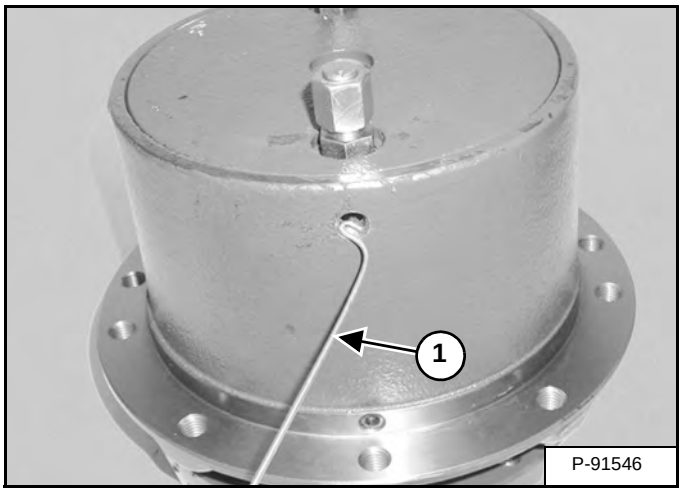
Install the O-ring (Item 1) **[Figure 20-70-85]** on the cover.

Figure 20-70-86



Install the cover with the cut out (Item 1) aligned with the hole (Item 2) in the housing. The lock wire (Item 3) is installed through the housing and the hook end of the wire must engage the cut out (Item 1) **[Figure 20-70-86]** on the cover.

Figure 20-70-87



Install the lock wire (Item 1) **[Figure 20-70-87]**.

SWIVEL JOINT (LATER MODELS)

Removal And Installation

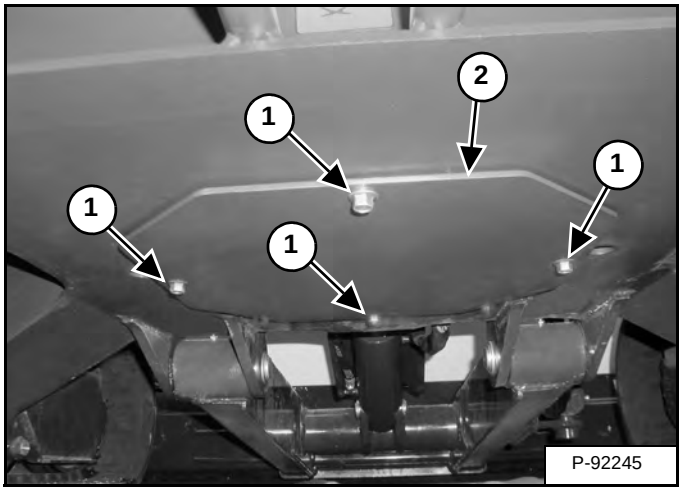
Figure 20-80-1

Block the excavator up as shown **[Figure 20-80-1]**.

Remove the floor mat and floor panel. (See Removal And Installation on Page 40-110-1.)

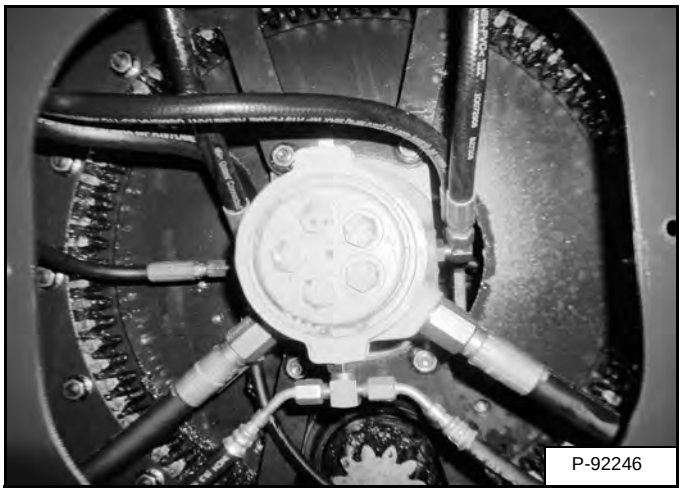
Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-130-4.)

Figure 20-80-2



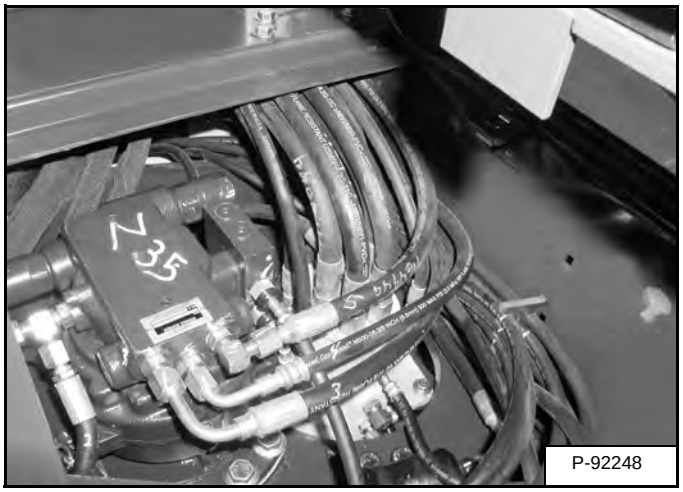
Remove the four bolts (Item 1) and remove the cover (Item 2) **[Figure 20-80-2]**.

Figure 20-80-3



Mark and remove the hoses from the bottom of the swivel joint **[Figure 20-80-3]**.

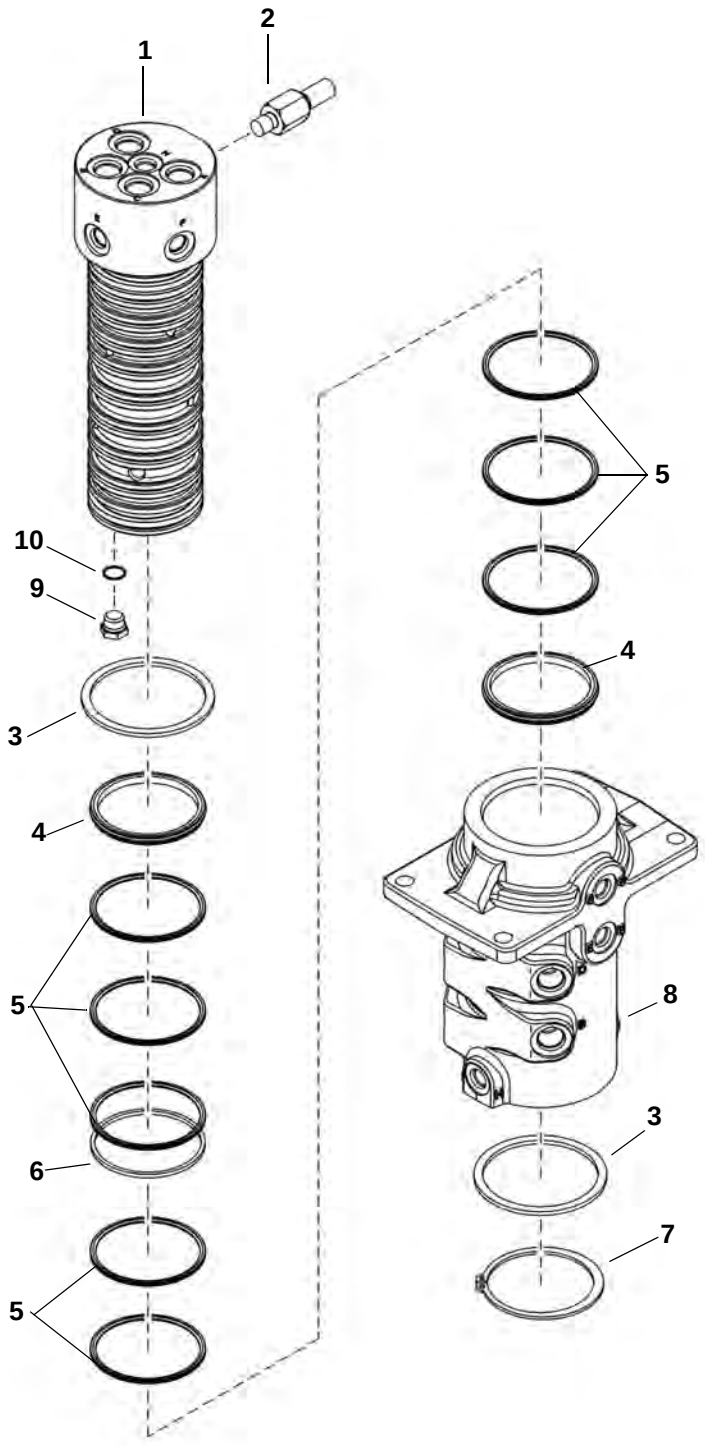
Figure 20-80-4



Remove the hoses from the top and side of the swivel joint **[Figure 20-80-4]**.

Parts Identification

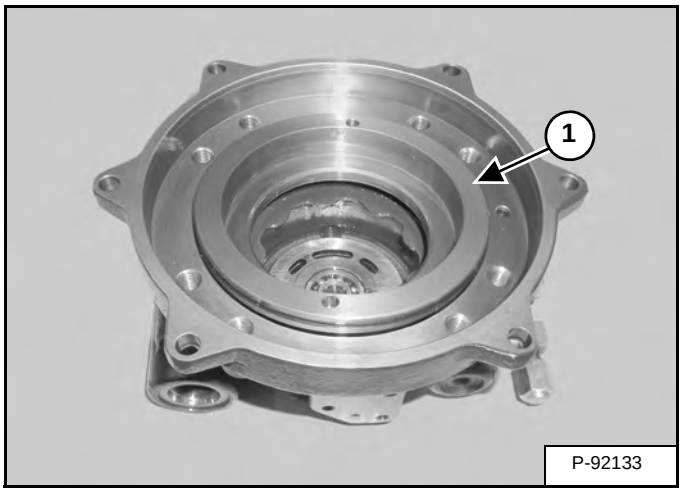
1. Rotor
2. Stop
3. Wear Ring
4. Crown Seal
5. Seal
6. Back-up Ring
7. Snap Ring
8. Housing
9. Plug
10. O-ring



NA2262S

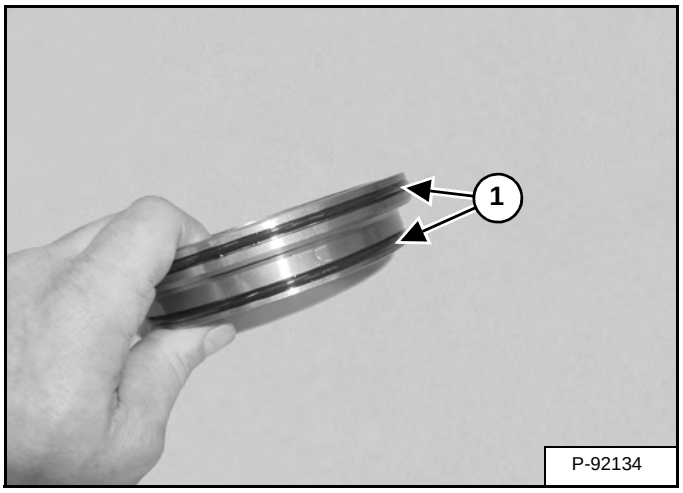
Disassembly And Assembly (Cont'd)

Figure 20-90-21



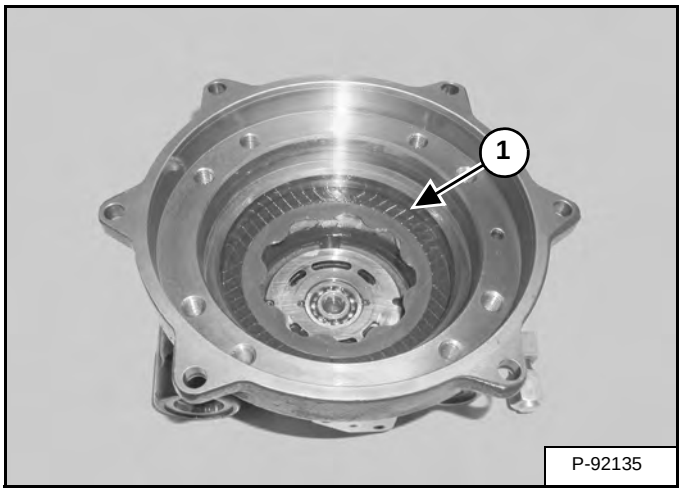
Remove the brake piston (Item 1) **[Figure 20-90-21]**.

Figure 20-90-22



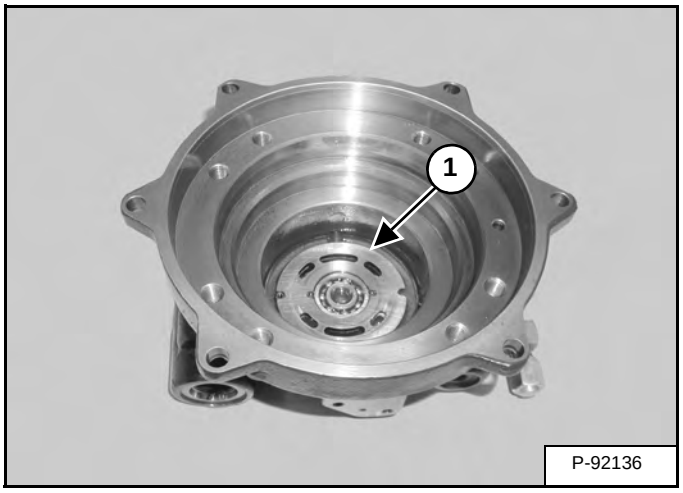
Remove the O-rings (Item 1) **[Figure 20-90-22]**.

Figure 20-90-23



Remove the brake disk (Item 1) **[Figure 20-90-23]**.

Figure 20-90-24



Remove the valve plate (Item 1) **[Figure 20-90-24]**.

CONTROL PATTERN SELECTOR VALVE

Removal And Installation

Remove the tool box. (See Removal And Installation on Page 40-230-1.)

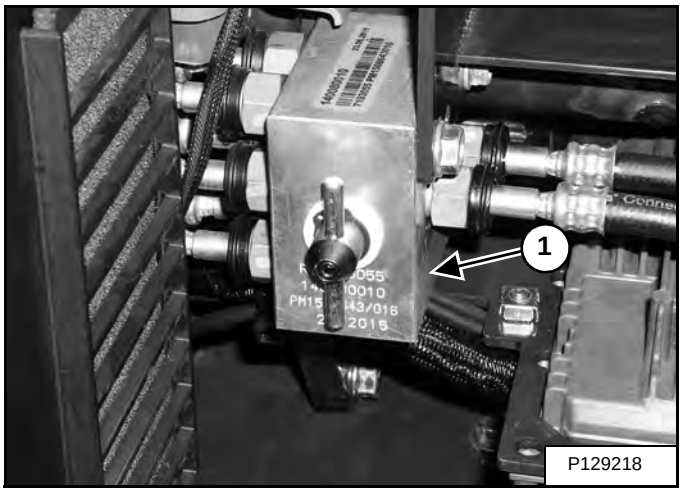
Mark all hydraulic hoses for proper installation.

IMPORTANT

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

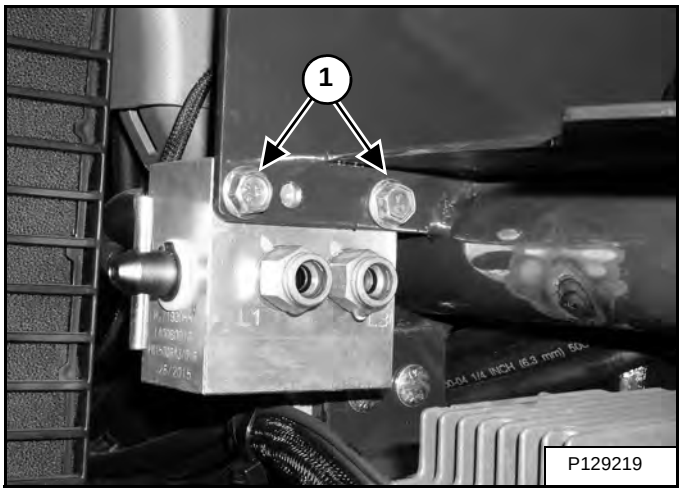
I-2003-0888

Figure 20-100-1



Remove the eight hydraulic hoses from the control pattern selector valve (Item 1) **[Figure 20-100-1]**.

Figure 20-100-2

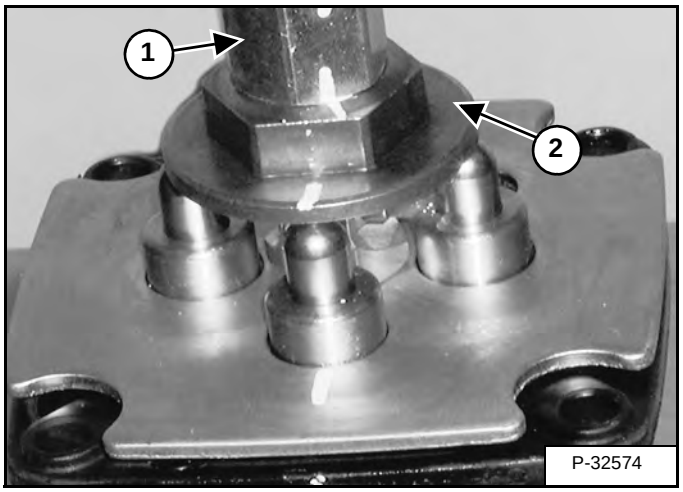


Remove the bolts (Item 1) **[Figure 20-100-2]**.

Remove the control pattern selector valve from the excavator.

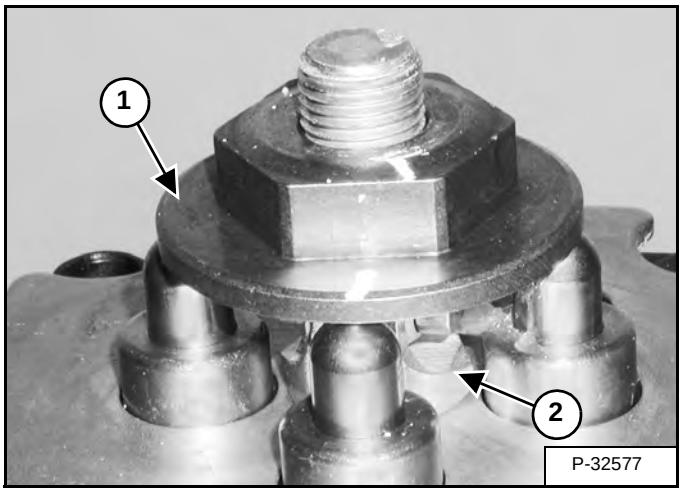
Disassembly (Cont'd)

Figure 20-110-17



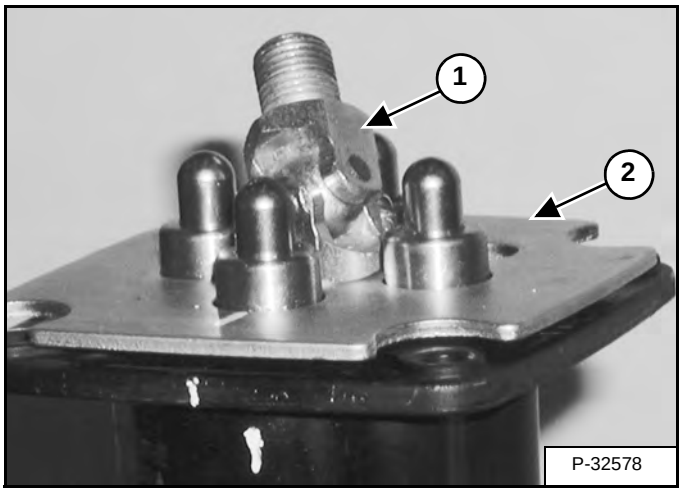
Remove the coupler (Item 1) from the control plate (Item 2) **[Figure 20-110-17]**.

Figure 20-110-18



Remove the control plate (Item 1) from the U-joint (Item 2) **[Figure 20-110-18]**.

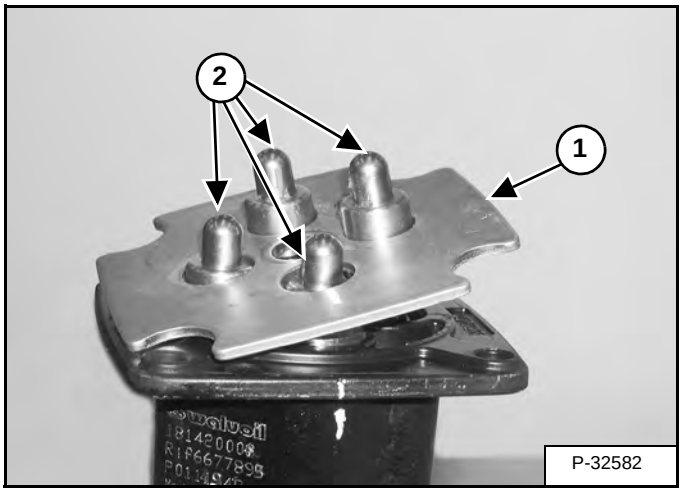
Figure 20-110-19



Mark the plate and housing for correct installation. Remove the U-joint (Item 1) **[Figure 20-110-19]**.

NOTE: The plate (Item 2) [Figure 20-110-19] is spring loaded and will come up as the U-joint is removed.

Figure 20-110-20



Remove the plate (Item 1) **[Figure 20-110-20]**.

LEFT CONTROL LEVER (JOYSTICK)

Testing

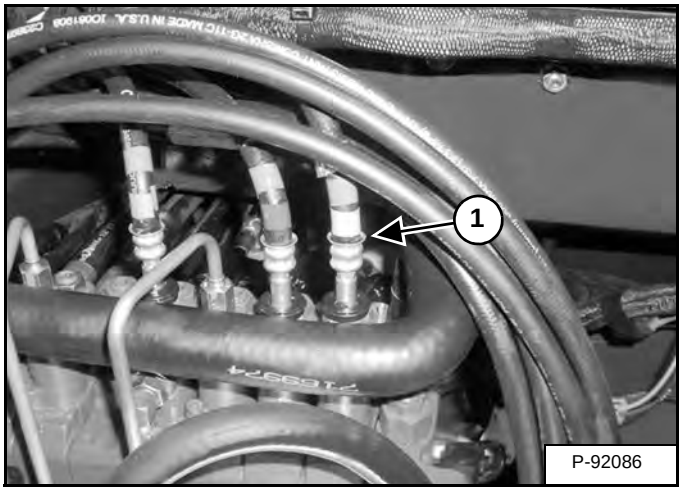
The following tools will be needed to do the procedure:

MEL1355 - Hydraulic Test Kit

Stop the engine.

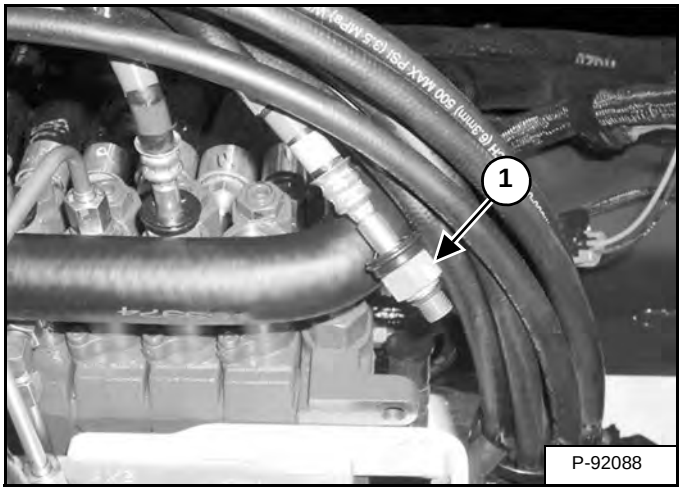
Open the right side cover. (See Opening And Closing on Page 10-60-1.)

Figure 20-120-1



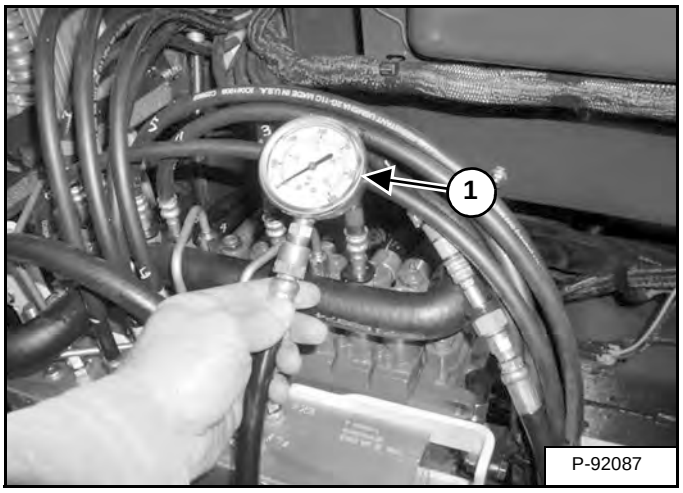
At the control valve assembly (Item 1) **[Figure 20-120-1]**, find the pilot line of the control lever (joystick) that is to be checked. (Boom, Arm, Slew, Bucket)

Figure 20-120-2



Disconnect the hydraulic fitting (Item 1) **[Figure 20-120-2]** from the control valve.

Figure 20-120-3



From the test kit install a 3447 kPa (35 bar) (500 psi) gauge (Item 1) **[Figure 20-120-3]** on the pilot line. Start the excavator, and warm the hydraulic oil to operating temperature.

Engage the circuit to be tested. Record the operating pressure.

The operating pressure should be approximately 2799 - 3103 kPa (28 - 31 bar) (406 - 450 psi).

If the operating pressure is correct, check the valve section spool for proper operation. If the operating pressure is incorrect, remove the pilot pressure relief valve, clean, install and retest. (See Testing And Adjusting The Pilot Pressure Relief Valve on Page 20-33-1.)

If the pressure is still incorrect replace the pilot pressure relief valve. (See Testing And Adjusting The Pilot Pressure Relief Valve on Page 20-33-1.)

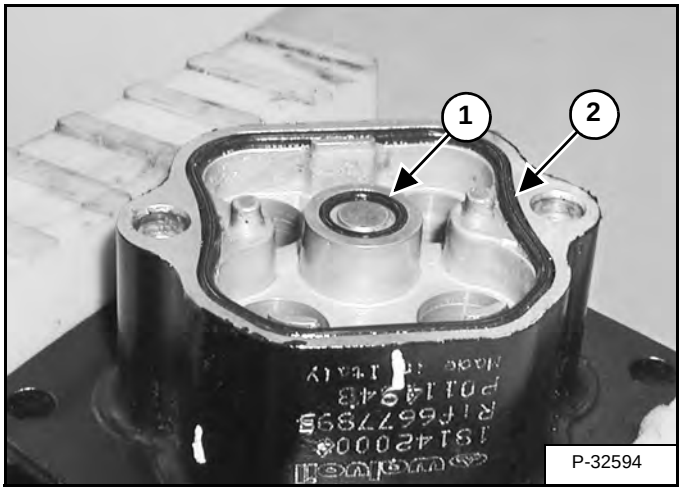
Assembly

Clean all parts in solvent and dry with compressed air.

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

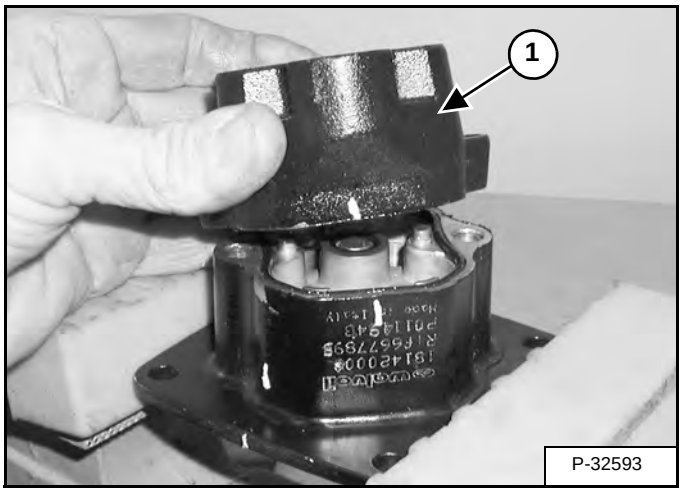
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-120-30



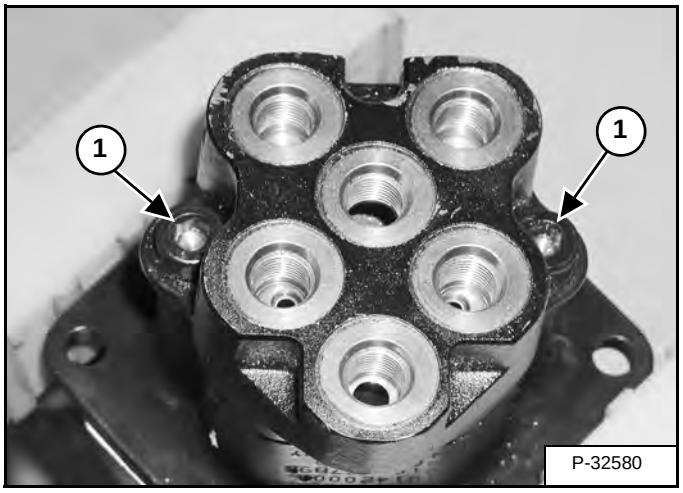
Clamp the housing in a vise equipped with padded jaws. Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-120-30]**.

Figure 20-120-31



Install the end cap (Item 1) **[Figure 20-120-31]**.

Figure 20-120-32



Install the bolts (Item 1) **[Figure 20-120-32]**.

Turn the housing over.

OIL COOLER

Removal And Installation

IMPORTANT

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

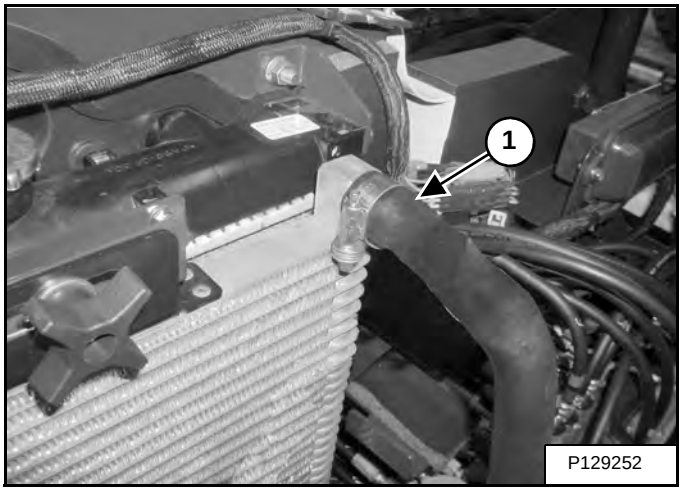
I-2003-0888

Open the right side cover. (See Opening And Closing on Page 10-60-1.)

Open the tailgate. (See Opening And Closing on Page 10-50-1.)

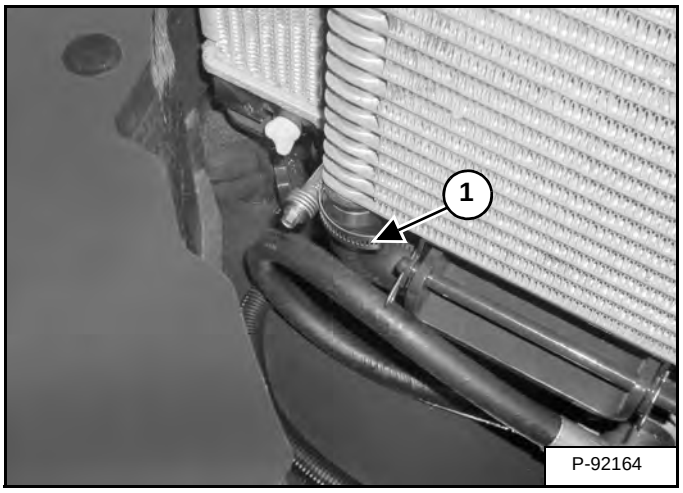
Remove the hydraulic reservoir. (See Removal And Installation on Page 20-140-1.)

Figure 20-150-1



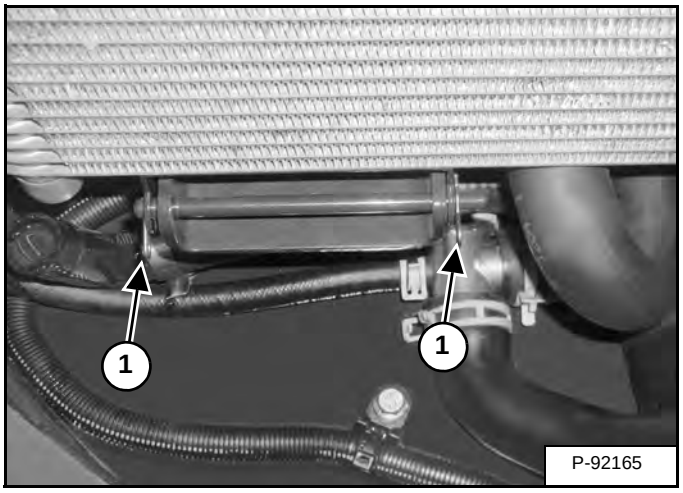
Remove the top hose (Item 1) **[Figure 20-150-1]**.

Figure 20-150-2



Remove the bottom hose (Item 1) **[Figure 20-150-2]**.

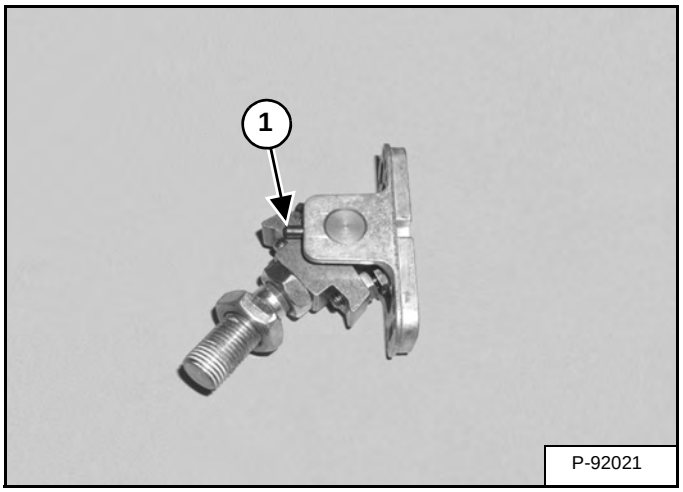
Figure 20-150-3



Remove the clips (Item 1) **[Figure 20-150-3]**.

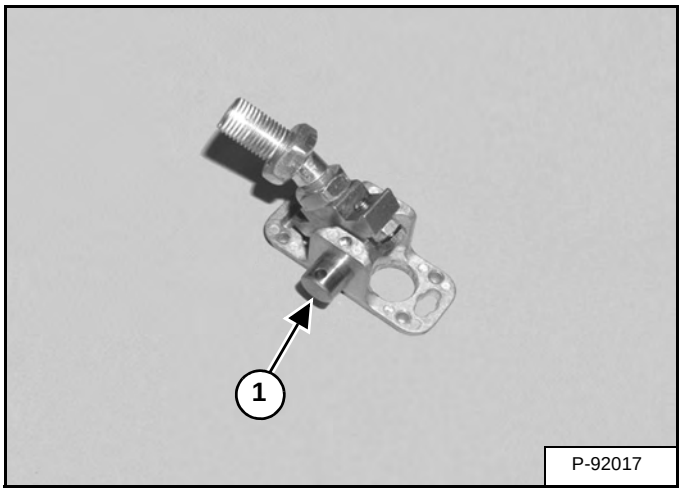
Disassembly And Assembly (Cont'd)

Figure 20-170-20



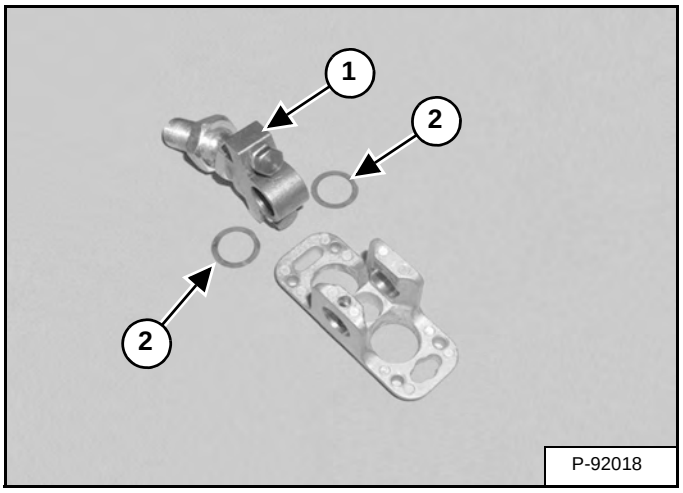
Remove the roll pin (Item 1) **[Figure 20-170-20]**.

Figure 20-170-21



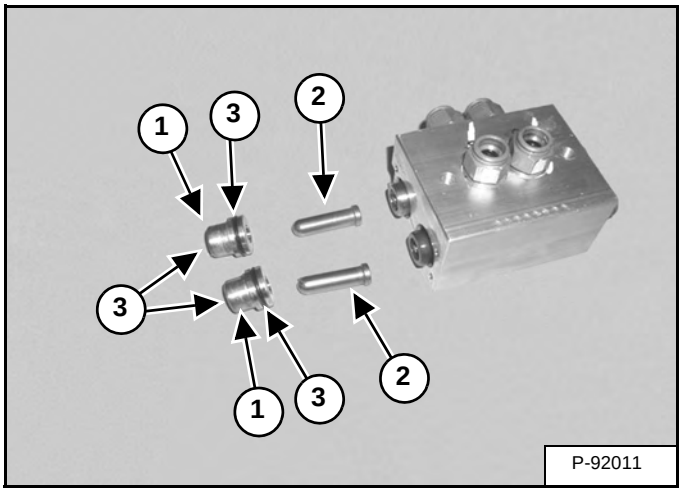
Remove the pivot pin (Item 1) **[Figure 20-170-21]**.

Figure 20-170-22



Remove the lever (Item 1). Remove the shim (Item 2) **[Figure 20-170-22]** from both sides of the lever.

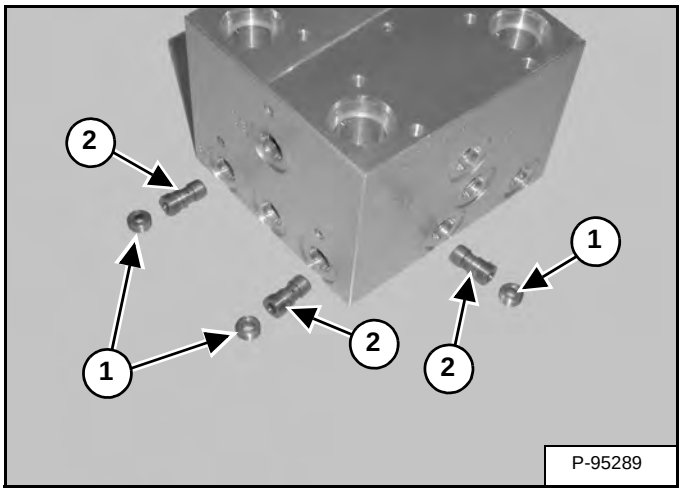
Figure 20-170-23



Remove the bushings (Item 1) and push rods (Item 2). Remove the O-rings (Item 3) **[Figure 20-170-23]** from the ID and OD of the bushings.

Disassembly And Assembly (Cont'd)

Figure 20-190-19

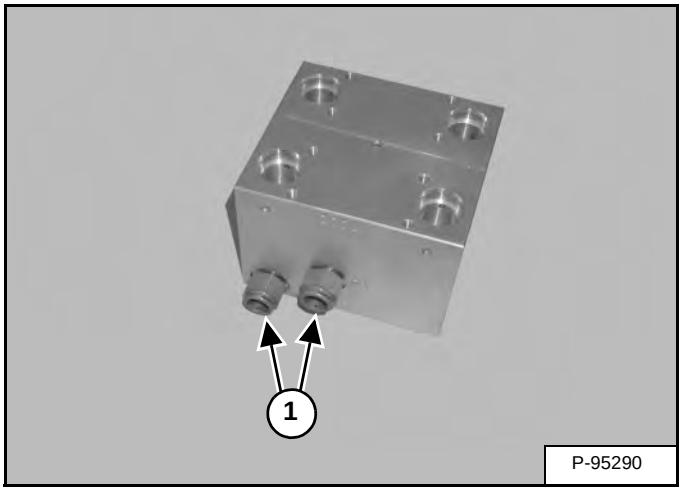


Remove the nut (Item 1) **[Figure 20-190-19]**.

Installation: Tighten the nut to 9,8 N•m (7.2 ft-lb) torque.

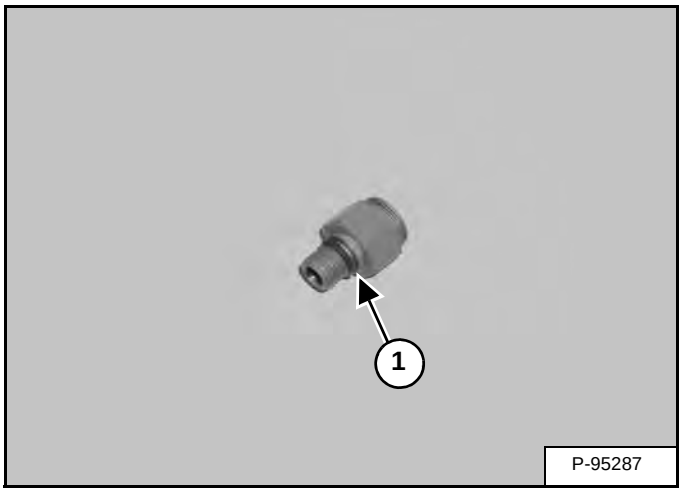
Remove the spool (Item 2) **[Figure 20-190-19]**.

Figure 20-190-20



Remove the fittings (Item 1) **[Figure 20-190-20]**.

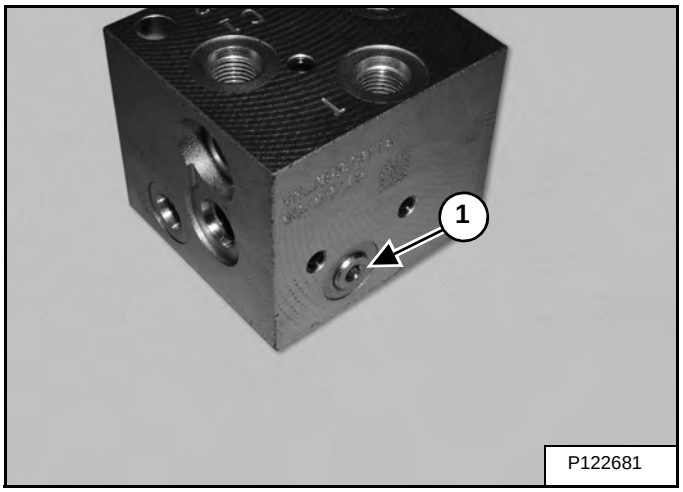
Figure 20-190-21



Remove the O-ring (Item 1) **[Figure 20-190-21]** from both fittings.

Disassembly And Assembly (Cont'd)

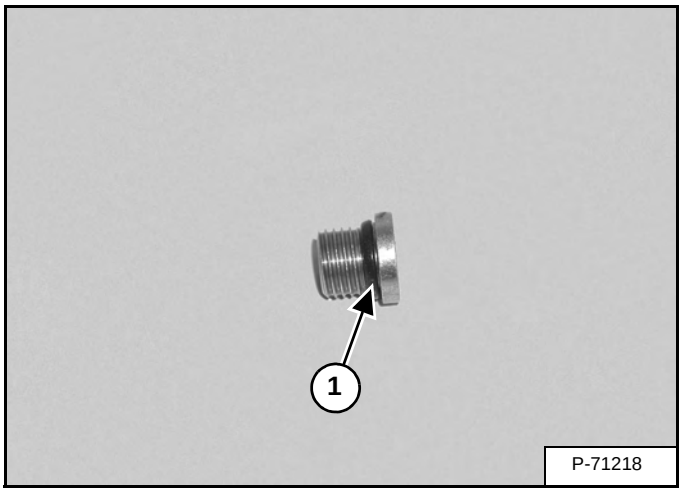
Figure 20-210-20



Remove the plug (Item 1) **[Figure 20-210-20]**.

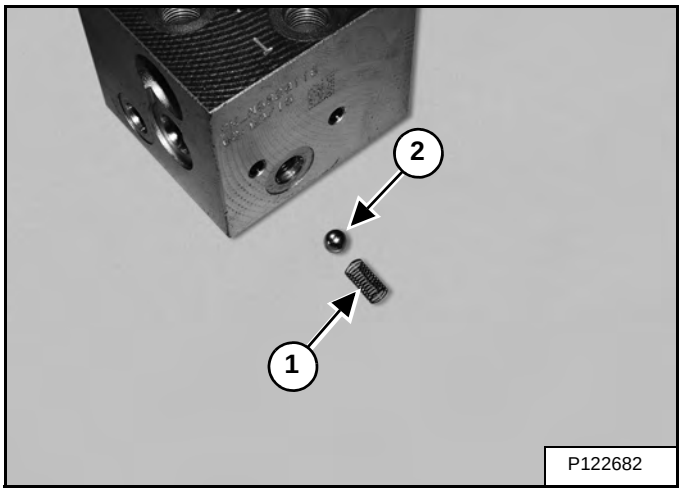
Installation: Tighten the plug to 18 N•m (13 ft-lb) torque.

Figure 20-210-21



Remove the O-ring (Item 1) **[Figure 20-210-21]** from the plug.

Figure 20-210-22



Remove the spring (Item 1) and ball (Item 2) **[Figure 20-210-22]** from the manifold.

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.

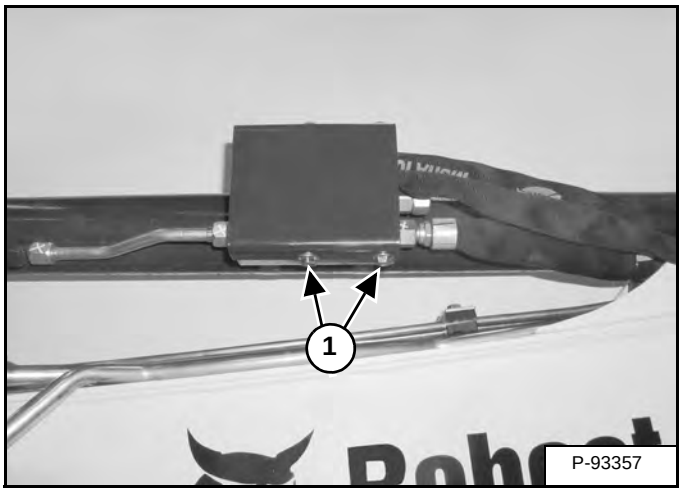
VALVE (ARM LOCK)

Removal And Installation

Lower the work equipment to the ground.

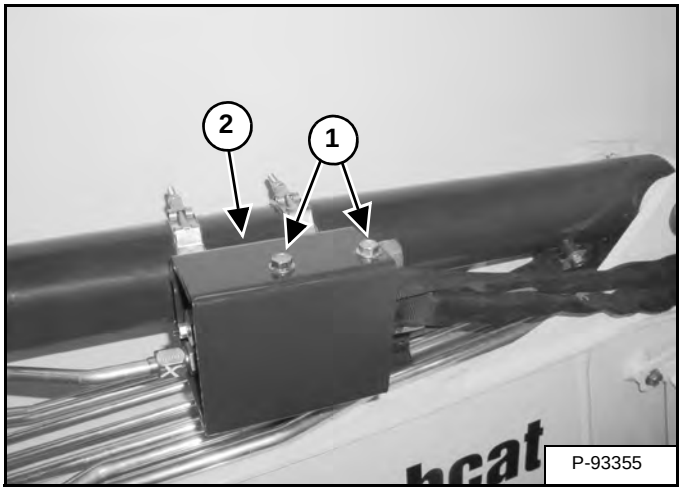
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-231-1



Remove the bolts (Item 1) **[Figure 20-231-1]**.

Figure 20-231-2



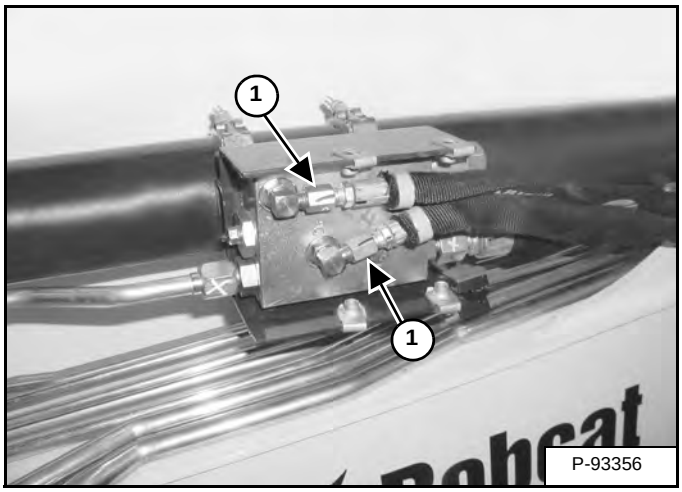
Remove the bolts (Item 1) and cover (Item 2) **[Figure 20-231-2]**.

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.

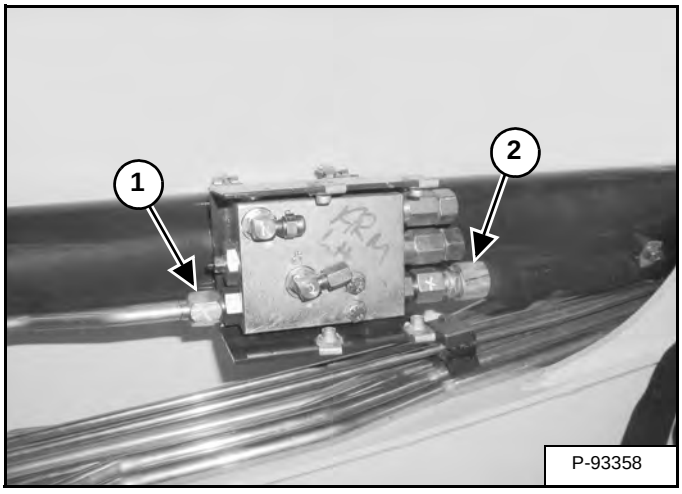
I-2003-0888

Figure 20-231-3



Remove the hoses (Item 1) **[Figure 20-231-3]**.

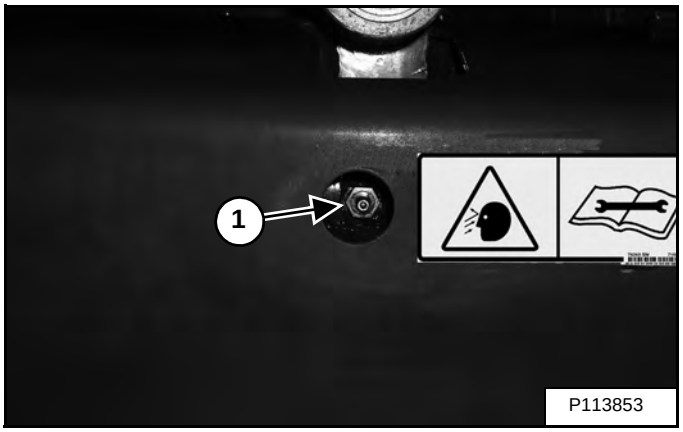
Figure 20-231-4



Remove the tubeline (Item 1) and hose (Item 2) **[Figure 20-231-4]**.

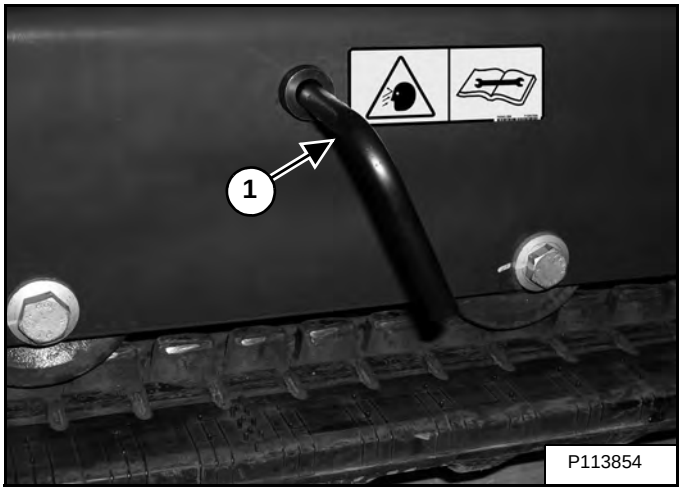
Checking Tension (Cont'd)

Figure 30-20-5



Add grease to the fitting (Item 1) **[Figure 30-20-5]** until the track tension is correct.

Figure 30-20-6



The tension removal tool (P/N 7277225) is available and recommended to direct the flow of grease to aid in cleanup, Always dispose of the grease in an environmentally friendly manor.

The tool is sized to fit the one piece track tension fitting (Item 1) **[Figure 30-20-5]**.

Use tool (P/N 7277225) (Item 1) **[Figure 30-20-6]** to loosen the tension fitting (Item 2) **[Figure 30-20-5]** to release tension from the track.

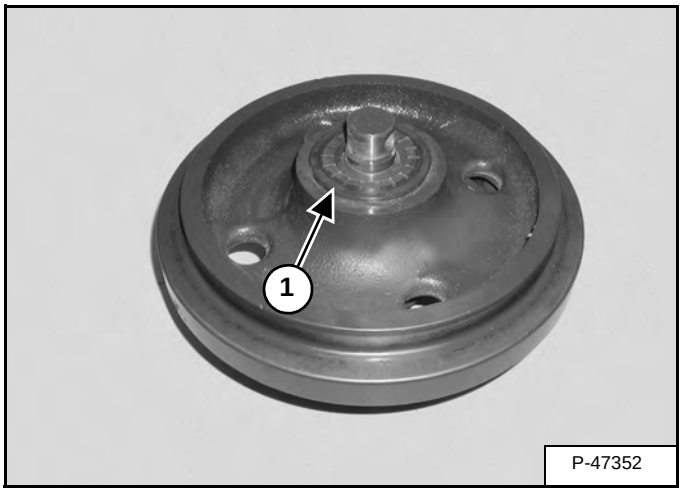
NOTE: Do not loosen the track tension fitting (Item 1) [Figure 30-20-5] more than 1-1/2 turns.

Installation: Tighten the track tension fitting to 23 N•m (17 ft-lb) torque.

Repeat the procedure for the other side.

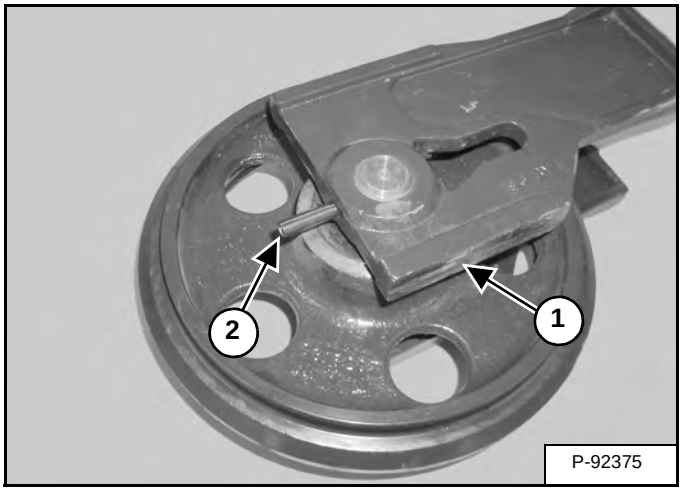
Idler Assembly (Cont'd)

Figure 30-20-31



Using the driving tool, install the seal (Item 1) **[Figure 30-20-31]** on both sides of the idler.

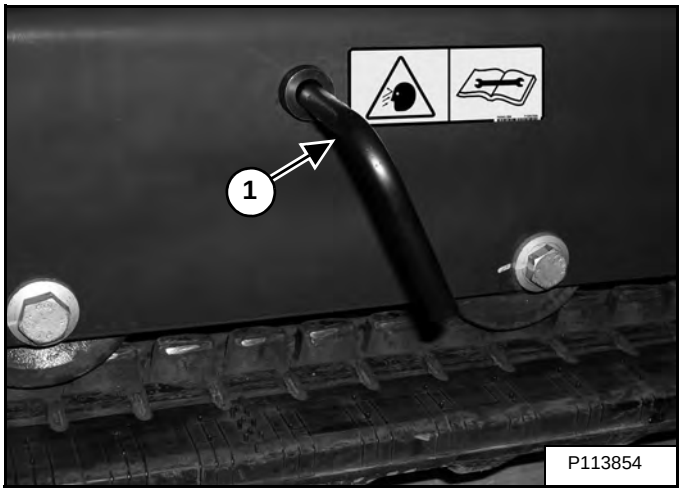
Figure 30-20-32



Install the block (Item 1) and roll pin (Item 2) **[Figure 30-20-32]** on both sides of the shaft.

Checking Tension (Cont'd)

Figure 30-21-4



The tension removal tool (P/N 7277225) is available and recommended to direct the flow of grease to aid in cleanup, Always dispose of the grease in an environmentally friendly manor.

The tool is sized to fit the one piece track tension fitting (Item 1) **[Figure 30-21-4]**.

Use tool (P/N 7277225) (Item 1) **[Figure 30-21-8]** to loosen the tension fitting (Item 2) **[Figure 30-21-7]** to release tension from the track.

NOTE: Do not loosen the track tension fitting (Item 1) [Figure 30-21-7] more than 1-1/2 turns.

Installation: Tighten the track tension fitting to 23 N•m (17 ft-lb) torque.

Repeat the procedure for the other side.

⚠ WARNING

HIGH PRESSURE GREASE CAN CAUSE SERIOUS INJURY

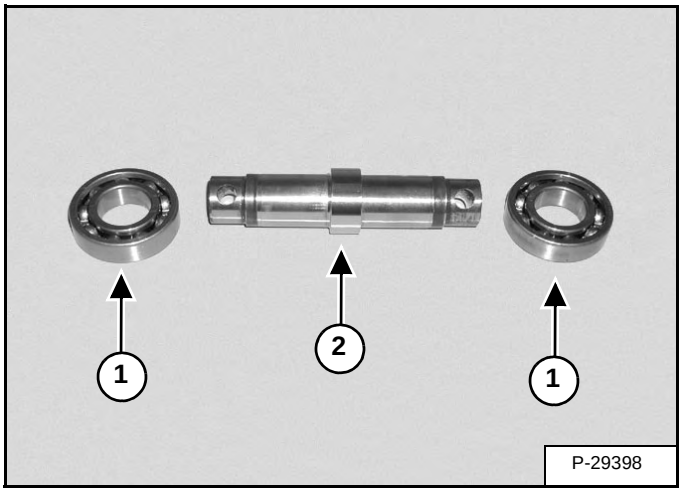
- **Do not loosen the track tension fitting more than 1 - 1/2 turns.**

W-2994-0515

Idler Assembly

Clean all parts in solvent and dry with compressed air.

Figure 30-21-25

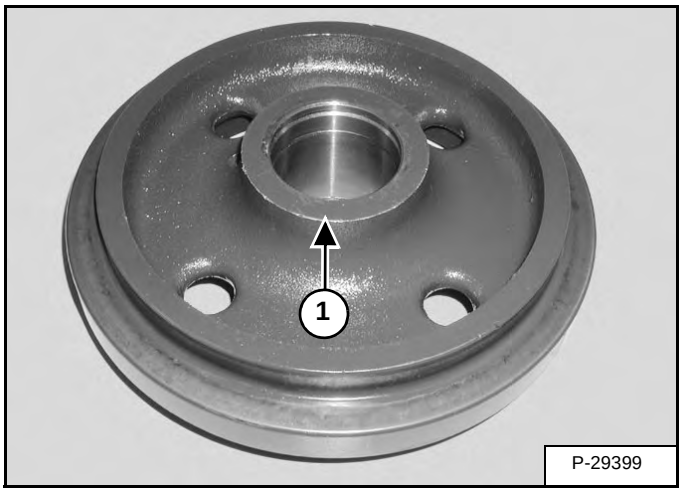


Inspect the bearings (Item 1) and shaft (Item 2) **[Figure 30-21-25]** for wear or damage.

The bearings are sealed. If the bearings do not roll smoothly, or if the seals are damaged, replace the bearings.

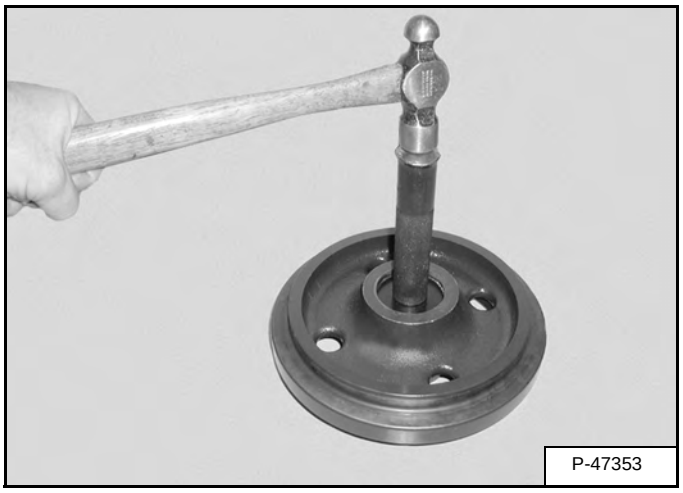
Replace any worn or damaged parts.

Figure 30-21-26



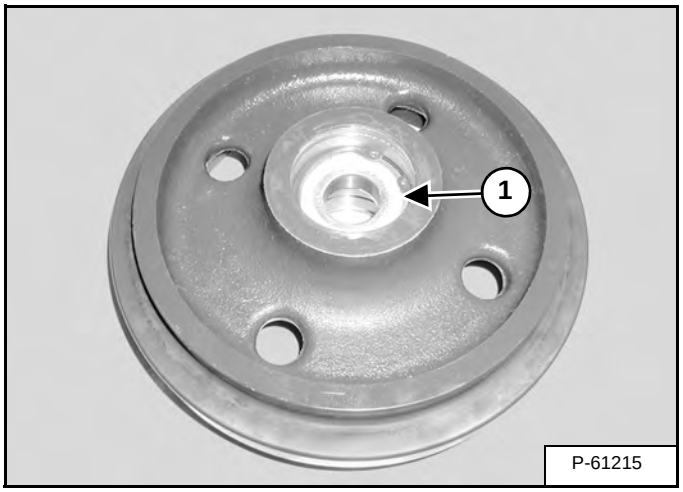
Remove all paint and corrosion from the seal surface (Item 1) **[Figure 30-21-26]** on both sides of the idler.

Figure 30-21-27



Using a bearing driver, install the bearing in the idler **[Figure 30-21-27]**.

Figure 30-21-28



Install the snap ring (Item 1) **[Figure 30-21-28]**.

TRACK MAINTENANCE

Track Damage Identification

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

Cutting Of Steel Cords

Figure 30-30-1

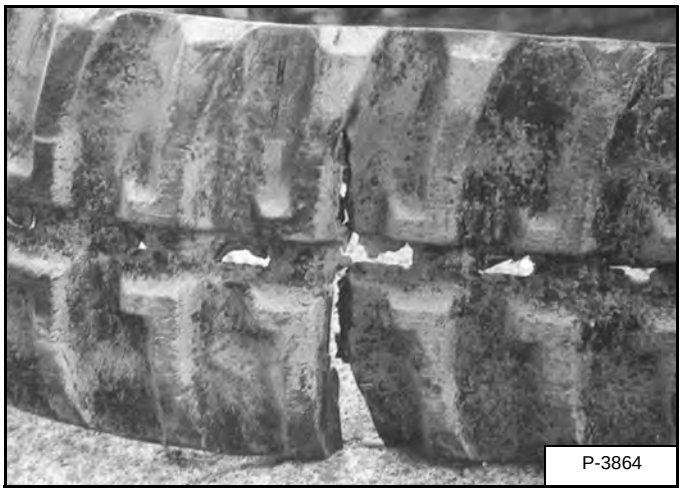
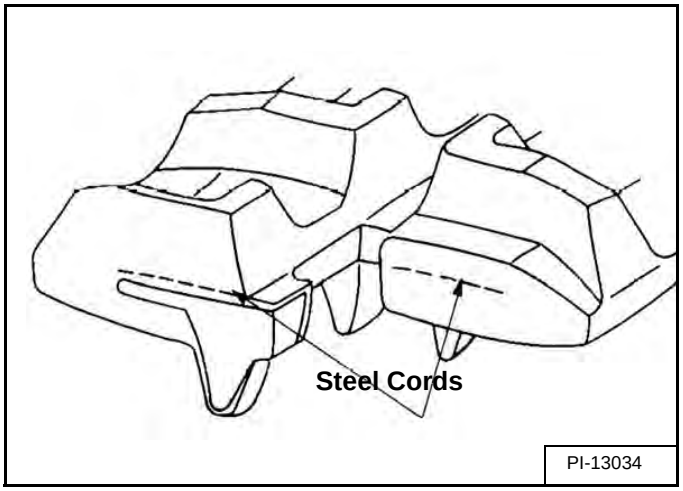


Figure 30-30-2



Damage:

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

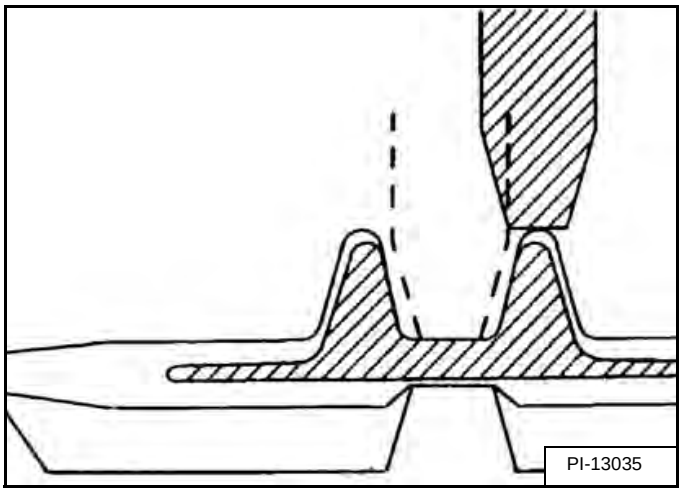
Replacement:

Replacement is required.

Causes of the damage:

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

Figure 30-30-3



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

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

The rubber track is clogged with stones or foreign obstacles.

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

Prevention:

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

Periodical checking on site of the recommended track tension.

Avoiding quick turns on bumpy and rocky fields.

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

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

Track Damage Identification (Cont'd)

Cuts On The Edges Of Track Roller Side

Figure 30-30-22

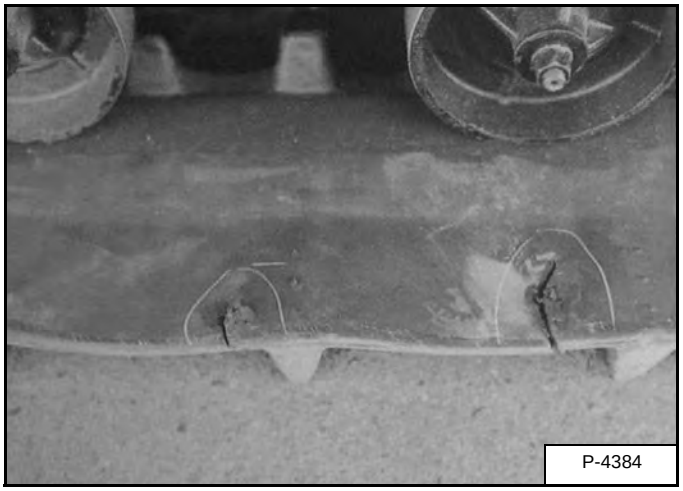
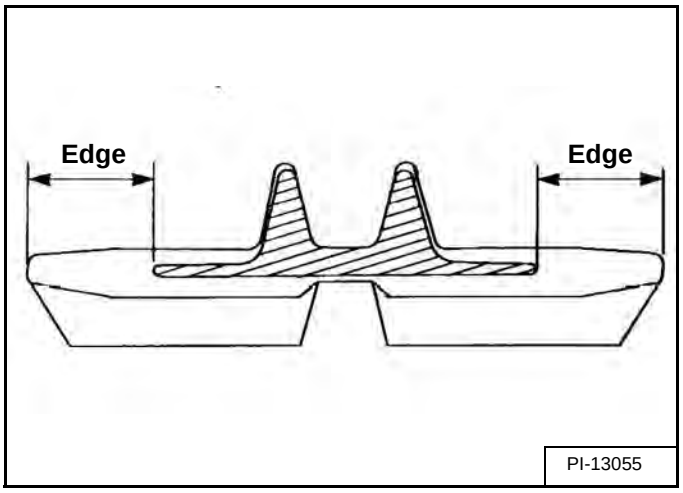


Figure 30-30-23



Damage:

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

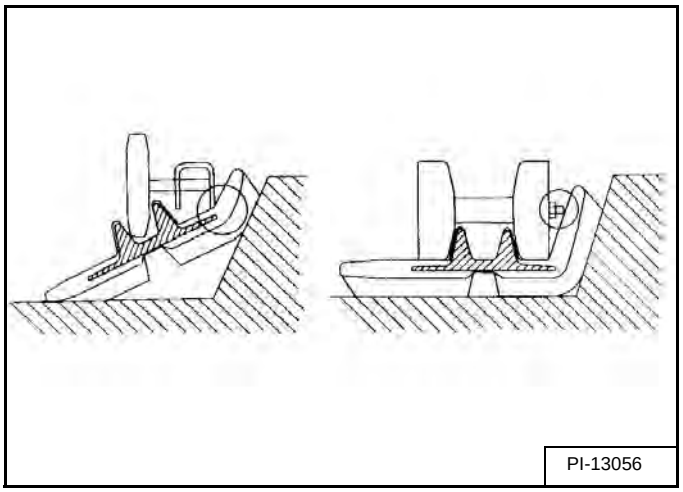
Replacement:

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

Causes of the damage:

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

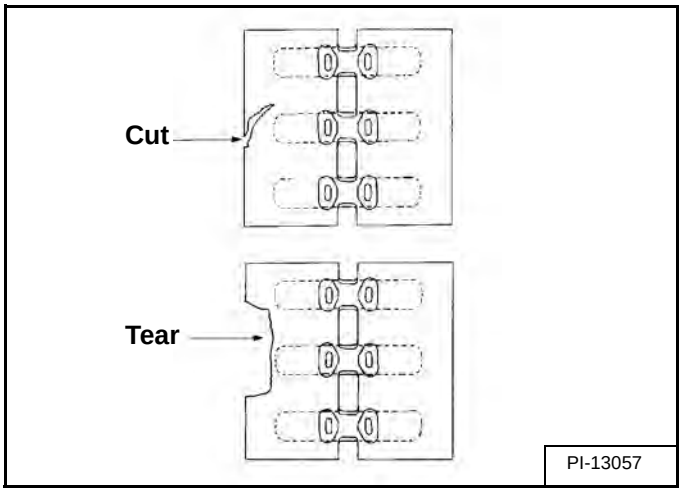
Figure 30-30-24



In case of damage by objects on the operating ground:

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

Figure 30-30-25

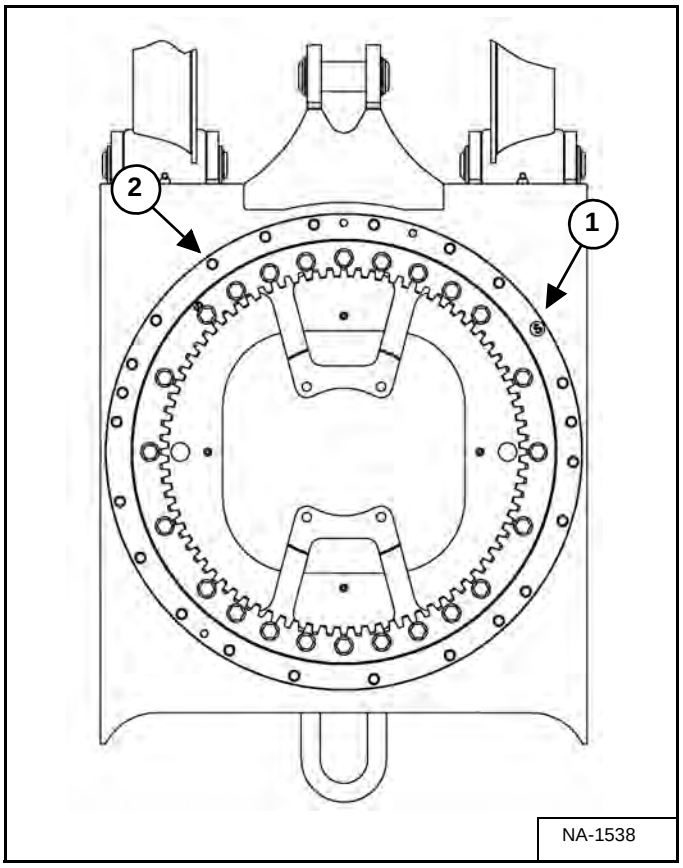


In case of damage by interference with the machine frame:

If a machine continues operating with rubber tracks being detracted, the rubber tracks may get caught up in the machine frame or undercarriage parts resulting in damage. When a machine travels along side slopes, the rubber tracks are deformed so much that they come into contact with the machine frame and undercarriage parts, which causes cutting, gouging and rubbing of rubber tracks in the end **[Figure 30-30-25]**.

Installation

Figure 40-10-6

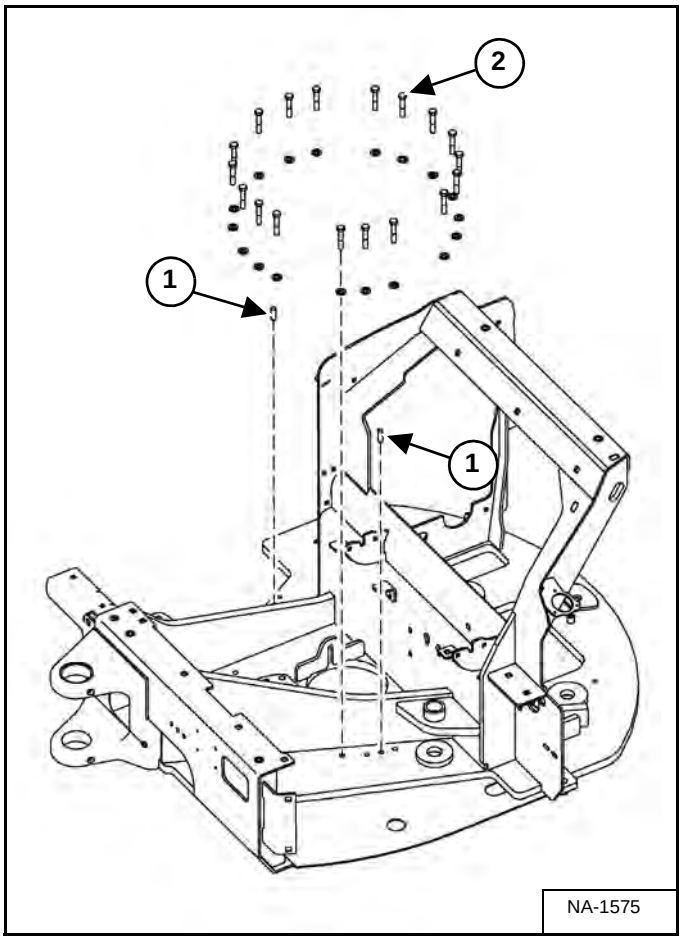


Rotate the swing bearing so the outside soft zone (Item 1) **[Figure 40-10-6]** is to the right hand side as shown.

Use a tap in the holes (Item 2) **[Figure 40-10-6]** of the swing bearing to remove any dried thread lock adhesive.

Install the upperstructure onto the swing bearing using the alignment marks.

Figure 40-10-7

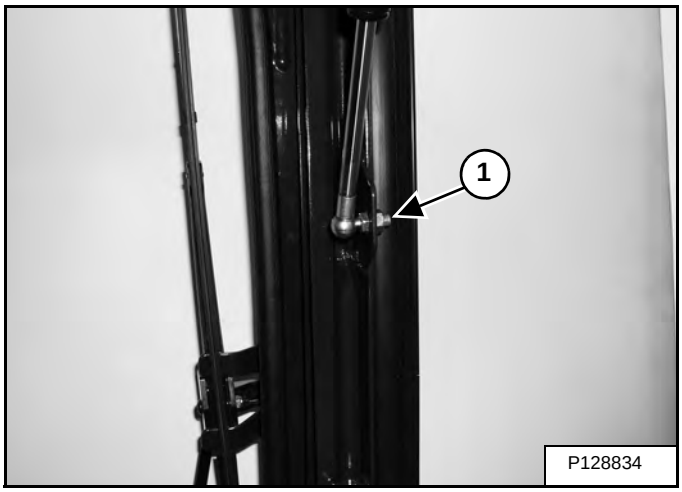


Install the dowel pins (Item 1) **[Figure 40-10-7]**.

Install the bolts (Item 2) **[Figure 40-10-7]** and washers. Tighten the bolts to 105 - 115 N•m (78 - 85 ft-lb) torque.

Front Window Removal And Installation

Figure 40-30-12



With the window open and latched, remove the nut (Item 1) **[Figure 40-30-12]** and remove the gas spring bolt from the cab.

Figure 40-30-13

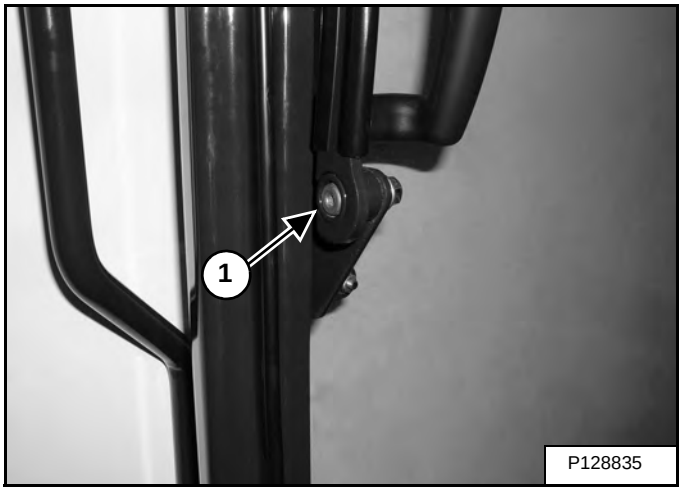
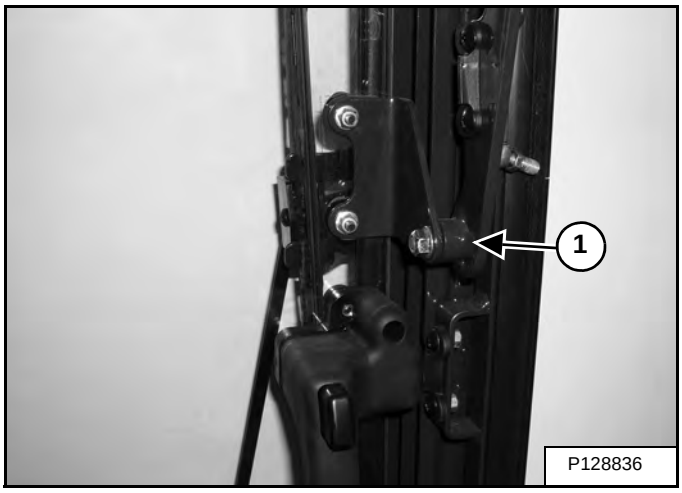
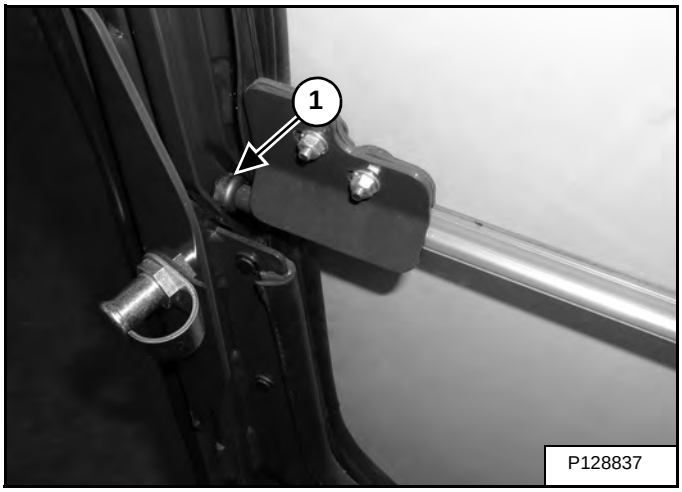


Figure 40-30-14



Close the window and remove the bolts (Item 1) **[Figure 40-30-13]** and **[Figure 40-30-14]** and nuts.

Figure 40-30-15

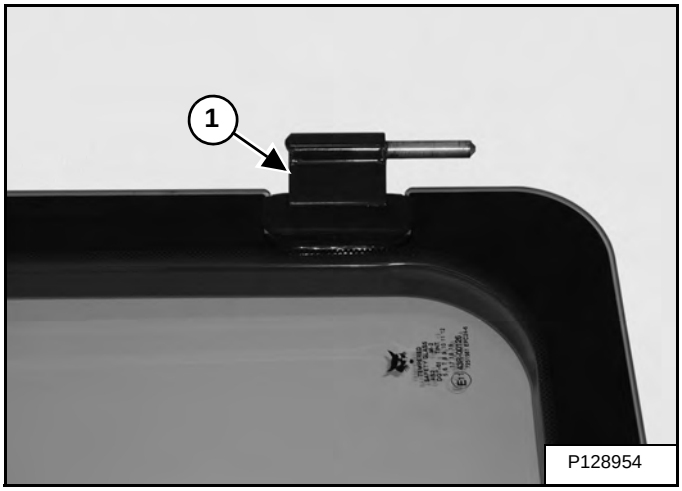


Tilt the window and remove the rollers (Item 1) **[Figure 40-30-15]** from both roller mounts. Remove the window.

Glass Installation (Cont'd)

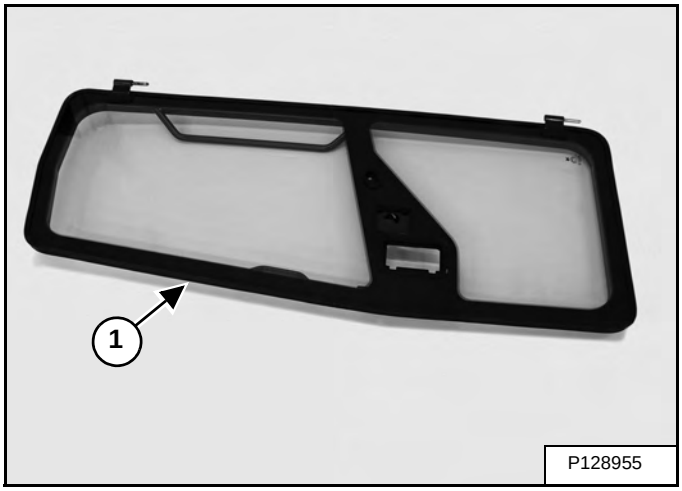
Door Glass (Cont'd)

Figure 40-30-40



Install the grommet (Item 1) **[Figure 40-30-40]** around the top and bottom hinge.

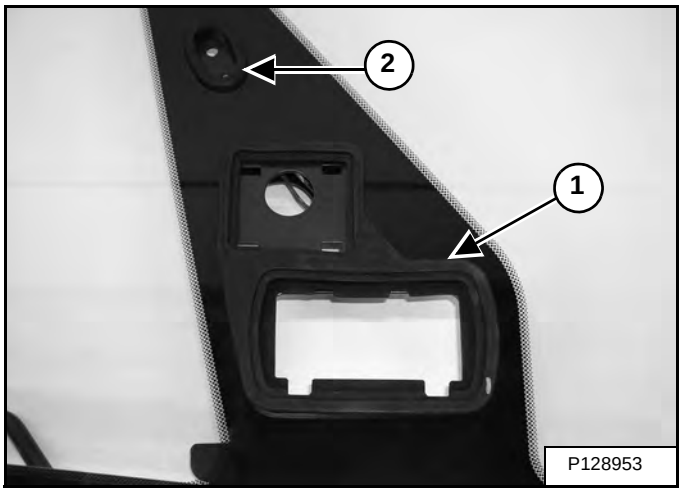
Figure 40-30-41



Install the door seal (Item 1) **[Figure 40-30-41]** around the edge of the door glass.

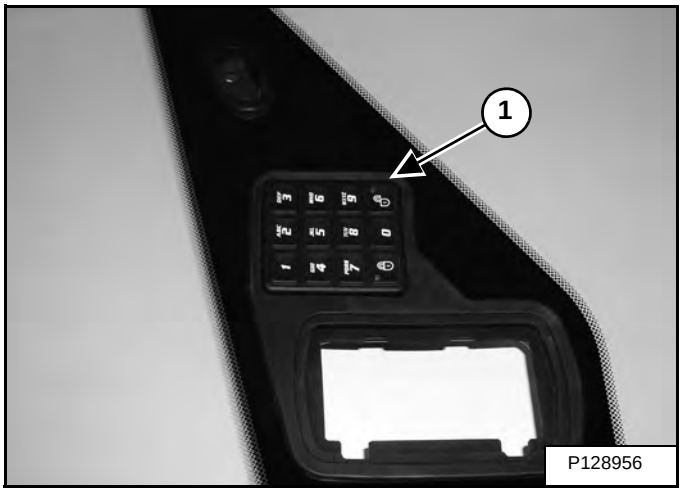
NOTE: Install the seal with the seal splice on the hinge side of the door.

Figure 40-30-42



Install the door handle grommet (Item 1) and striker U-bolt grommet (Item 2) **[Figure 40-30-42]**.

Figure 40-30-43

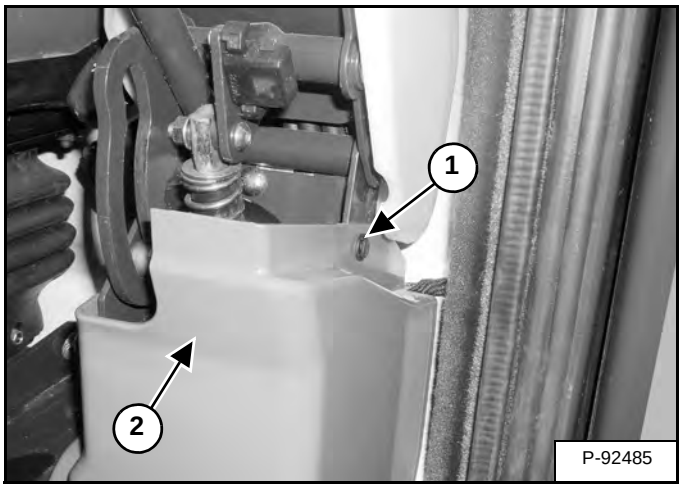


If equipped, install the keypad (Item 1) **[Figure 40-30-43]**.

LEFT CONSOLE

Lower Console Cover Removal And Installation

Figure 40-60-1



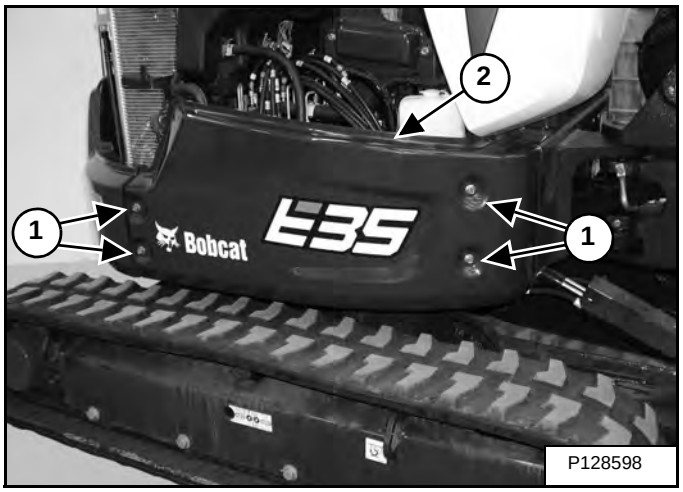
Pull out on the center of the plastic fastener assembly (Item 1) **[Figure 40-60-1]** (both sides).

Remove the fastener assembly and cover (Item 2) **[Figure 40-60-1]**.

RIGHT UPPERSTRUCTURE COVER

Removal And Installation

Figure 40-80-1

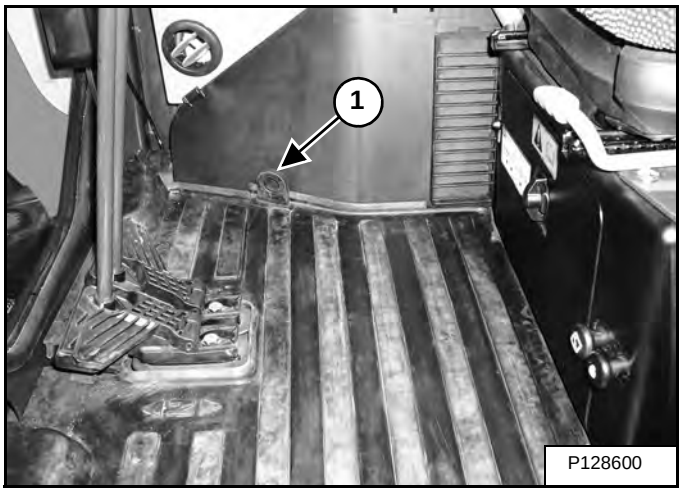


Remove the bolts (Item 1). Remove the cover (Item 2) **[Figure 40-80-1]**.

FLOOR MAT

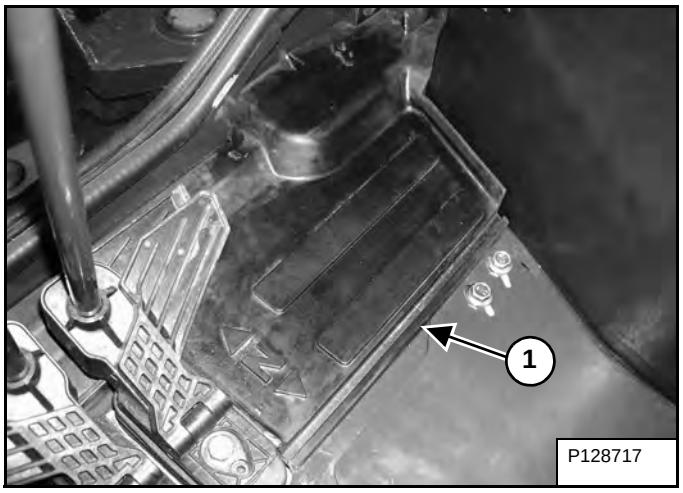
Removal And Installation

Figure 40-110-1



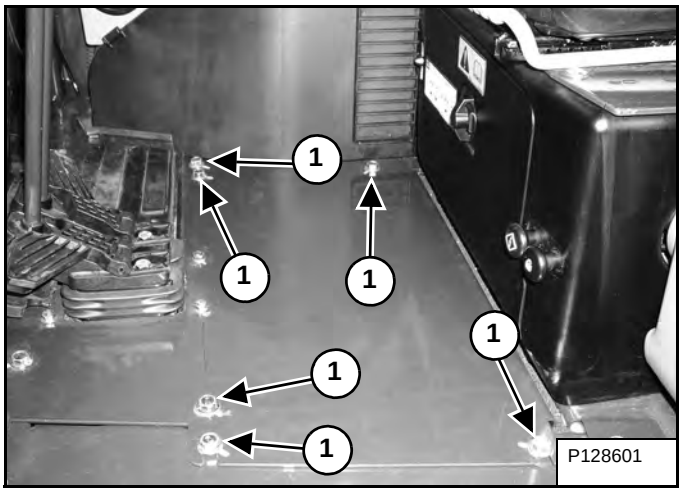
Lift up on and remove the floor mat (Item 1) **[Figure 40-110-1]**.

Figure 40-110-2



Lift up on and remove the front floor mat (Item 1) **[Figure 40-110-2]**.

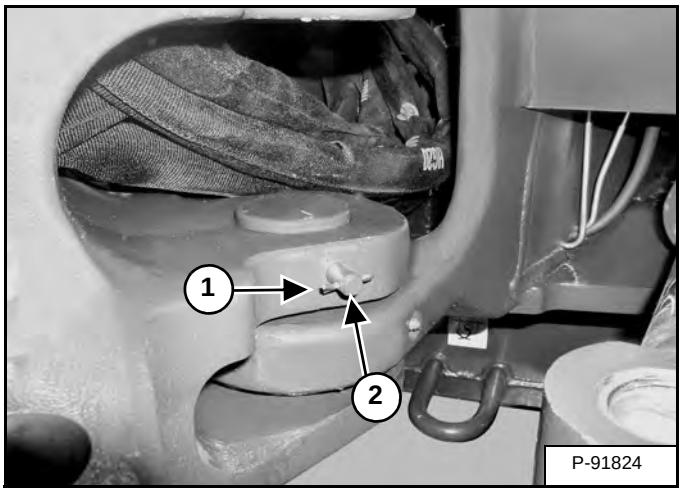
Figure 40-110-3



Remove the bolts (Item 1) **[Figure 40-110-3]** and remove the floorplate.

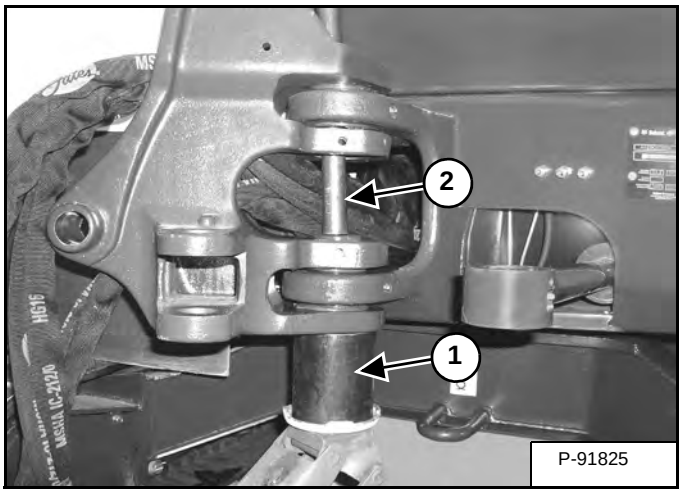
Removal And Installation (Cont'd)

Figure 40-140-5



Remove the cotter pin (Item 1) and retaining pin (Item 2) **[Figure 40-140-5]**.

Figure 40-140-6

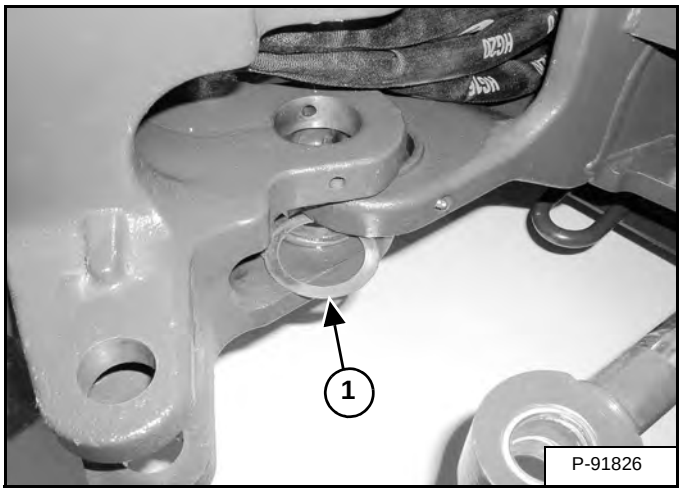


Install a spacer tube (Item 1) **[Figure 40-140-6]** and jack under the swing frame to support the casting. The spacer tube must be large enough to allow the pin to be driven in the center of the spacer tube for pin removal.

Use a large punch (Item 2) **[Figure 40-140-6]** and drive the bottom swing frame pin out.

NOTE: Do not use a porta-power to press out the bottom pin because the top casting cannot be supported and possible damage to the casting could occur.

Figure 40-140-7

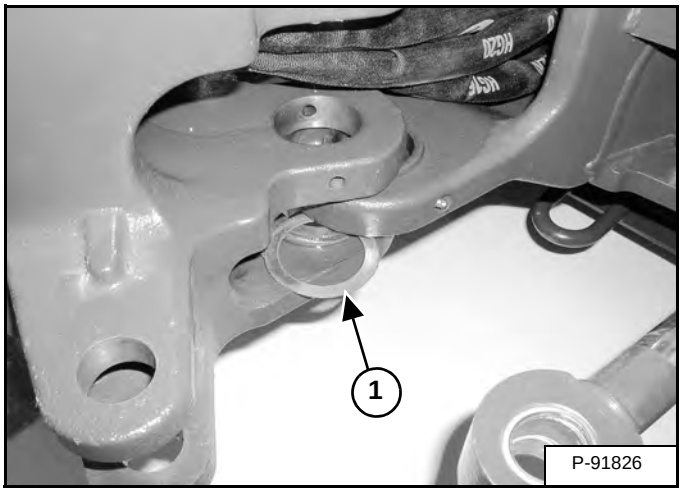


Remove the bottom spacer (Item 1) **[Figure 40-140-7]** from the swing frame.

Remove the swing frame.

Inspect the bushings for damage. Replace damaged bushings as necessary. (See Bushing Removal on Page 40-140-6.)

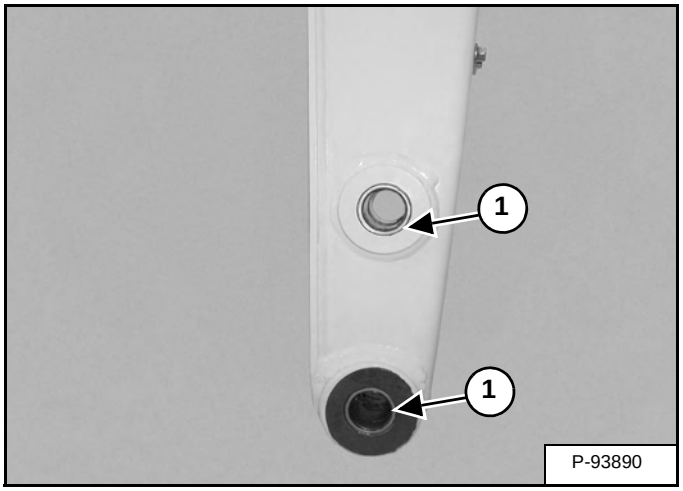
Figure 40-140-8



Installation: Install the bottom spacer (Item 1) **[Figure 40-140-8]** (if equipped) on the swing frame. Install the swing frame.

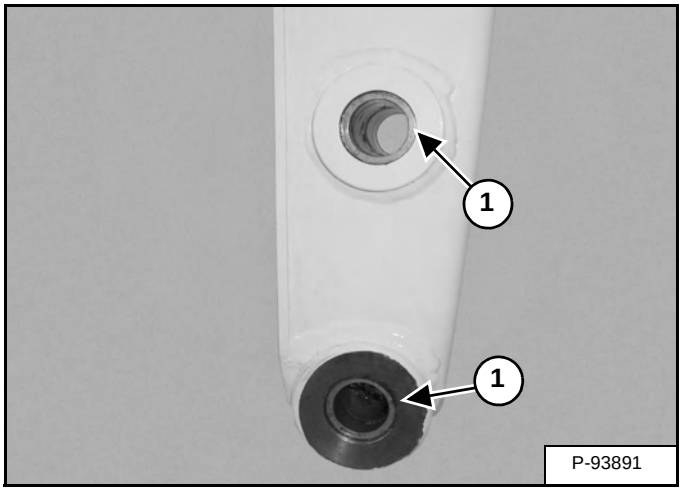
Arm To Bucket And Bucket Link Bushing Removal And Installation

Figure 40-160-5



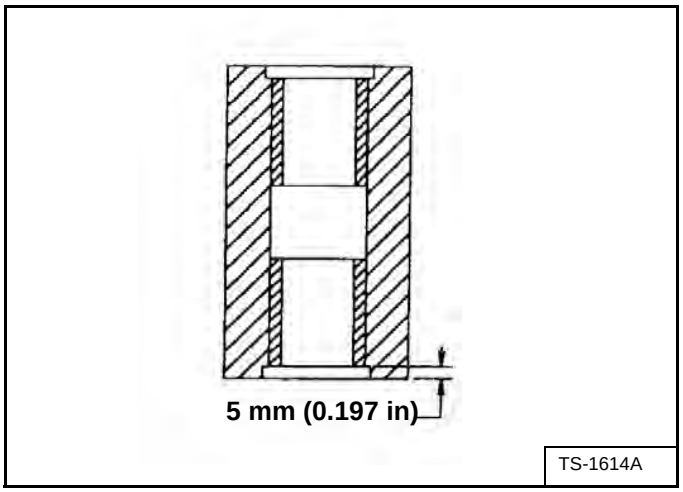
Remove the seals (Item 1) **[Figure 40-160-5]** from both sides of the arm.

Figure 40-160-6



Remove the bushings (Item 1) **[Figure 40-160-6]** from both sides of the arm.

Figure 40-160-7

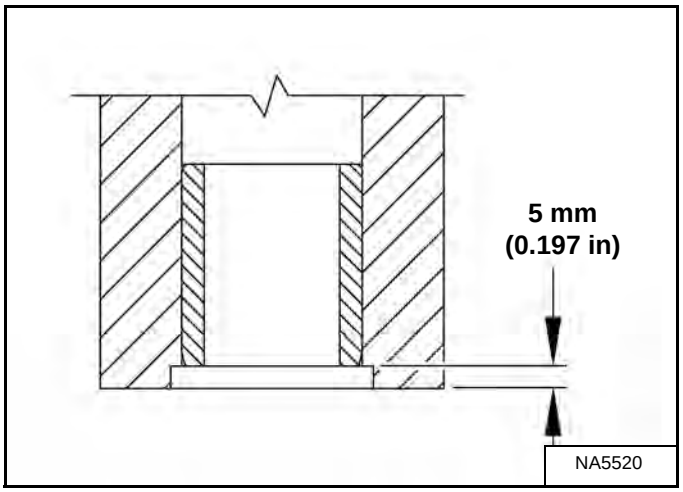


Install the bushings until they are seated 5 mm (0.197 in) in the pin boss **[Figure 40-160-7]** (both sides).

Install new seals on both sides of the arm.

Disassembly And Assembly (Cont'd)

Figure 40-161-27

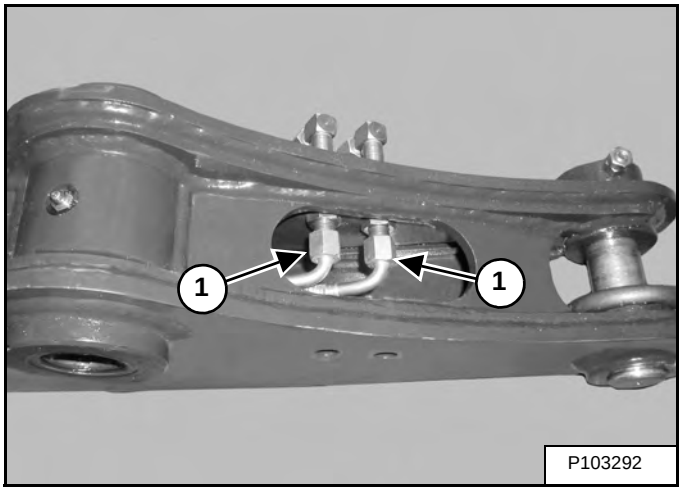


Install the bushings until they are seated 5 mm (0.197 in) in the pin boss **[Figure 40-161-27]**.

Install new seals on both sides of the arm.

NOTE: The metal side of the seals must face outward.

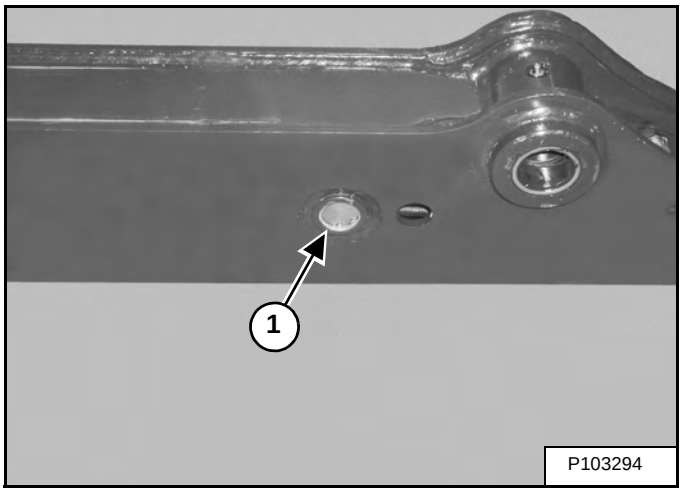
Figure 40-161-28



Remove the hoses (Item 1) **[Figure 40-161-28]** from the bulkhead fittings.

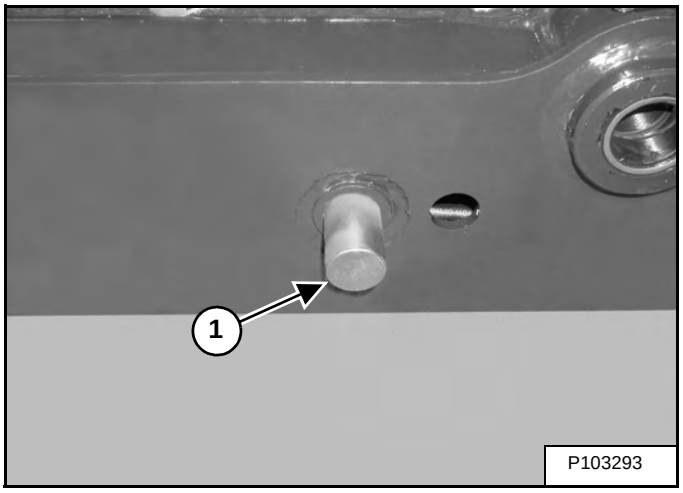
NOTE: The hoses will be removed with the cylinder.

Figure 40-161-29



Remove the snap ring (Item 1) **[Figure 40-161-29]**.

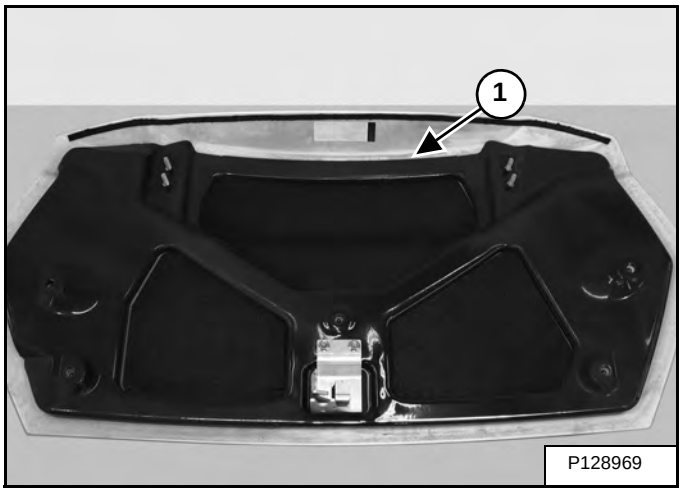
Figure 40-161-30



Remove the cylinder base end pin (Item 1) **[Figure 40-161-30]**.

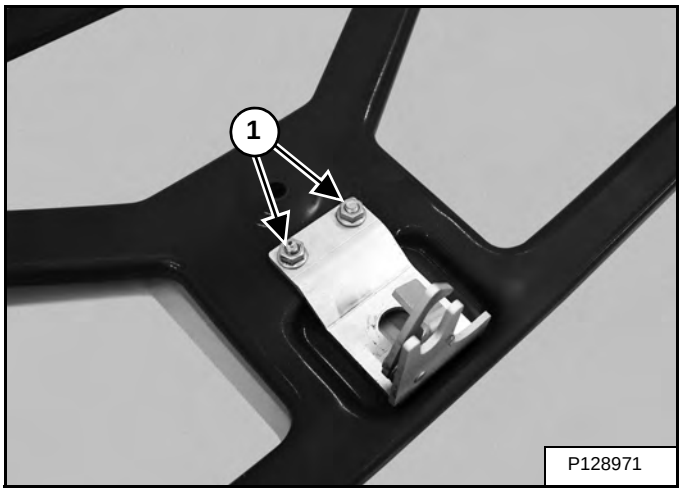
Disassembly and Assembly (Cont'd)

Figure 40-190-6



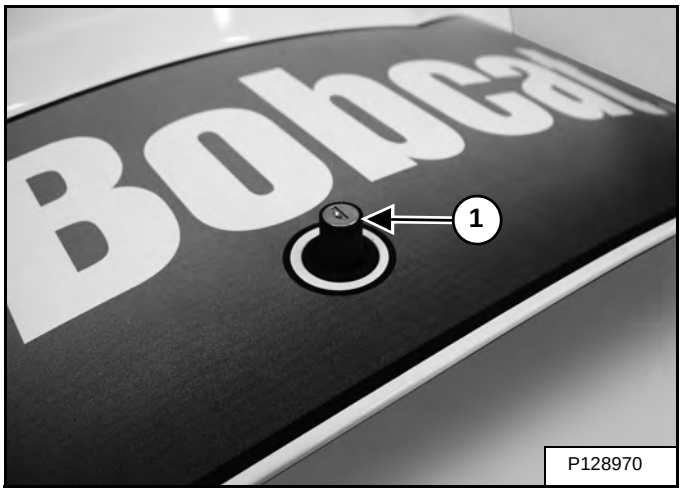
Remove the frame (Item 1) **[Figure 40-190-6]** from the tailgate.

Figure 40-190-7



Remove the nuts (Item 1) **[Figure 40-190-7]** and remove the latch.

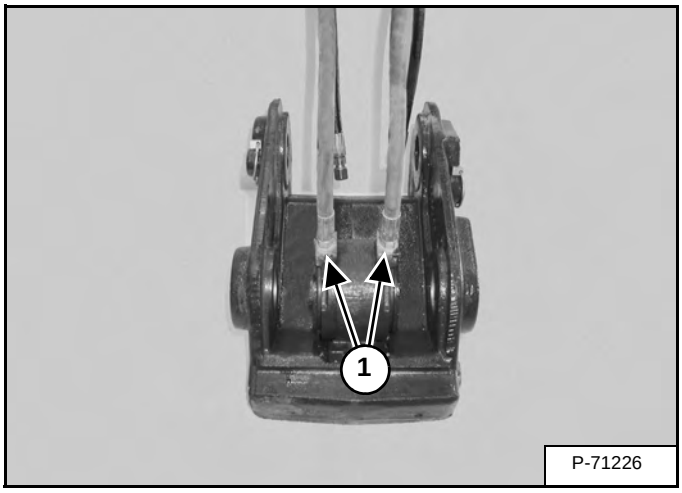
Figure 40-190-8



Remove the push button (Item 1) **[Figure 40-190-8]** from the tailgate.

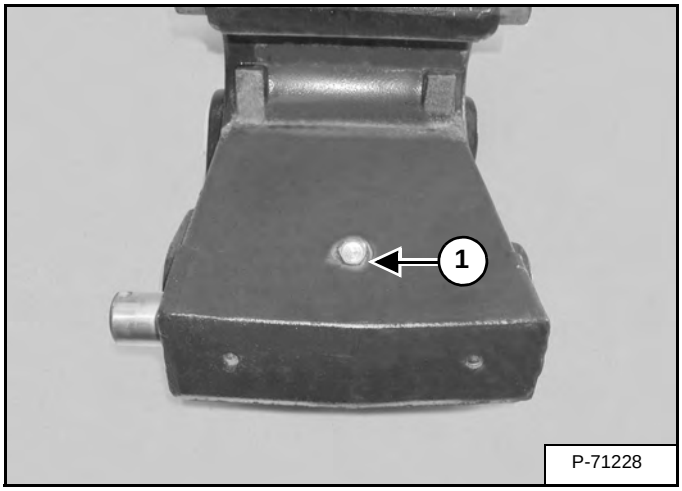
Disassembly (Cont'd)

Figure 40-201-13



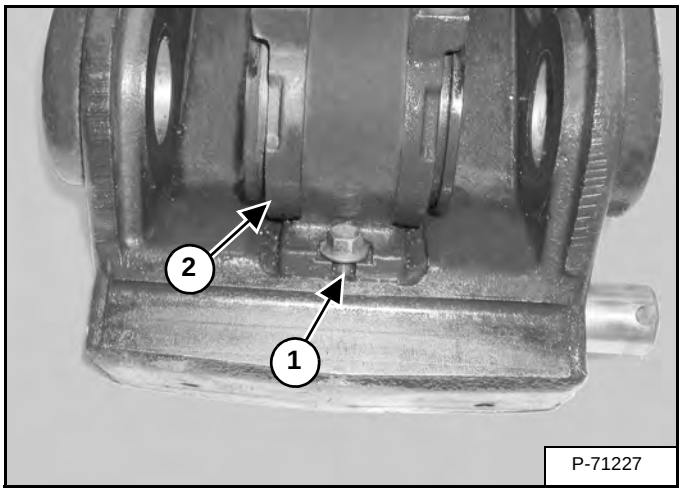
Remove the two hydraulic hoses (Item 1) **[Figure 40-201-13]** from the swivel ends.

Figure 40-201-14



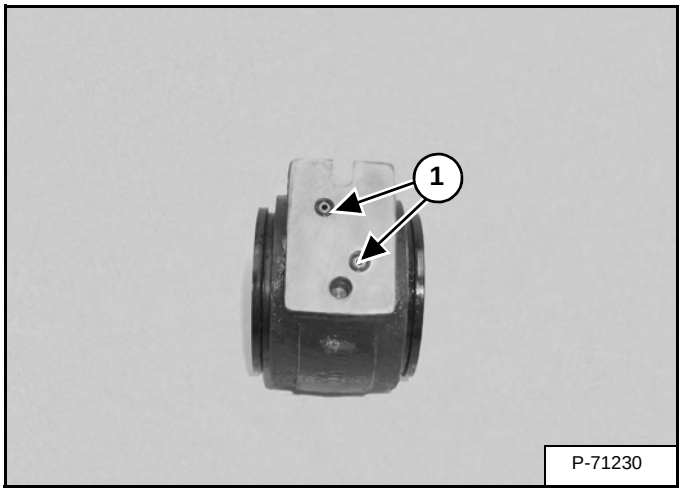
Remove the bolt (Item 1) **[Figure 40-201-14]**.

Figure 40-201-15



Remove the bolt (Item 1), nut, and the swivel assembly (Item 2) **[Figure 40-201-15]**.

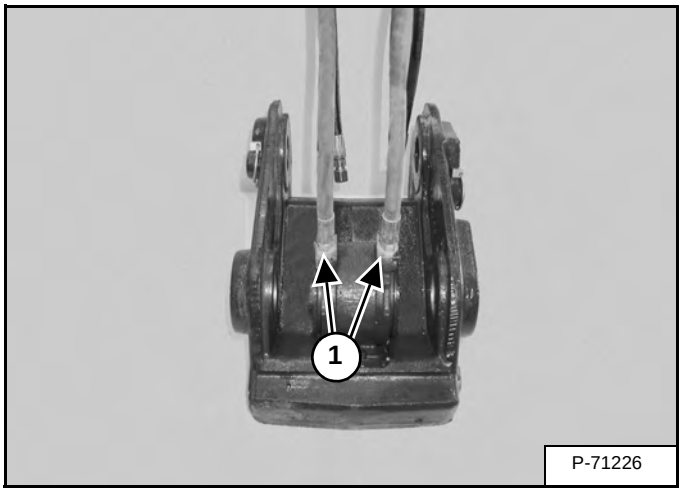
Figure 40-201-16



Remove the O-rings (Item 1) **[Figure 40-201-16]** from the swivel assembly.

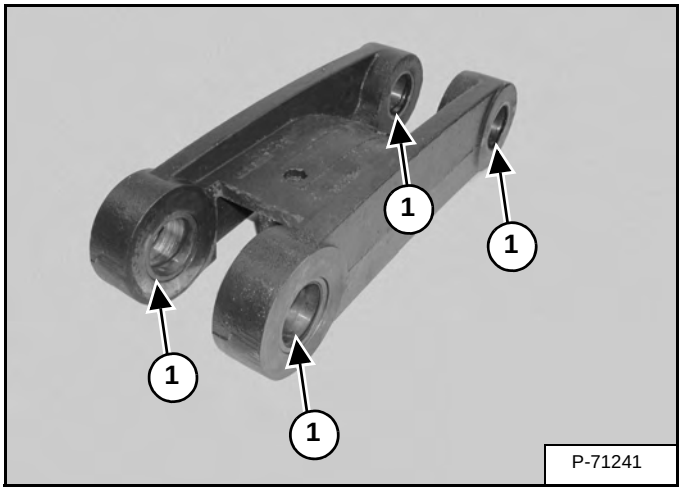
Assembly (Cont'd)

Figure 40-201-53



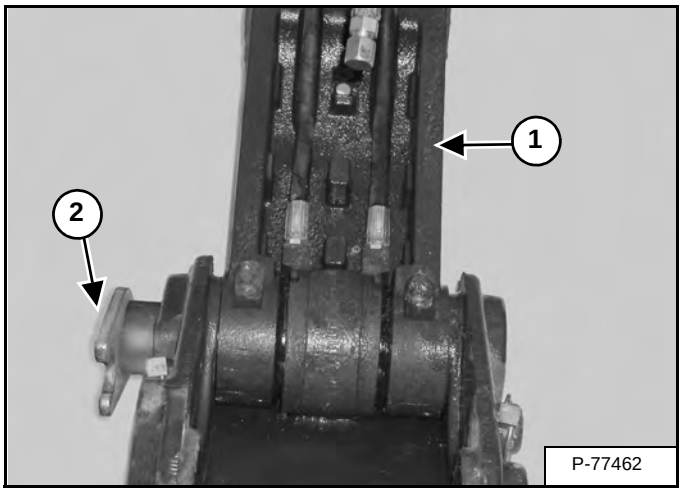
Install the hydraulic hoses (Item 1) **[Figure 40-201-53]** onto the swivel ends.

Figure 40-201-54



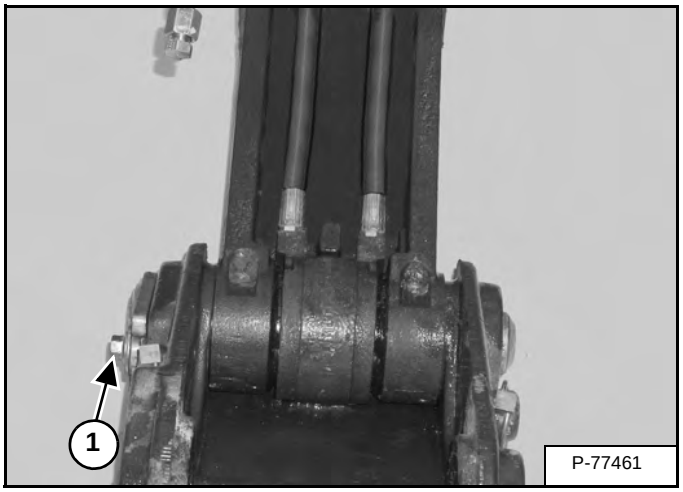
Install the bushings (Item 1) **[Figure 40-201-54]** and dust seals into the bucket link.

Figure 40-201-55



Install the bucket link (Item 1) and pin (Item 2) **[Figure 40-201-55]**.

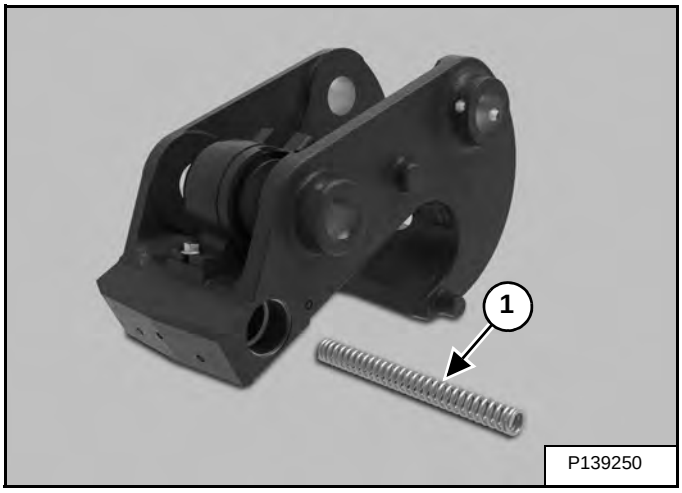
Figure 40-201-56



Install the spacer, flat washer and bolt (Item 1) **[Figure 40-201-56]**.

Disassembly (Cont'd)

Figure 40-202-29



Remove the compression spring (Item 1) **[Figure 40-202-29]**.

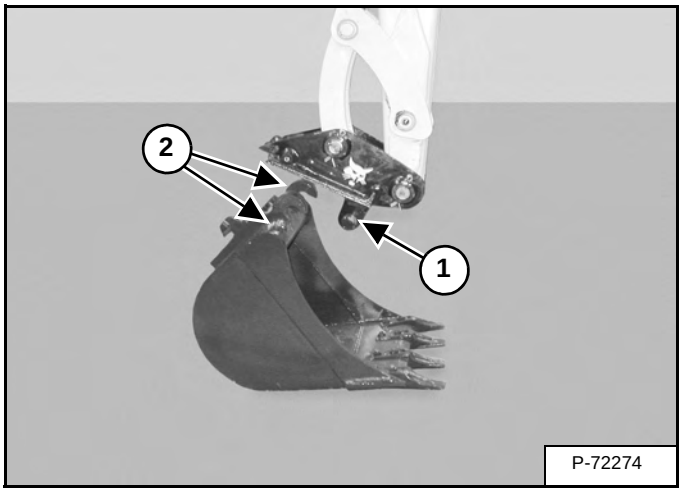
QUICK COUPLER (KLAC™ SYSTEM)

Troubleshooting

PROBLEM	CAUSE	CORRECTION
Coupler does not seat properly on the attachment mounting frame.	Mud, dirt, stones or debris are lodged between the coupler and the attachment mounting frame.	Remove mud, dirt, stones and debris from between the coupler and the attachment mounting frame.
	Worn locking mechanism.	Repair or replace worn pins and locking mechanisms.
	Attachment mounting frame damaged.	Repair or replace the attachment mounting frame.

Daily Inspection

Figure 40-210-1

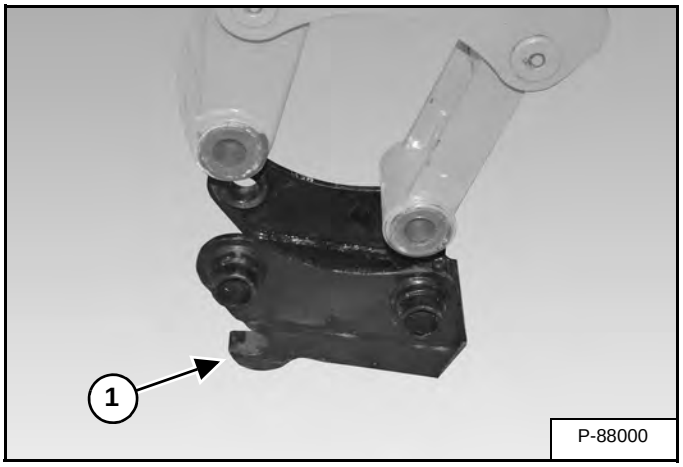


Inspect the quick coupler for wear or damage. Inspect the quick locking shaft (Item 1) and the hooks (Item 2) **[Figure 40-210-1]** (on the attachment) for wear or damage.

Repair or replace damaged parts.

Installation (MS03 And MS08)

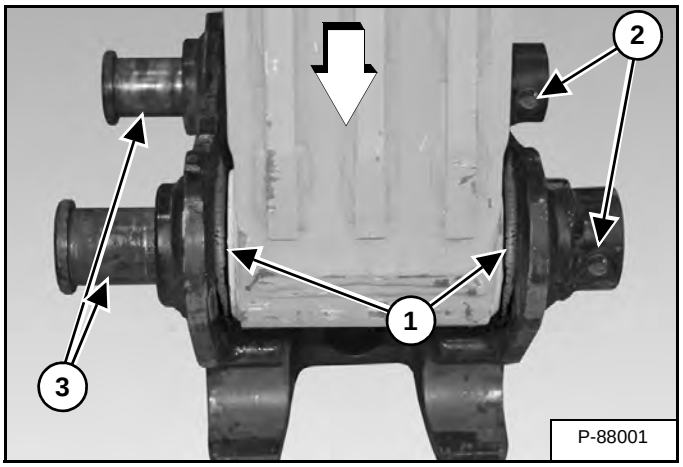
Figure 40-211-5



Place the coupler on the ground with the hooks (Item 1) **[Figure 40-211-5]** facing towards the excavator.

Align the arm and bucket link with the coupler **[Figure 40-211-5]**.

Figure 40-211-6



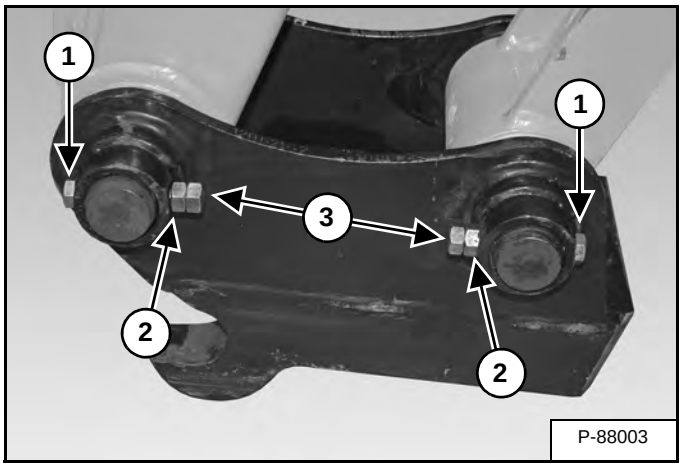
Install the O-rings (Item 1) **[Figure 40-211-6]** between the coupler pivot point and the arm and bucket link when lowering into position.

NOTE: The O-rings will prevent dirt and debris from entering the pivot points of the coupler.

Align the holes of the connecting pins with the holes (Item 2) **[Figure 40-211-6]** in the coupler.

Install the two pins (Item 3) **[Figure 40-211-6]** through the coupler, arm and bucket link.

Figure 40-211-7



Install the two bolts (Item 1) **[Figure 40-211-7]**.

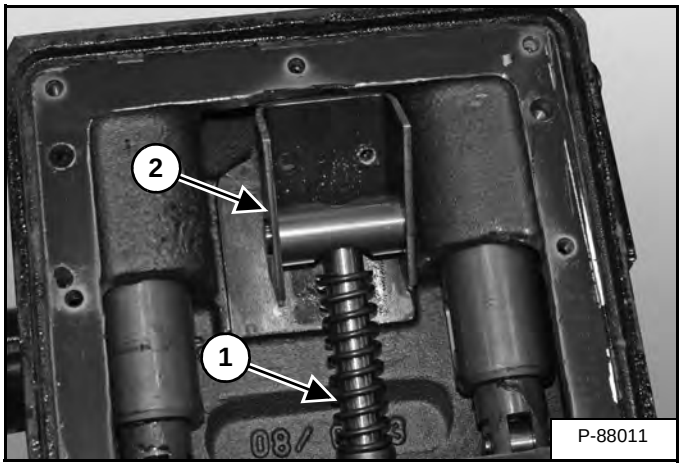
Install nuts (Item 2) **[Figure 40-211-7]** just until contact is made with the coupler.

NOTE: Do Not tighten nuts (Item 2) [Figure 40-211-7] against the coupler. The retaining bolt must rotate freely.

Install and tighten nuts (Item 3) securely against the two nuts (Item 2) **[Figure 40-211-7]**. The retaining bolts must rotate freely.

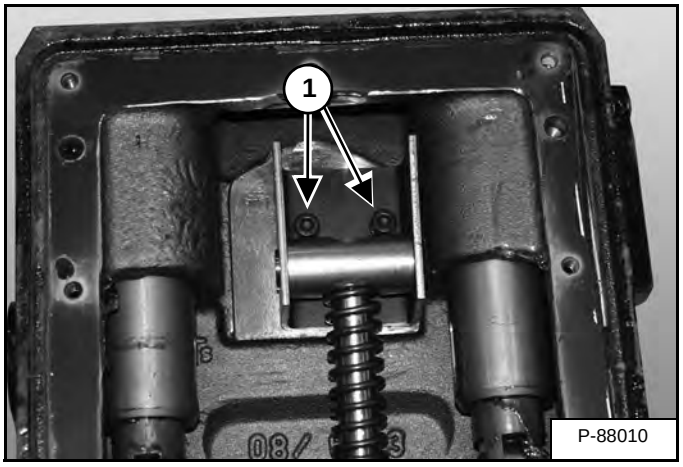
Assembly (MS08) (Cont'd)

Figure 40-211-34



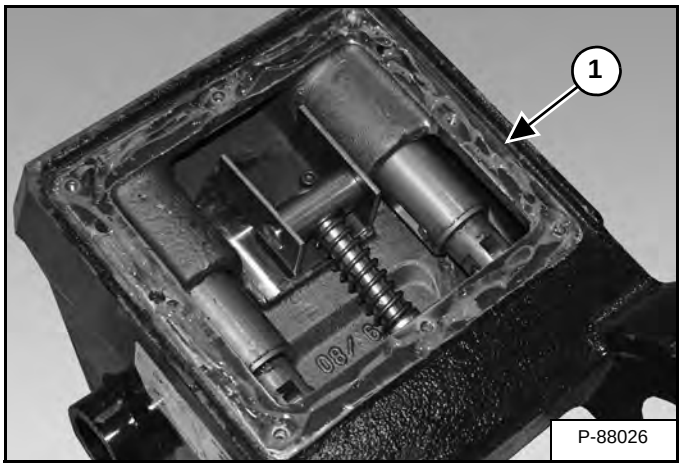
Install pressure spring (Item 1) on the spring guide. Tilt the bearing block and pivoting journal (Item 2) **[Figure 40-211-34]** down and install on the spring guide.

Figure 40-211-35



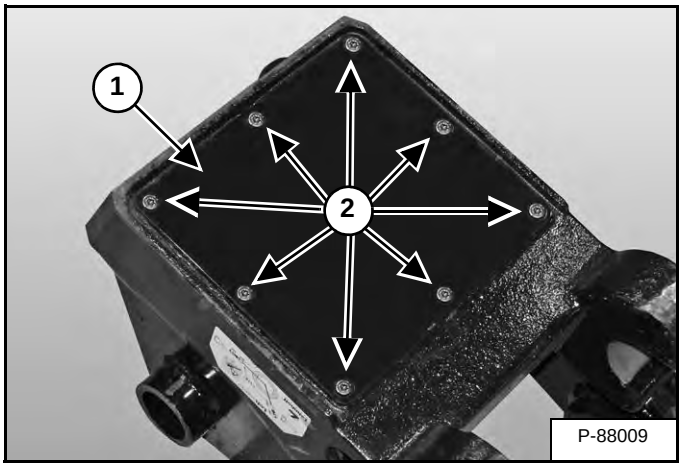
Install the two bolts (Item 1) **[Figure 40-211-35]**.

Figure 40-211-36



Apply a bead of sealant around the cover mounting surface (Item 1) **[Figure 40-211-36]**.

Figure 40-211-37



Install the cover (Item 1) **[Figure 40-211-37]**.

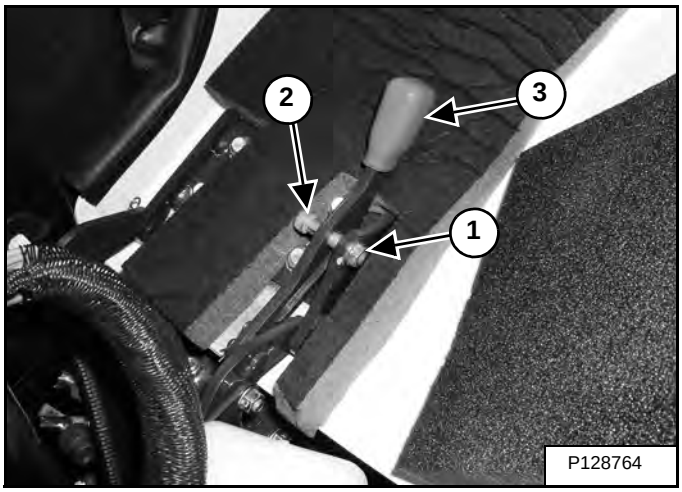
Apply Loctite® 242 on the eight bolts.

Install the eight bolts (Item 2) **[Figure 40-211-37]**.

RIGHT SIDE COVER

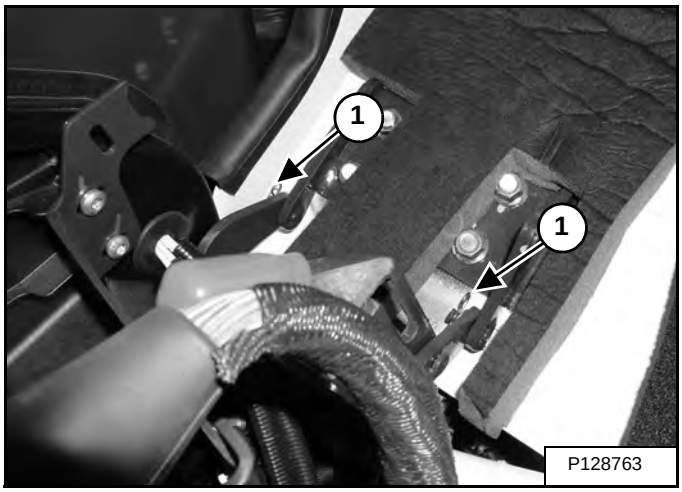
Removal And Installation

Figure 40-220-1



Support the cover and remove the nut (Item 1) and bolt (Item 2). Rotate the handle (Item 3) **[Figure 40-220-1]** to the rear of the excavator.

Figure 40-220-2



Support the cover and remove the two clips (Item 1) **[Figure 40-220-2]**.

Slide the cover to the right and remove the cover from the excavator.

Latch Removal And Installation

Figure 40-220-3

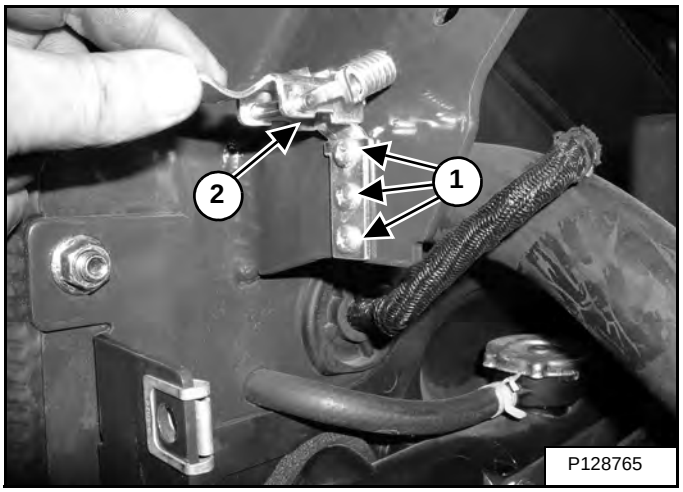
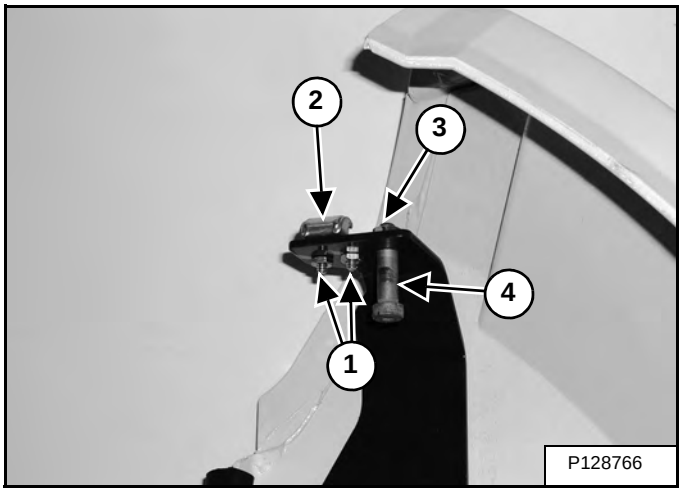
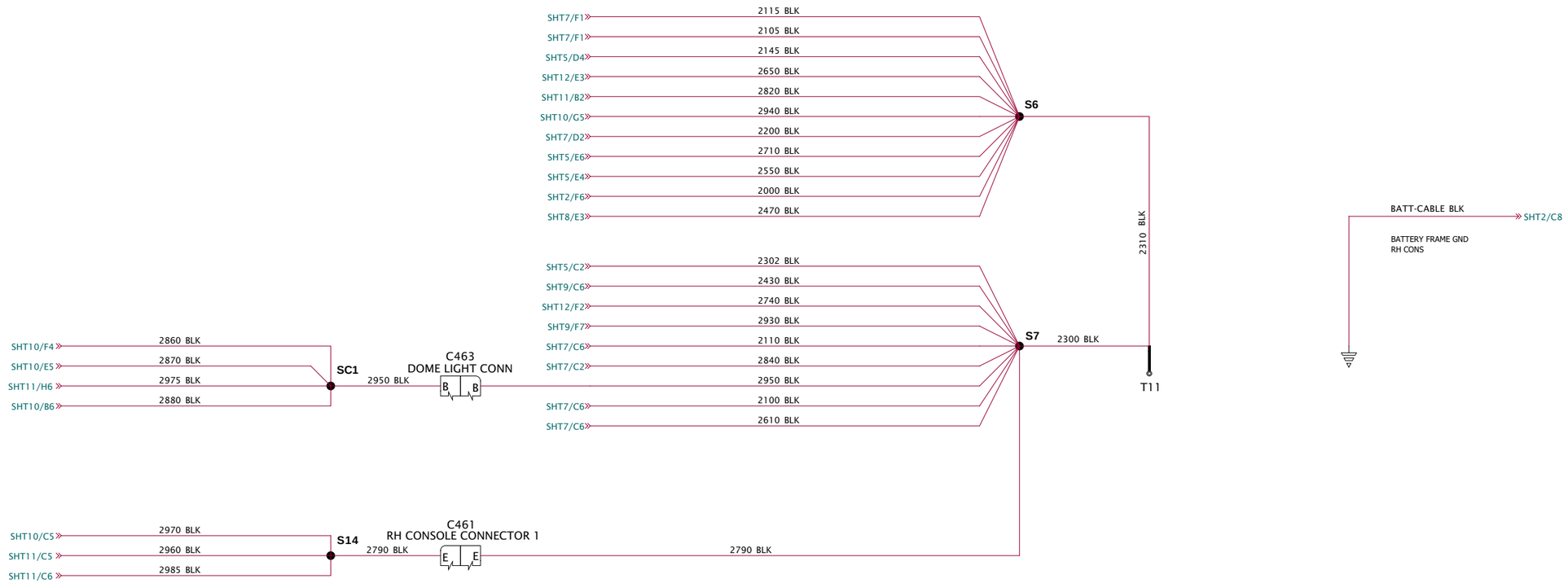


Figure 40-220-4



Remove the screws and nuts (Item 1) from both halves of the latch (Item 2) **[Figure 40-220-3]** and **[Figure 40-220-4]**.

Remove the nut (Item 3) and alignment pin (Item 4) **[Figure 40-220-4]**.

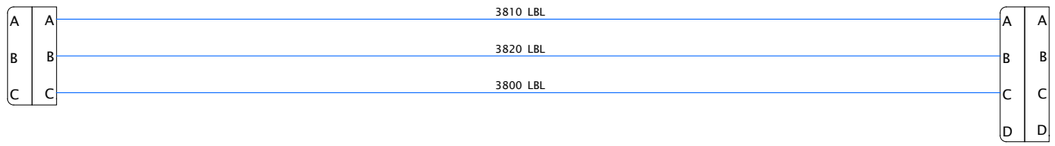


Wiring Schematic **E35** S/N B3Y211001 through B3Y211958

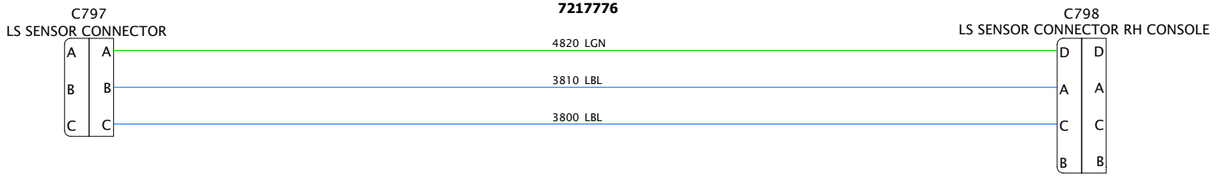
Printed On February 2018
7301115 (0)
Sheet 3 of 14

Printable Version Click Here

LOAD SENSE JUMPER LARGE FRAME
7217775

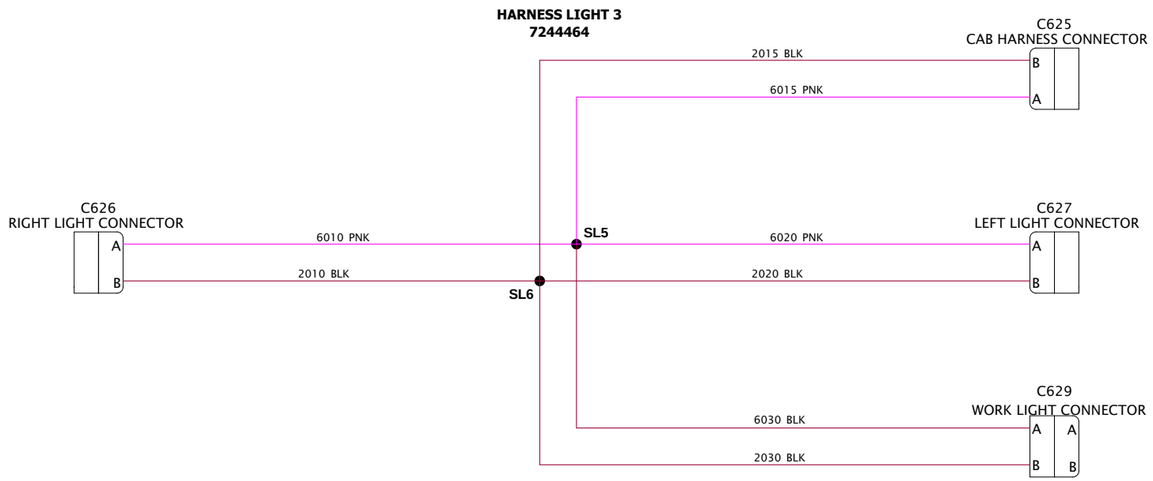


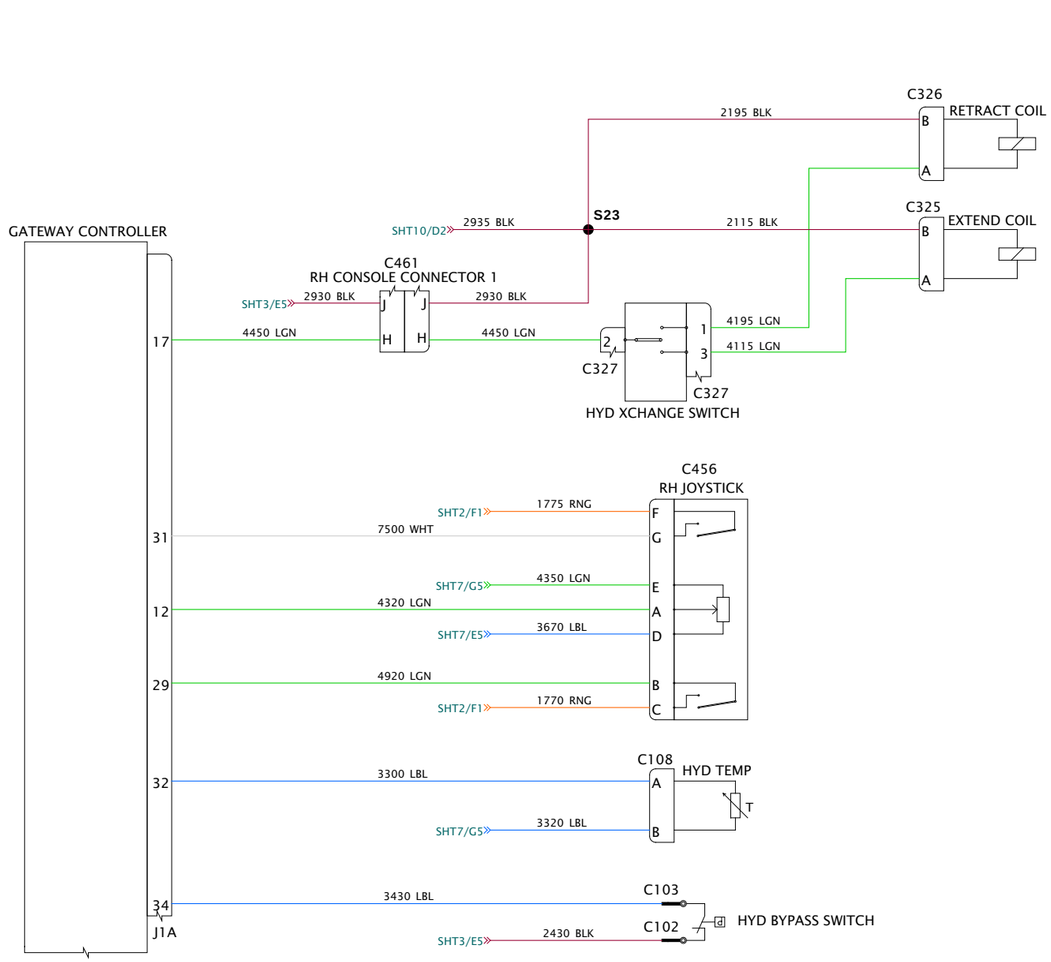
LOAD SENSE JUMPER MEDIUM FRAME
7217776

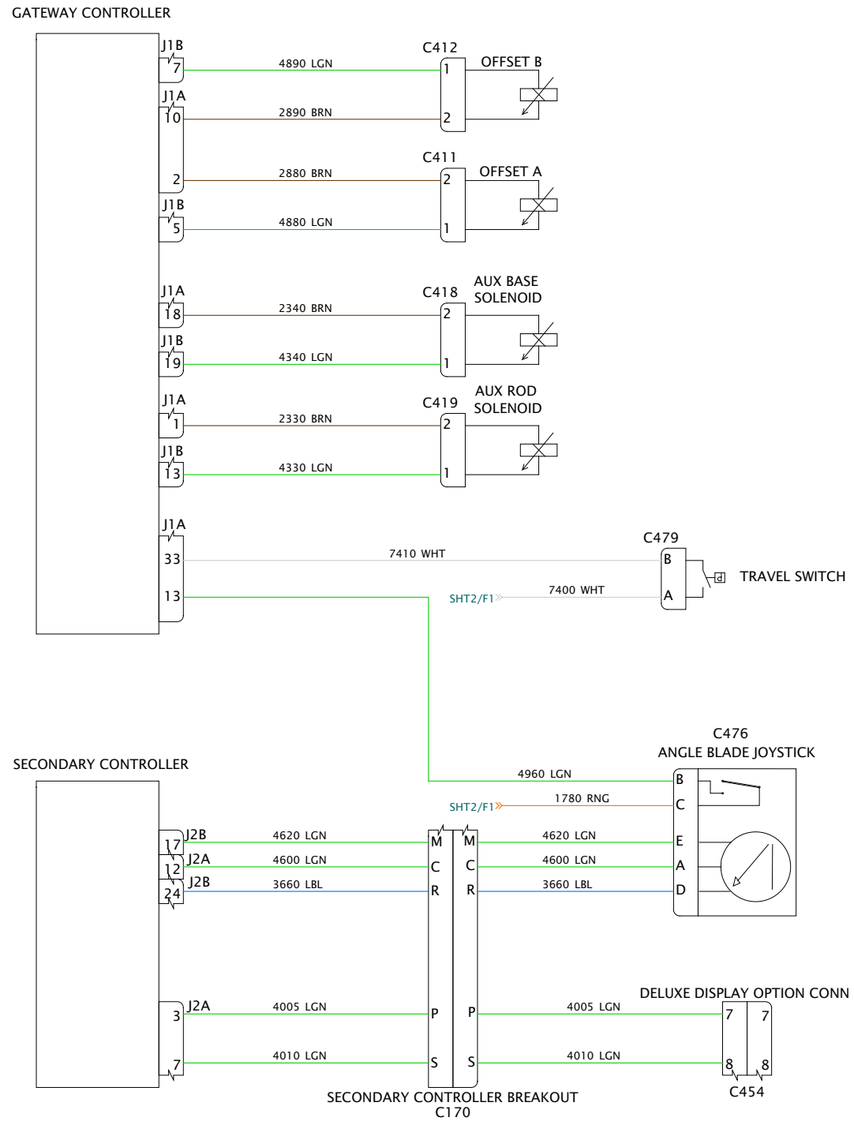


HARNESS TRAVEL (LARGE FRAME MACHINES)
7234118

HARNESS LIGHT 3
7244464





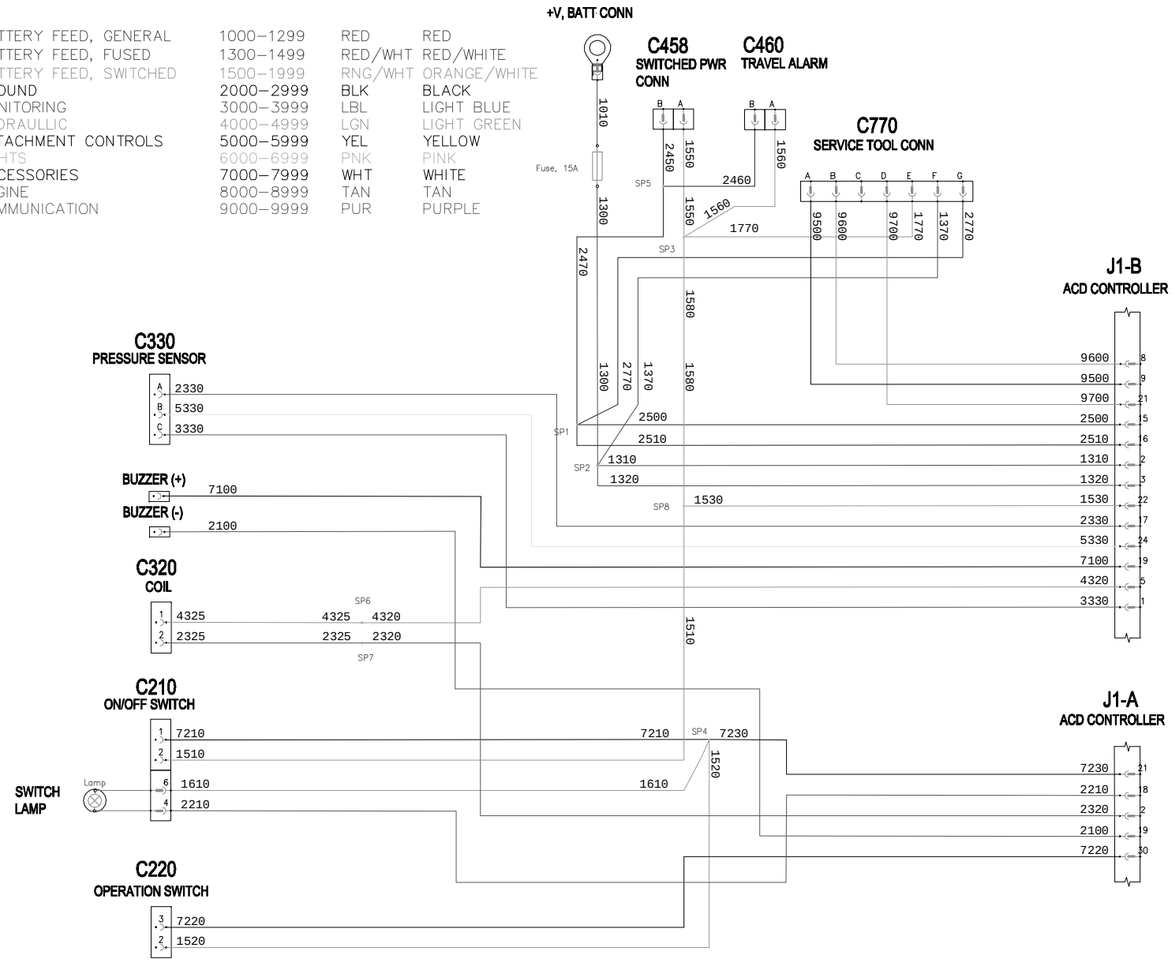


Wiring Schematic **E35** S/N B3Y211959 & Above

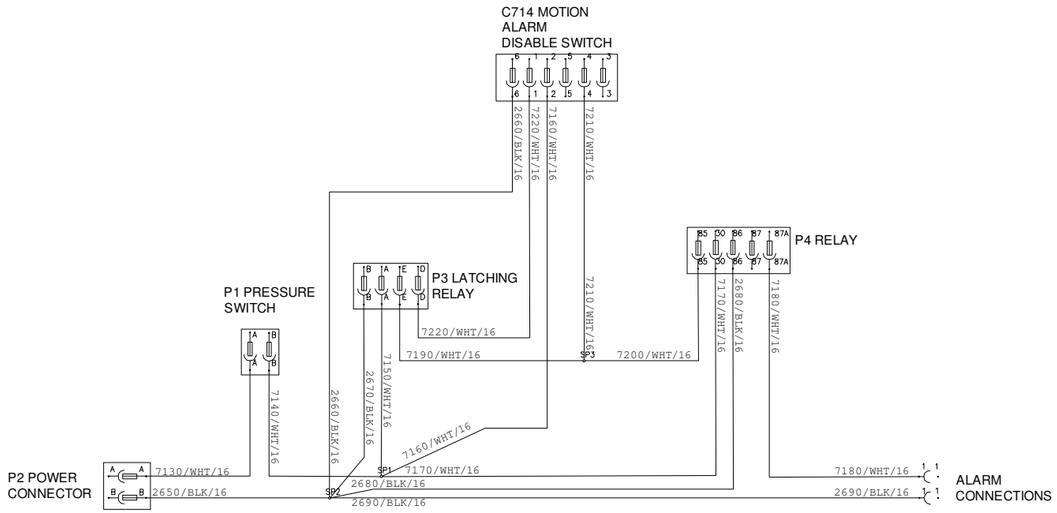
Printed On February 2018
7301115 (A)
Sheet 9 of 14

Printable Version Click Here

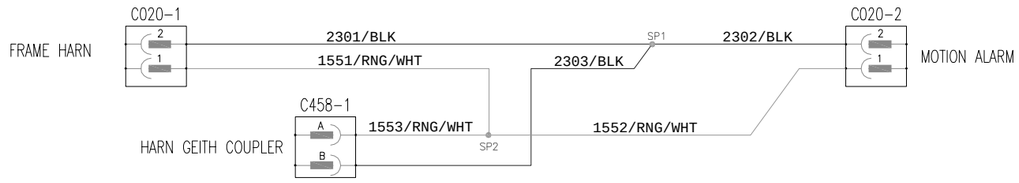
BATTERY FEED, GENERAL	1000–1299	RED	RED
BATTERY FEED, FUSED	1300–1499	RED/WHT	RED/WHITE
BATTERY FEED, SWITCHED	1500–1999	RNG/WHT	ORANGE/WHITE
GROUND	2000–2999	BLK	BLACK
MONITORING	3000–3999	LBL	LIGHT BLUE
HYDRAULLIC	4000–4999	LGN	LIGHT GREEN
ATTACHMENT CONTROLS	5000–5999	YEL	YELLOW
LIGHTS	6000–6999	PNK	PINK
ACCESSORIES	7000–7999	WHT	WHITE
ENGINE	8000–8999	TAN	TAN
COMMUNICATION	9000–9999	PUR	PURPLE



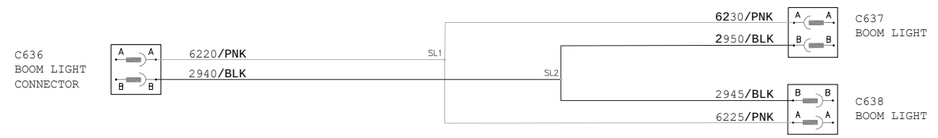
7219627 HARNESS ELECTRIC COUPLER



7180310 HARNESS MOTION ALARM



7244139 GEITHER PWR SWITCH



7241202 BOOM LIGHT HARNESS

WIRING SCHEMATIC OPTIONS

Sheet 5 of 6

JANUARY 2019

Printable Version Click Here

ALTERNATOR

Belt Adjustment

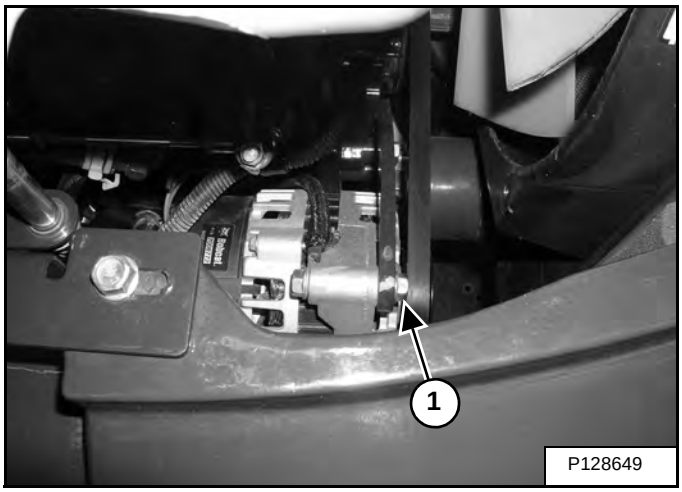
The alternator belt is a special maintenance free type that is pretensioned over the pulleys. This belt eliminates the need for a tensioning device and does not require periodic adjustment.

Belt Replacement

Removal

Stop the engine and open the tailgate. (See TAILGATE on Page 10-50-1.)

Figure 50-30-1



Loosen the bolt (Item 1) **[Figure 50-30-1]** and the lower alternator mounting bolt and nut (not shown).

Use a pry bar to take the pressure off of the bolt (Item 1) and remove the top bolt.

Remove and replace the alternator belt.

Installation

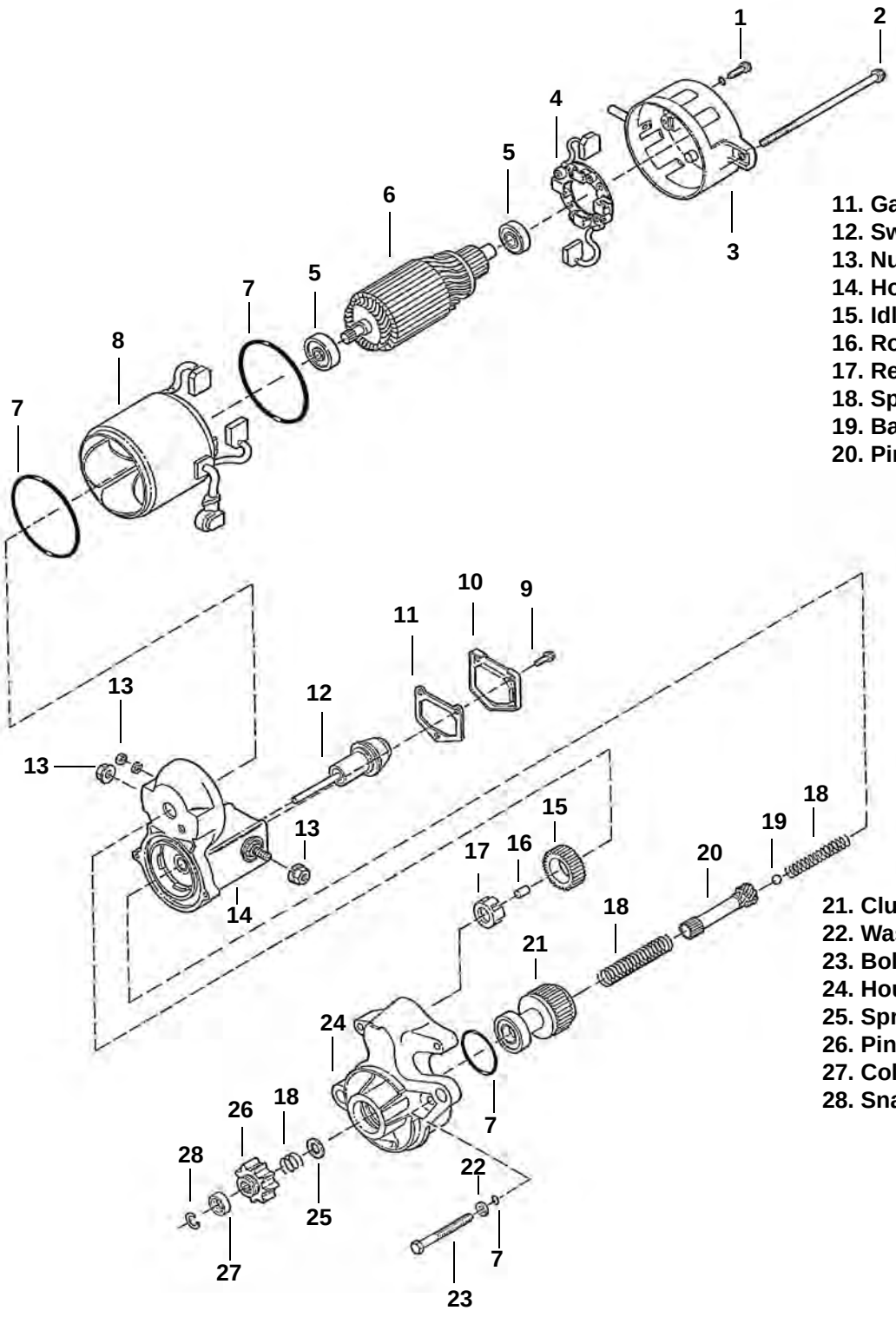
Use the pry bar to position the alternator and install the bolt (Item 1).

Tighten the top and bottom alternator mounting bolts.

Close the tailgate.

Parts Identification

1. Screw
2. Bolt
3. Brush Cover
4. Brush Holder
5. Bearing
6. Armature
7. O-ring
8. Frame
9. Bolt
10. Cover



11. Gasket
12. Switch
13. Nut
14. Housing
15. Idler Gear
16. Roller
17. Retainer
18. Spring
19. Ball
20. Pinion Shaft
21. Clutch
22. Washer
23. Bolt
24. Housing
25. Spring Seat
26. Pinion Gear
27. Collar
28. Snap Ring

D-2396

DIAGNOSTIC SERVICE CODE (CONT'D)

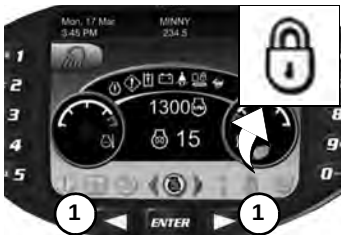
Service Codes List (Cont'd)

CODE		CODE	
M0909	Fuel Level Low	M2721	Throttle Sensor Out of Range High
M0921	Fuel Level Out of Range High	M2722	Throttle Sensor Out of Range Low
M0922	Fuel Level Out of Range Low		
		M3128	Interrupted Power Failure
M1121	Console Sensor Out of Range High		
M1122	Console Sensor Out of Range Low	M3204	Throttle Controller No Communication
M1128	Console Sensor Failure		
		M3304	Deluxe Panel No Communication
M1305	Fuel Hold Solenoid Short to Battery		
M1306	Fuel Hold Solenoid Short to Ground	M3404	RFID Key Controller No Communication
M1307	Fuel Hold Solenoid Open Circuit		
		M3702	Hyd Exchange Output Error On
M1402	Fuel Pull Output Error On	M3703	Hyd Exchange Output Error Off
M1403	Fuel Pull Output Error Off		
M1407	Fuel Pull Output Open Circuit		
M1428	Fuel Pull Output Failure		
		M4109	Alternator Low
M1705	Hydraulics Enable Solenoid Short to Battery	M4110	Alternator High
M1706	Hydraulics Enable Solenoid Short to Ground		
M1707	Hydraulics Enable Solenoid Open Circuit	M4304	Keyless Start Panel No Communication
M1732	Hydraulics Enable Solenoid Overcurrent		
		M4404	Secondary Controller No Communication
M2005	Two-Speed Solenoid Short to Battery		
M2006	Two-Speed Solenoid Short to Ground	M4621	5V Sensor Supply Out of Range High
M2007	Two-Speed Solenoid Open Circuit	M4622	5V Sensor Supply Out of Range Low
M2102	Glow Plug Output Error On	M4721	8V Sensor Supply Out of Range High
M2103	Glow Plug Output Error Off	M4722	8V Sensor Supply Out of Range Low
M2107	Glow Plug Output Open Circuit		
M2128	Glow Plug Output Failure	M5002	Light Output Error On
		M5003	Light Output Error Off
M2202	Starter Output Error On		
M2203	Starter Output Error Off	M5205	Offset Base Solenoid Short to Battery
M2207	Starter Output Open Circuit	M5206	Offset Base Solenoid Short to Ground
M2228	Starter Output Failure	M5207	Offset Base Solenoid Open Circuit
		M5232	Offset Base Solenoid Overcurrent
M2302	Starter Relay Error On		
M2303	Starter Relay Error Off	M5305	Offset Rod Solenoid Error On
		M5306	Offset Rod Solenoid Short to Ground
M2402	Fuel Pull Relay Error On	M5307	Offset Rod Solenoid Open Circuit
M2403	Fuel Pull Relay Error Off	M5332	Offset Rod Solenoid Overcurrent
M2521	Load Sense Sensor Out of Range High	M5421	Offset Control Switch Out of Range High
M2522	Load Sense Sensor Out of Range Low	M5422	Offset Control Switch Out of Range Low
		M5424	Offset Control Switch Out of Neutral
M2602	Glow Plug Relay Error On		
M2603	Glow Plug Relay Error Off		

CONTROL PANEL SETUP (CONT'D)

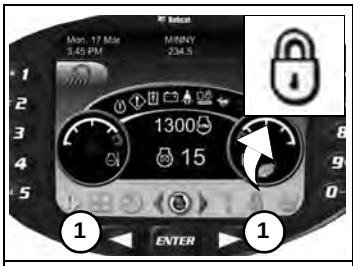
Password Setup (Deluxe Instrument Panel) (Cont'd)

Changing The User Passwords

	Press a scroll button (Item 1) repeatedly until the Security screen icon (Inset) is highlighted.
	Select **[1. PASSWORDS / LOCKOUTS]**.
	Enter owner password and press **[ENTER]**.
	Select **[1. USER SETTINGS]**.
	Select user.
	Select **[2. CHANGE PASSWORD]**.
	Enter new user password and press **[ENTER]**.

Password Lockout Feature

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

	Press a scroll button (Item 1) repeatedly until the Security screen icon (Inset) is highlighted.
	Select **[1. PASSWORDS / LOCKOUTS]**.
	Enter owner password and press **[ENTER]**.
	Select **[2. MACHINE LOCK]**.

NOTE: The procedure above can be followed to reset the machine lock so that the machine requires a password to start the engine.

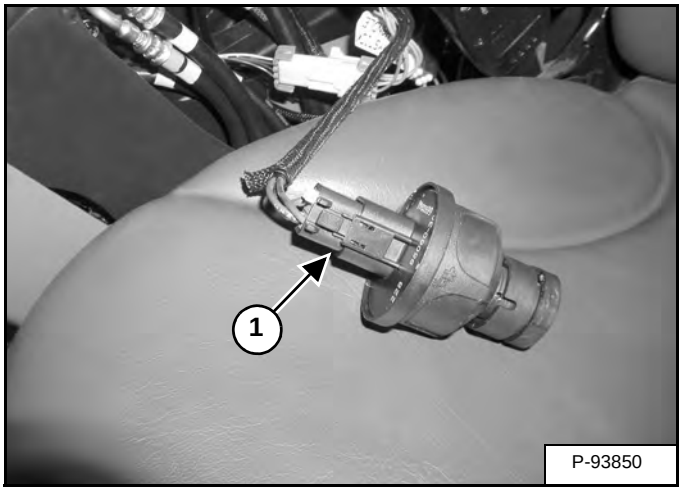
NOTE: When the password is in UNLOCKED, no password is needed. The start switch is used to start the machine.

KEY SWITCH

Removal And Installation

Remove the console cover. (See Console Cover Removal And Installation on Page 40-50-1.)

Figure 50-120-1



Disconnect the wire harness (Item 1) **[Figure 50-120-1]** from the switch. Remove the switch.

TRAVEL MOTOR AUTO-SHIFT

Auto-Shift Drive System (If Equipped)

When in high range, the travel motors will automatically shift to low range when more torque is required and return to high range when hydraulic pressure decreases.

NOTE: Always set the travel speed to low range when loading or unloading the excavator onto a transport vehicle.

ENGINE INFORMATION

Description

The excavator has a Kubota® direct injected D1703-NA diesel engine with a displacement of 1,6 L (100.2 in^3). The engine is rated at an SAE Gross 18,5 kW (24.8 hp) and has a closed breather system.

The engine has 3 cylinders and the rotation is counterclockwise (viewed from the flywheel side). It is equipped with glow plugs for assisting in cold start. Engine block heaters are also available from Bobcat Parts.

The engine serial number is stamped on the engine and is located near the injection pump. The model number is located on the valve cover. Use these numbers to obtain the correct service parts.

The engine is liquid cooled with a propylene glycol / water mixture in a radiator. Coolant flow is controlled by a thermostat. The cooling fan is belt driven.

Engine Removal And Installation

Disconnect the negative (-) cable on the battery.

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-130-4.)

Drain the radiator. (See Removing And Replacing Coolant on Page 10-100-4.)

Remove the muffler. (See Removal And Installation on Page 60-30-1.)

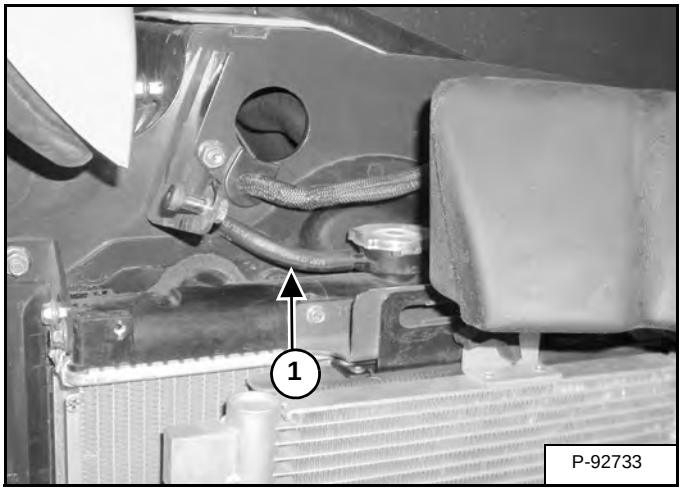
Remove the air cleaner. (See Removal And Installation on Page 60-40-1.)

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

Remove the starter. (See Removal And Installation on Page 50-40-2.)

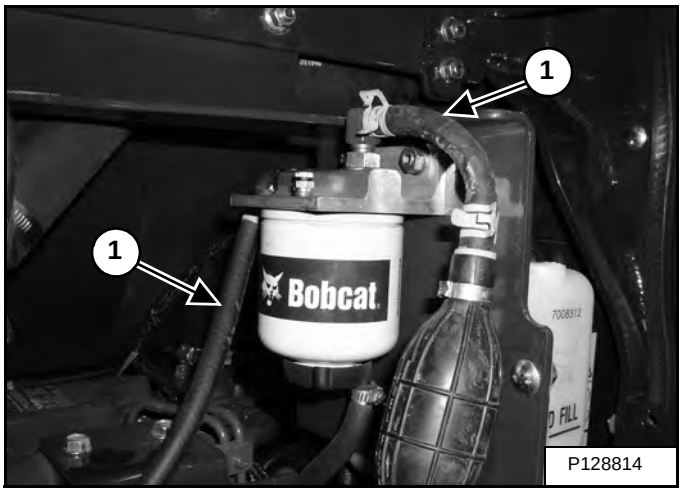
Remove the hydraulic pump. (See Removal And Installation on Page 20-50-11.)

Figure 60-10-2



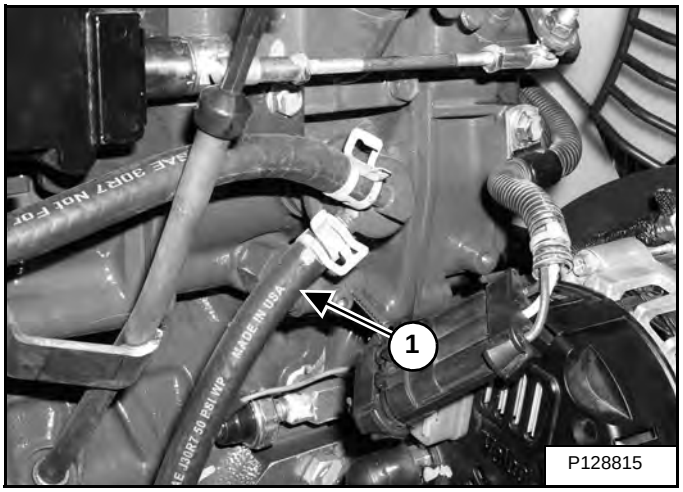
Remove the radiator overflow hose (Item 1) **[Figure 60-10-2]**.

Figure 60-10-3



Remove the fuel lines (Item 1) **[Figure 60-10-3]** from the filter.

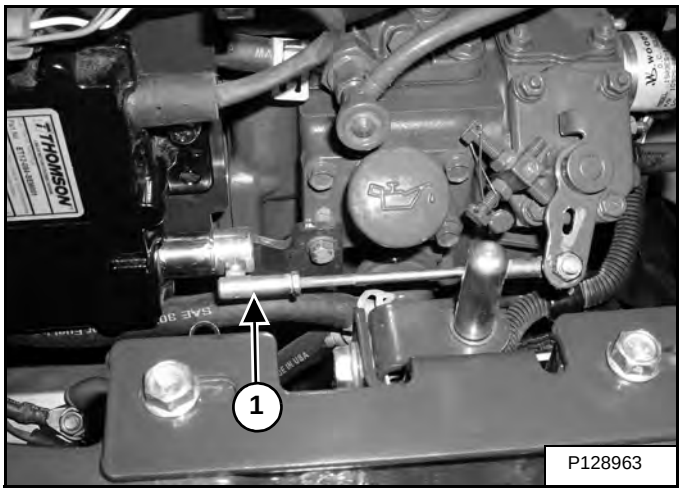
Figure 60-10-4



Remove the fuel line (Item 1) **[Figure 60-10-4]** from the fuel pump.

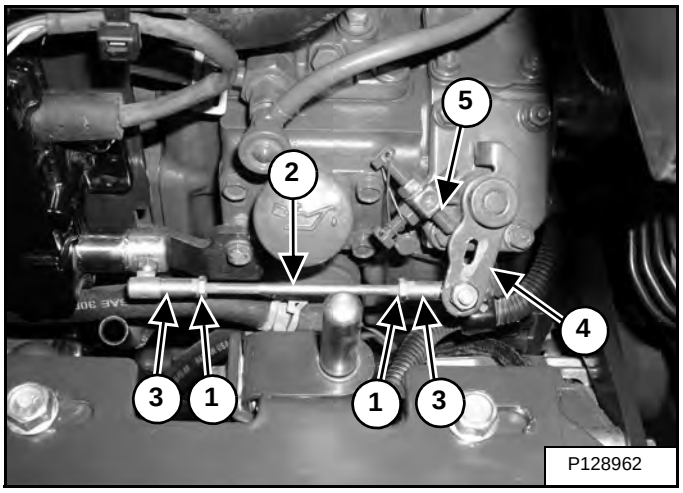
Calibration (Cont'd)

Figure 60-20-6



Connect the linkage (Item 1) **[Figure 60-20-6]** to the actuator.

Figure 60-20-7



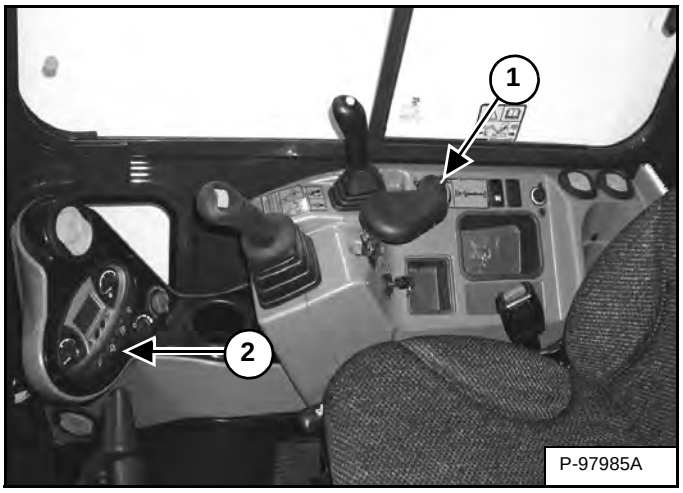
Loosen the nuts (Item 1). Push down and disconnect the linkage (Item 2). Turn the ball joints (Item 3) a small amount and reconnect the linkage. Repeat the procedure until the lever (Item 4) fully contacts the stop (Item 5) **[Figure 60-20-7]**.

Tighten the nuts (Item 1) **[Figure 60-20-7]**.

The following procedure must be completed within 7.5 seconds:

With the engine off and the engine speed control dial at the high speed position, turn the key to the ON position.

Figure 60-20-8



Turn the engine speed control dial (Item 1) **[Figure 60-20-8]** from the high speed position to the low speed position four times:

High Speed
Low Speed
High Speed
Low Speed
High Speed
Low Speed
High Speed
Low Speed

NOTE: The auto idle icon (Item 2) [Figure 60-20-8] will flash while the calibration procedure is in process.

NOTE: The calibration procedure may start after the third rotation of the speed control dial.

When the calibration procedure is complete, the operator warning alarm will sound twice. Turn the key to the STOP position.

Radiator Removal And Installation (Cont'd)

Figure 60-50-7

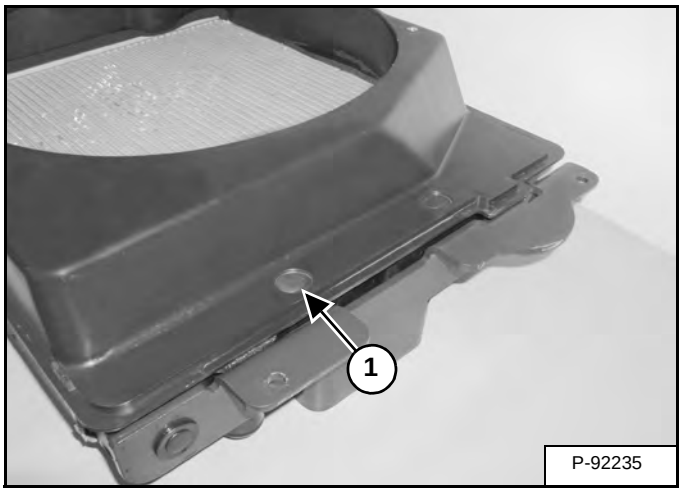
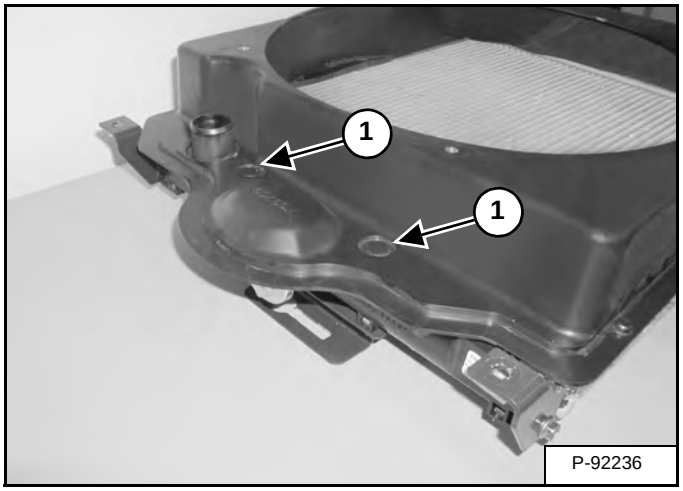


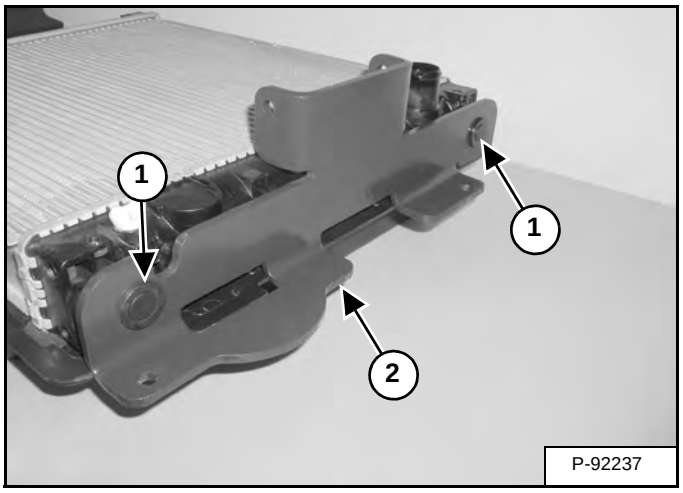
Figure 60-50-8



Remove the fasteners (Item 1) **[Figure 60-50-7]** and **[Figure 60-50-8]**.

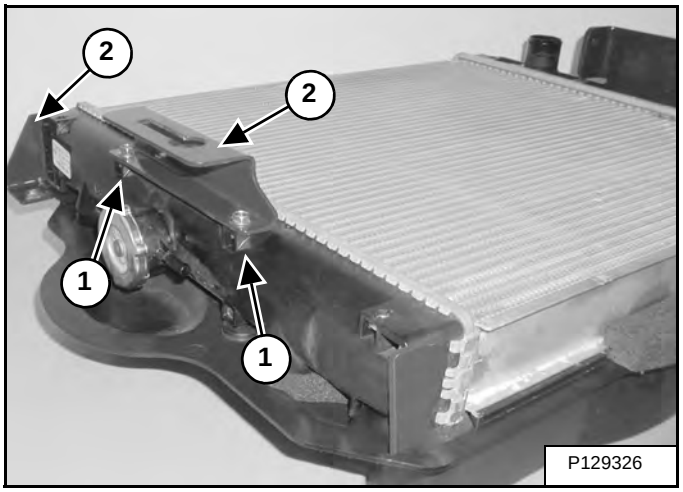
Remove the shroud.

Figure 60-50-9



Remove the fasteners (Item 1). Remove the bottom bracket (Item 2) **[Figure 60-50-9]**.

Figure 60-50-10



Remove the bolts (Item 1) and remove the top brackets (Item 2) **[Figure 60-50-10]**.

Fuel Injection Pump - Testing

The injection pump contains parts which have a very close tolerance and its operation has a direct effect on the performance of the engine.

⚠ 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

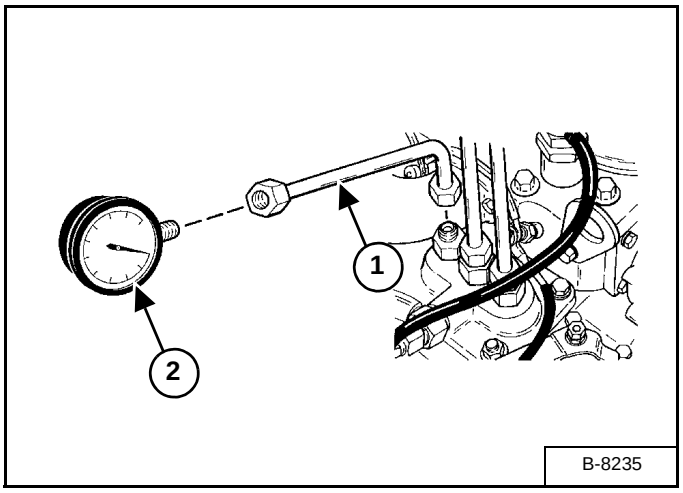
The tools listed will be needed to do the following procedure:

MEL1237 - Adapter Fuel Line
MEL1173-1 Pressure Gauge

To check the discharge pressure at the fuel injection pump, use the following procedure:

Disconnect a high pressure fuel line from the injection pump. Loosen the other end of the same fuel line so it can be turned away from the fitting.

Figure 60-70-6



Connect the adapter fuel line (Item 1) to the fitting and connect the pressure gauge (Item 2) **[Figure 60-70-6]**.

Move the speed control lever to the high engine idle position.

Turn the flywheel to increase the pressure. If the pressure can not reach the allowable limit, replace the injection pump assembly.

Fuel Tightness of Pump Element Allowable Limit	18630 kPa (186 bar) (2702 psi)

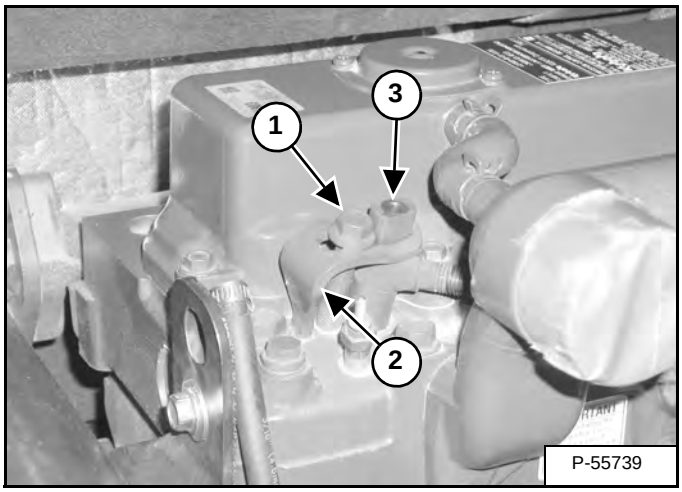
With the speed control lever at the low engine idle position, turn the flywheel until the pressure is at 18630 - 20105 kPa (186 - 201 bar) (2702 - 2916 psi).

Turn the flywheel back approximately one-half turn. Keep the flywheel at this position, and measure the time it takes the pressure to decrease from 12755 kPa (127,5 bar) (1850 psi).

Fuel Tightness of Delivery Valve Allowable Limit	5 Seconds

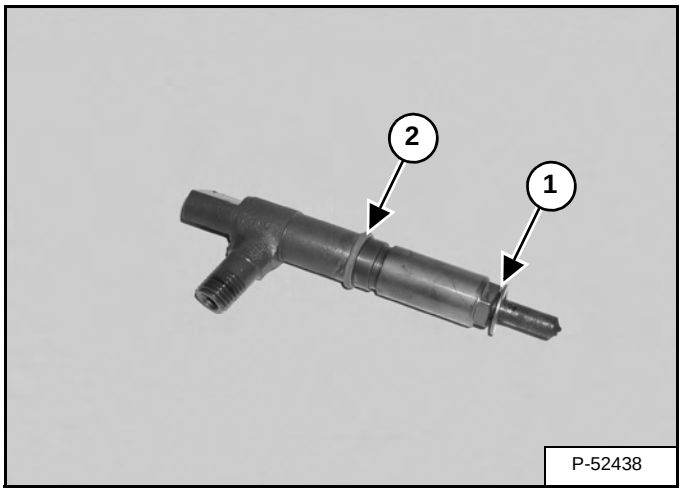
Fuel Injector Removal And Installation (Cont'd)

Figure 60-70-30



Remove the bolts (Item 1) and clamps (Item 2). Remove the injector nozzles (Item 3) **[Figure 60-70-30]**.

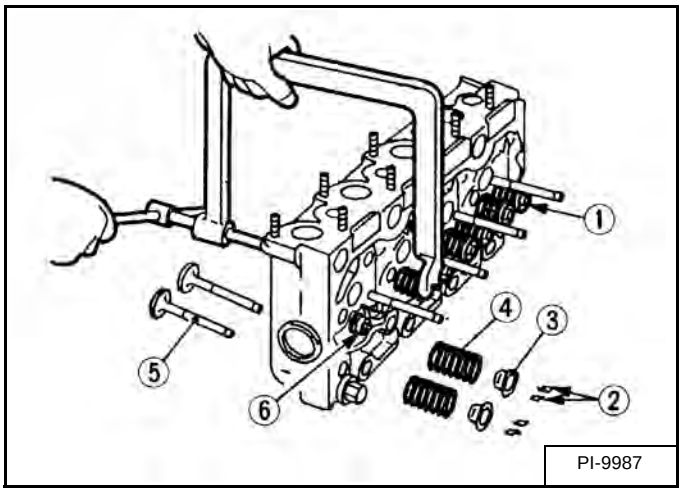
Figure 60-70-31



NOTE: Replace the copper washer (Item 1) and O-ring (Item 2) [Figure 60-70-31] anytime new or used fuel injectors are installed.

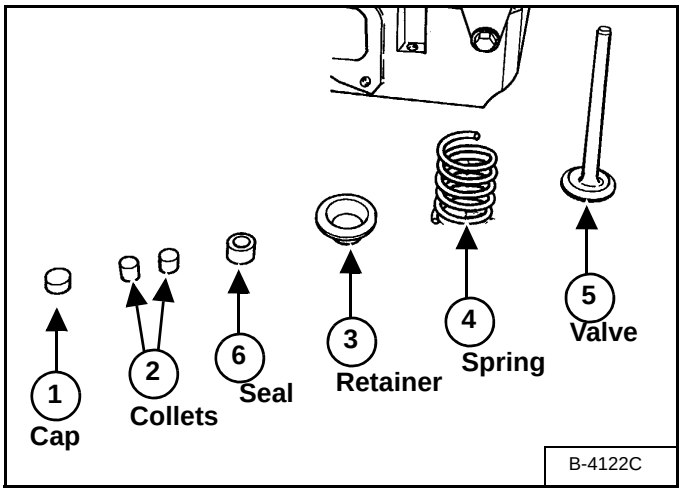
Cylinder Head Disassembly And Assembly

Figure 60-80-19



Use a valve spring compressor to compress the valve springs **[Figure 60-80-19]**.

Figure 60-80-20



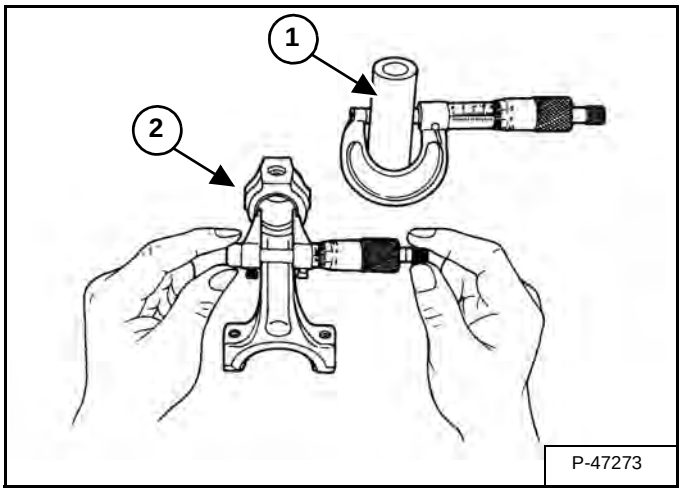
Remove the valve cap (Item 1) and valve spring collet (Item 2) **[Figure 60-80-19]** and **[Figure 60-80-20]**.

Remove the valve spring retainer (Item 3) and the spring (Item 4) **[Figure 60-80-19]** and **[Figure 60-80-20]**.

Remove the seal (Item 6) and the valve (Item 5) **[Figure 60-80-19]** and **[Figure 60-80-20]**.

Piston And Connecting Rod - Servicing

Figure 60-90-7



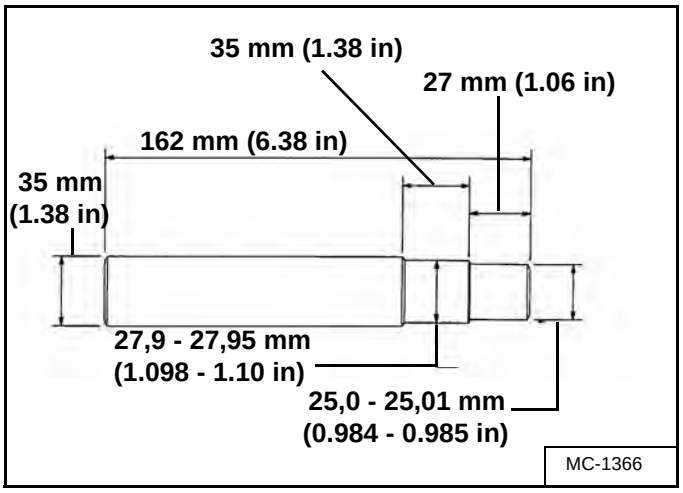
Measure the O.D. of the piston pin (Item 1) **[Figure 60-90-7]**.

Measure the I.D. of the connecting rod small end (Item 2) **[Figure 60-90-7]**.

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

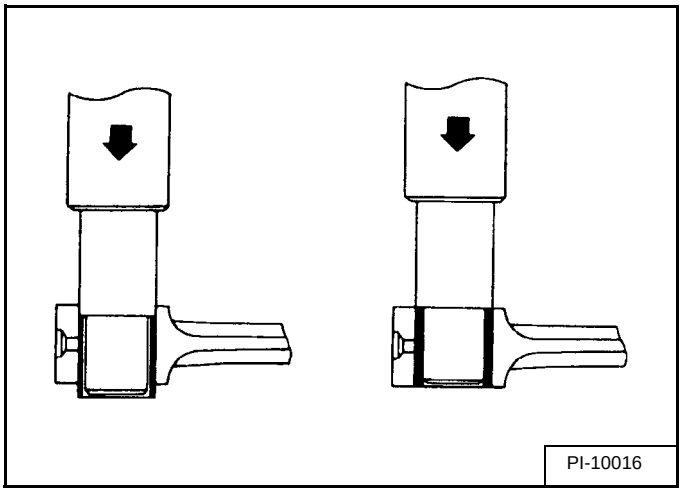
Piston Pin O.D.	25,0 - 25,011 mm (0.984 - 0.985 in)
Bushing I.D.	25,025 - 25,04 mm (0.985 - 0.986 in)
Oil Clearance Between Piston Pin & Bushing	0,014 - 0,038 mm (0.0006 - 0.0015 in)
Allowable Limit	0,15 mm (0.006 in)

Figure 60-90-8



To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 60-90-8]**.

Figure 60-90-9



Use a press and special driver tool to remove the small end bushing **[Figure 60-90-9]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 60-90-9]**.

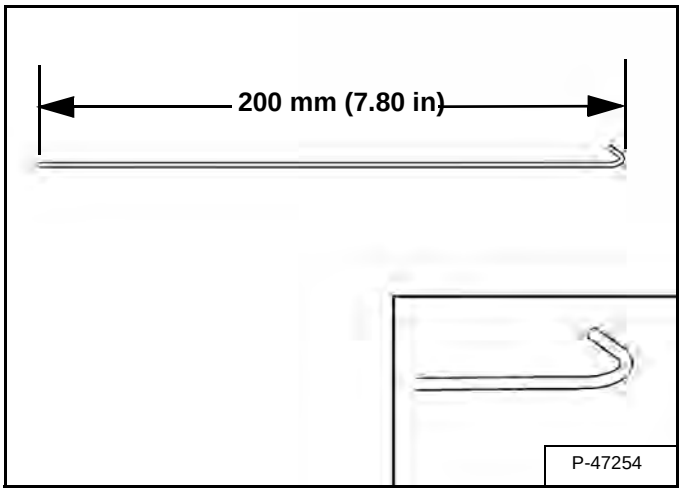
CAMSHAFT AND TIMING GEARS

Timing Gearcase Cover Removal And Installation

Remove the fuel injection pump. (See Fuel Injection Pump Removal And Installation on Page 60-50-4.)

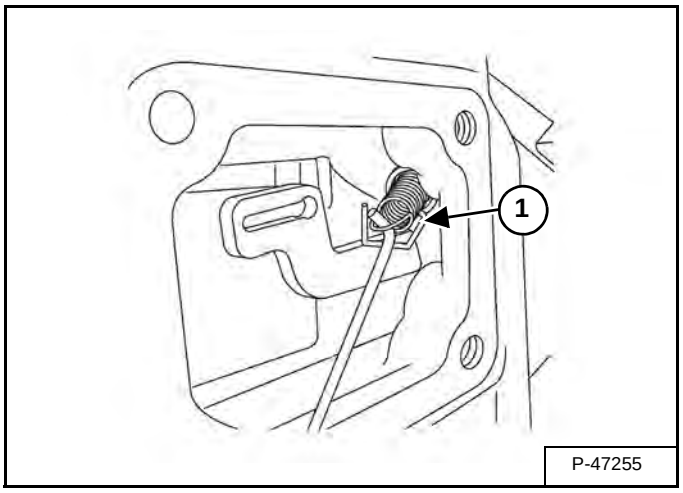
Remove the cylinder head, rocker arms and push rods. (See Cylinder Head Removal And Installation on Page 60-80-4.)

Figure 60-100-1



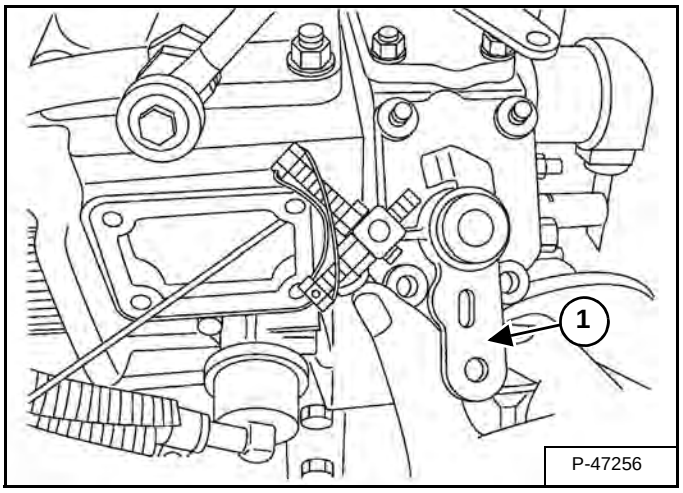
Bend a hook on the end of a 200 mm (7.80 in) long, 1,2 mm (0.050 in) diameter hard wire **[Figure 60-100-1]**.

Figure 60-100-2



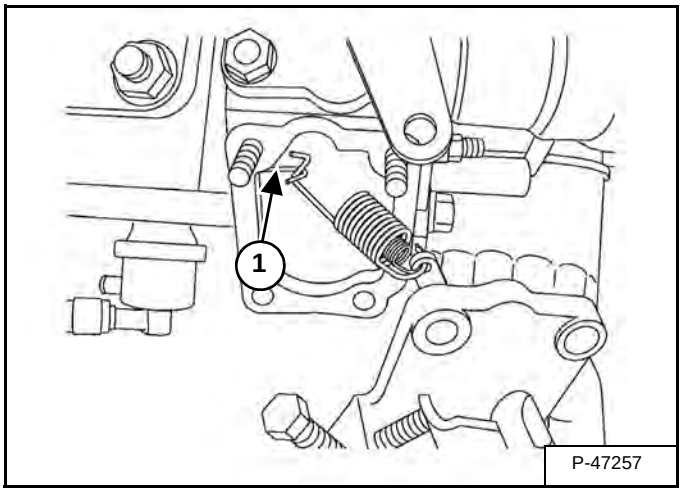
Disconnect the two governor springs (Item 1) **[Figure 60-100-2]**.

Figure 60-100-3



Remove the speed control plate (Item 1) **[Figure 60-100-3]**.

Figure 60-100-4



Remove the wire (Item 1) **[Figure 60-100-4]** from the springs.

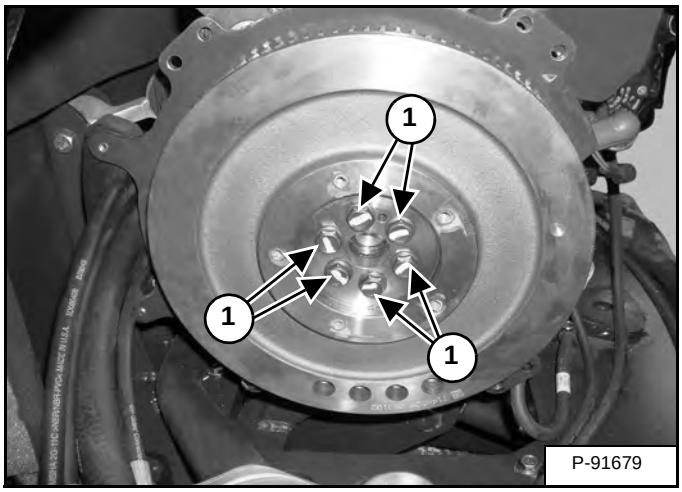
Installation: Do not drop the governor springs into the gearcase.

Remove the crankshaft pulley nut.

Installation: Tighten the nut to 138 - 156 N•m (102 - 115 ft-lb) torque.

Flywheel Removal And Installation

Figure 60-110-7



Remove the six bolts (Item 1) **[Figure 60-110-7]** from the flywheel.

Installation: Apply Loctite® 242 to the bolts. Tighten the bolts to 113 - 122 N•m (83 - 90 ft-lb) torque.

Remove the flywheel.

Flywheel Ring Gear

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

The ring gear on the flywheel is an interference fit. Heat the ring gear enough to expand it and hit it with a hammer evenly to remove it.

Clean the outer surface of the flywheel to give a smooth fit.

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

Fit the ring gear over the flywheel. Make sure the gear is seated correctly.

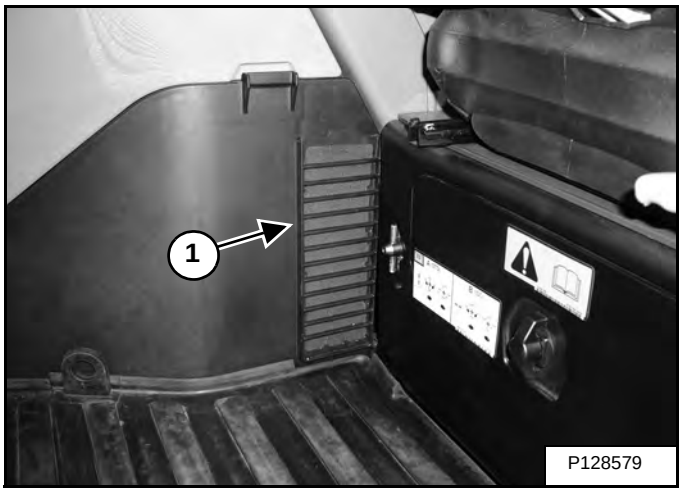
REGULAR MAINTENANCE

Cab Filters

The recirculation filter and the fresh air filter must be cleaned regularly. (See SERVICE SCHEDULE on Page 10-70-1.)

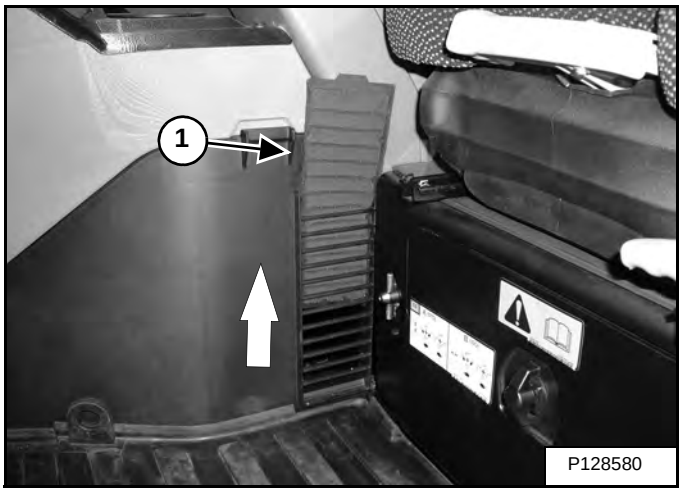
Recirculation Filter

Figure 70-20-1



The recirculation filter (Item 1) **[Figure 70-20-1]** is located to the right of the operator's seat.

Figure 70-20-2



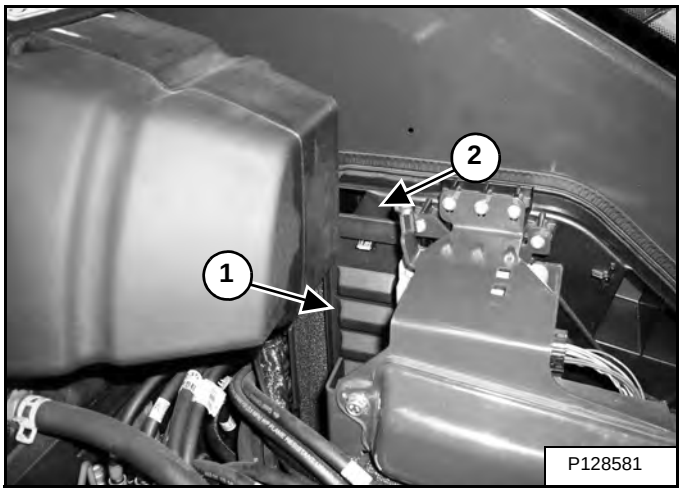
Pull up on the filter (Item 1) **[Figure 70-20-2]** until removed from the housing.

Shake the filter or use low pressure air to clean the filter. Replace the filter when very dirty or if damaged.

Installation: Position the bottom of the filter (Item 1) **[Figure 70-20-2]** into the housing and slowly push the filter down fully.

Fresh Air Filter

Figure 70-20-3

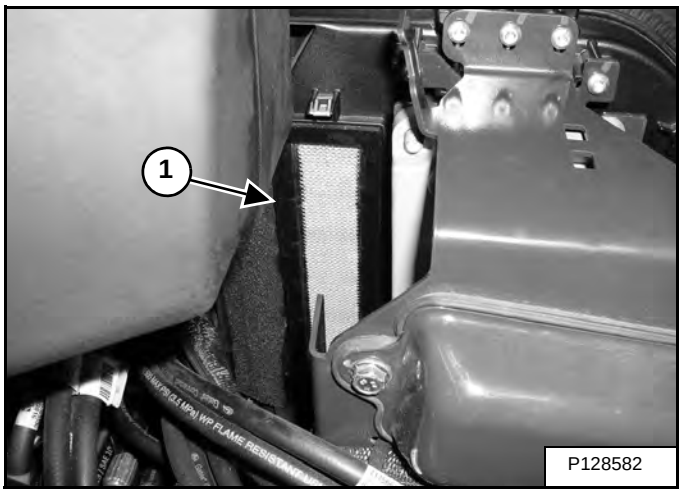


The fresh air filter is located under the right side cover.

Open the right side cover. (See Opening And Closing on Page 10-60-1.)

Pull out on the tab (Item 1) and remove the cover (Item 2) **[Figure 70-20-3]**.

Figure 70-20-4



Pull the filter (Item 1) **[Figure 70-20-4]** out of the housing.

Shake the filter or use pressure air to clean the filter. Do not use solvents. Replace the filter when very dirty or damaged.

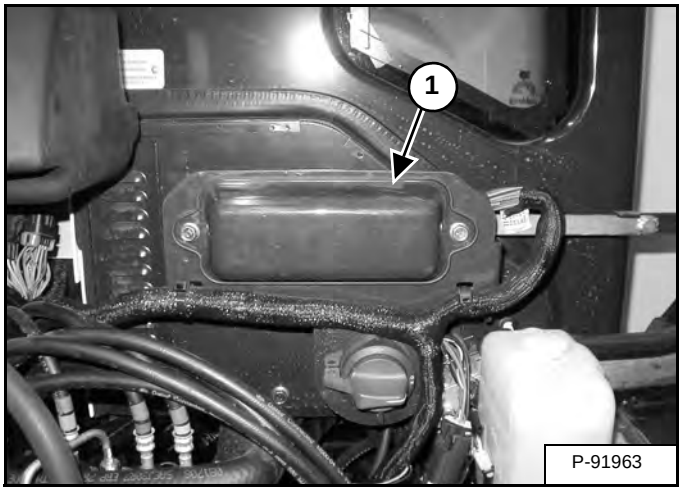
Installation: Position the filter (Item 1) **[Figure 70-20-4]** into the housing and slowly push the filter in fully.

Place the bottom tabs of the filter cover (Item 2) into the frame and push the top in until the tab (Item 1) **[Figure 70-20-3]** locks to the frame.

Electrical System

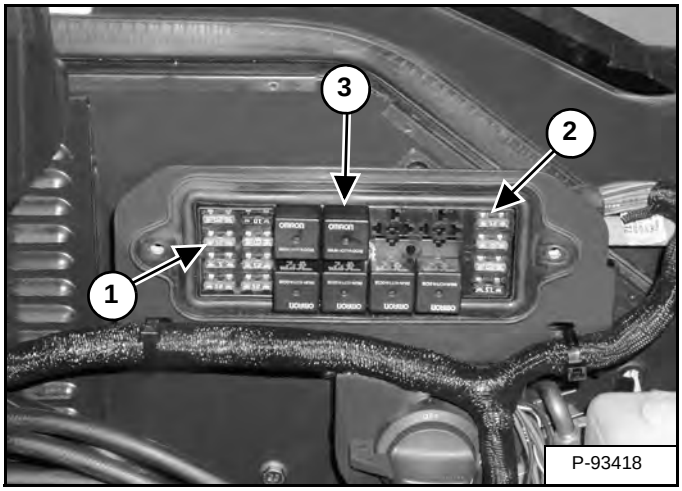
If the excavator A/C system shows no blower motor function, no A/C switch light and no A/C compressor function, do the following check:

Figure 70-30-4



Remove the two bolts and fuse / relay cover (Item 1) **[Figure 70-30-4]**.

Figure 70-30-5

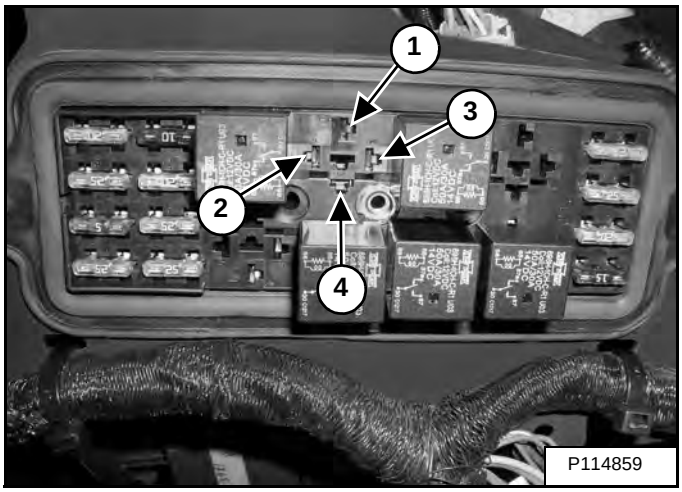


Check the HVAC fuse (Item 1) and controller fuse (Item 2) **[Figure 70-30-5]**.

Replace the fuse if burned out. If the fuses are good, remove the relay (Item 3) **[Figure 70-30-5]**.

Using a multimeter, check the voltage at the following relay terminals:

Figure 70-30-6



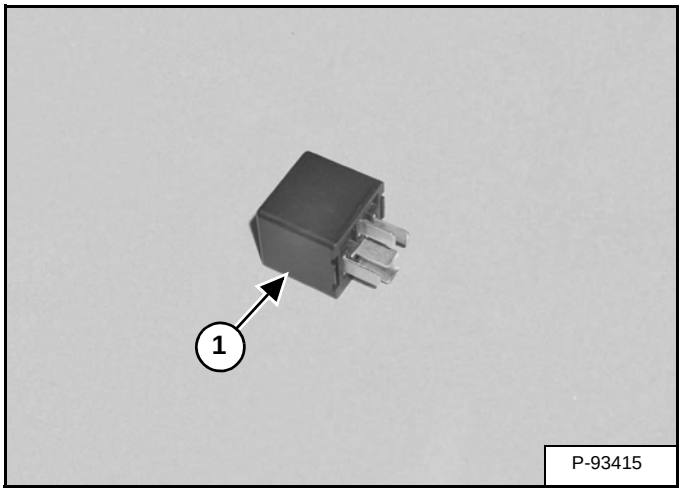
Voltage at pin 30 (Item 1) **[Figure 70-30-6]** is 12 volts at all times.

Voltage at pin 86 (Item 2) **[Figure 70-30-6]** is 12 volts when the start key is in the on position.

Pin 85 (Item 3) **[Figure 70-30-6]** is ground. Check for continuity to the ground.

With the key in the ON position, A/C switch ON, turn the fan switch ON pin 87 (Item 4) **[Figure 70-30-6]** is ground. Turn the fan switch OFF, and there is no continuity.

Figure 70-30-7



If the voltages and continuity checks are OK but the problem still persists, replace the A/C relay (Item 1) **[Figure 70-30-7]**.

Check to see if the compressor clutch is engaging.

With a person in the operator seat and the cab door open, turn the key switch to RUN (Standard panel) OR press the RUN / ENTER Button (Deluxe Panel), without starting the excavator.

COMPRESSOR (CONT'D)

Oil Check

The compressor oil should be checked as follows when oil is being added to an in service excavator.

There is a close affinity between oil and refrigerant. During normal operation, part of the oil circulates with the refrigerant in the system. When checking the amount of oil in the system or replacing any system component, the compressor must be run in advance to insure return of oil to the compressor.

If the amount of refrigerant in the system has decreased, charge the system. (See Reclamation And Charging With Recovery / Charging Unit on Page 70-40-3.)

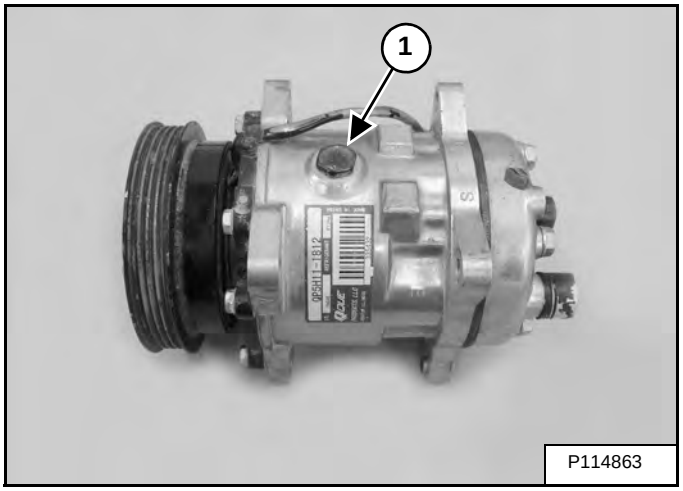
Open the cab door and windows.

Run the blower at maximum speed.

Run the compressor for at least 20 minutes at 800 - 1200 rpm.

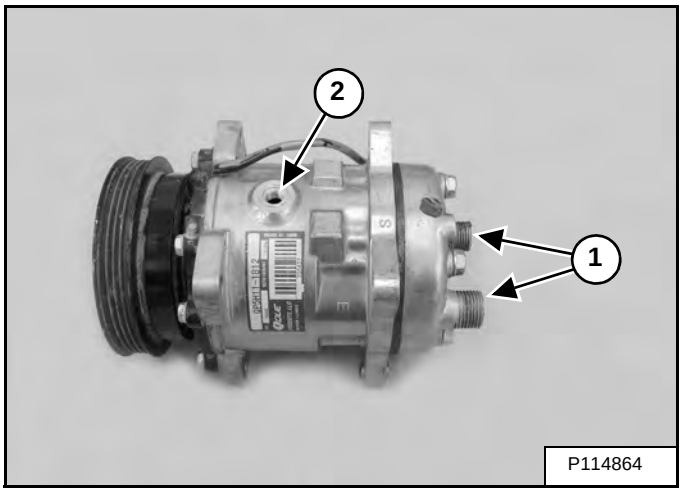
Remove the compressor from the excavator. (See Removal And Installation on Page 70-50-1.)

Figure 70-50-6



Remove the drain plug (Item 1) **[Figure 70-50-6]**.

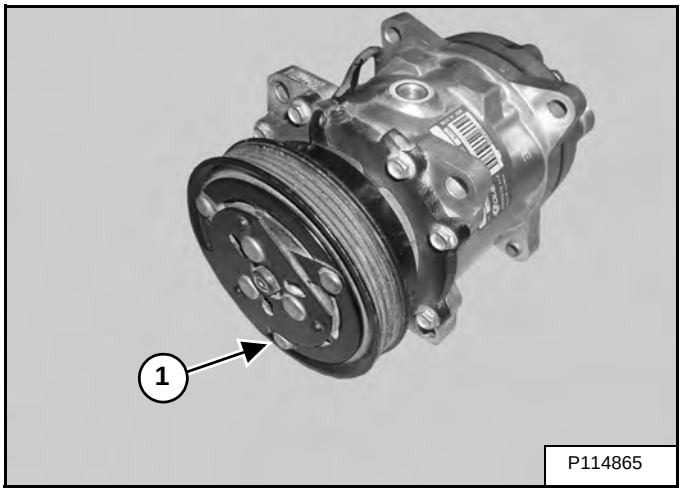
Figure 70-50-7



Drain the oil through the connectors (Item 1) and the oil drain hole (Item 2) **[Figure 70-50-7]**.

Installation: Tighten the oil drain plug to 13 - 15 N•m (9.4 - 10.8 ft-lb) torque.

Figure 70-50-8



NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 70-50-8] several times by hand.

Measure the drained oil in a measuring cylinder.

Check the oil for contamination, dirt, metal shavings, or varnish color, discard the oil if contaminated.

NOTE: If metal shavings are found in the compressor oil, replace the complete compressor assembly.

THERMOSTAT

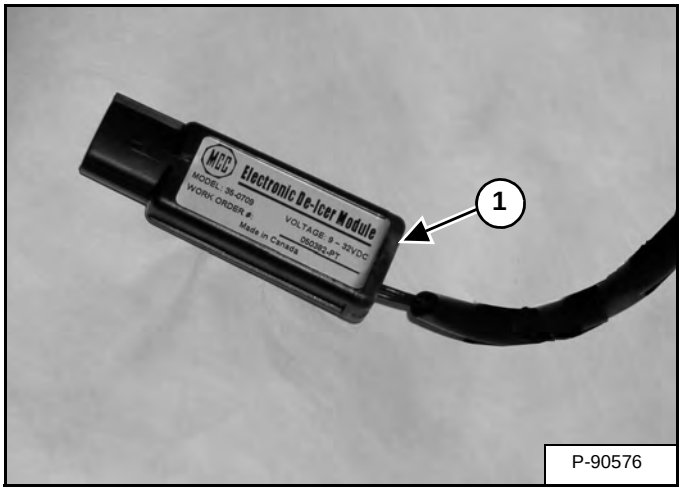
Description

The Electronic De-icing Thermostat (EDT) is a micro controller based module that measures evaporator coil temperature and cycles the compressor clutch to maintain a constant evaporator pressure. Onboard circuit protection and diagnostics are also built into the module.

NOTE: The EDT has a six second delay before startup to protect the compressor clutch.

The EDT will turn the clutch on when the evaporator coil temperature is above 2°C (35.6°F). If the EDT does not detect any malfunction, it will continue to operate and the status LED will be lit continuously. When the evaporator temperature is below -2°C (28.4°F), the EDT will turn off the clutch and status LED.

Figure 70-90-1



When the EDT detects an open or short from the temperature sensor, the status LED (Item 1) **[Figure 70-90-1]** will blink once per second and the output signal to the clutch will be turned off. The status LED will flash two times per second when EDT detects an open circuit (current draw less than 200 mA), short circuit or over current (current draw greater than 7A) from the clutch output. The status LED will flash three times per second when the compressor clutch is shorted to ground.

NOTE: The EDT will attempt to restart every 20 seconds until the fault is repaired.

The EDT has the following protection built in:

1. Over temperature
2. Over current from clutch output
3. Voltage (Above and below operational limits or reverse voltage)
4. Short circuit protection (Output shorted to ground)
5. Temperature sensor open and short detection

MALFUNCTION	DETECTION INTERVAL	STATUS LED
Temperature sensor	Continuous	1x per second
Temperature sensor open and short detection	At A/C startup	2x per second
Compressor clutch short to battery	Continuous	3x per second

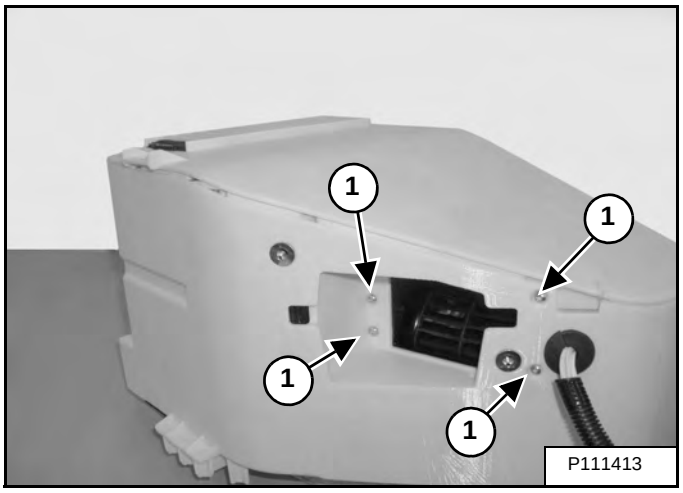
BLOWER FAN

Removal And Installation

Figure 70-130-1

Mark and remove the wire connectors from the motor **[Figure 70-130-1]**.

Figure 70-130-2

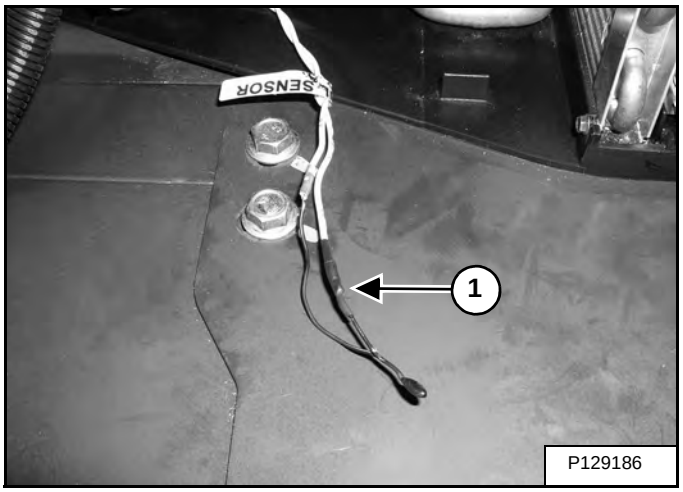


Remove the four bolts (Item 1) **[Figure 70-130-2]**.

Remove the motor.

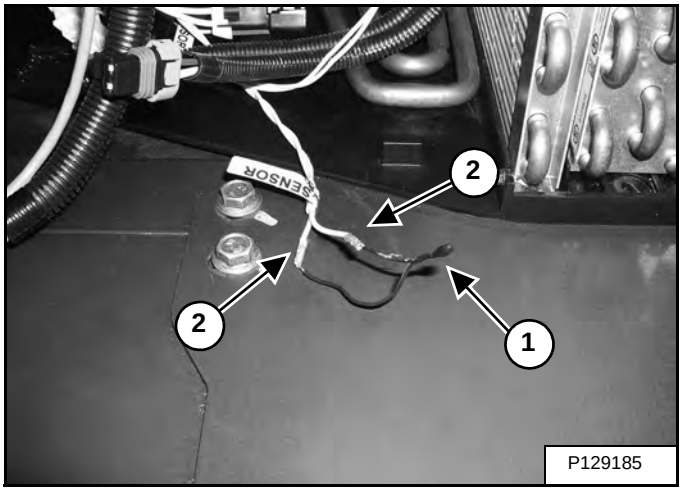
Inside And After Coil Sensor Testing (Cont'd)

Figure 70-160-13



Cut and remove the heat shrink tubing (Item 1) **[Figure 70-160-13]**.

Figure 70-160-14



Test the sensor (Item 1) at the connectors (Item 2) **[Figure 70-160-14]**.

Compare the actual sensor resistance to the resistance shown in the chart.

Temperature		Resistance In Ohms
°F	°C	
-20	-28.9	165,300
-10	-23.3	117,800
0	-17.8	85,500
10	-12.2	62,400
20	-6.7	46,300
30	-1.1	34,500
32	0	32,700
40	4.4	26,200
50	10.0	19,900
60	15.6	15,300
70	21.1	11,900
77	25	10,00
80	26.7	9,300
90	32.2	7,300
100	37.8	5,800
110	43.3	4,700
120	48.9	3,800

Rated Lift Capacity - Standard Arm With Additional Counterweight

A	B		kg (lb) @ max. B	B		kg (lb) @ max. B	B		kg (lb) @ max. B
	3000 mm (118.1 in)	4000 mm (157.5 in)		3000 mm (118.1 in)	4000 mm (157.5 in)		3000 mm (118.1 in)	4000 mm (157.5 in)	
4000 mm (157.5 in)									
3000 mm (118.1 in)		*737 kg (1625 lb)	*738 kg (1626 lb) @ 4005 mm (158 in)		593 kg (1306 lb)	592 kg (1305 lb) @ 4005 mm (158 in)		566 kg (1248 lb)	565 kg (1245 lb) @ 4005 mm (158 in)
2000 mm (78.7 in)	*903 kg (1991 lb)	*771 kg (1699 lb)	*760 kg (1674 lb) @ 4453 mm (175 in)	*903 kg (1991 lb)	587 kg (1293 lb)	497 kg (1096 lb) @ 4453 mm (175 in)	*903 kg (1991 lb)	560 kg (1233 lb)	474 kg (1045 lb) @ 4453 mm (175 in)
1000 mm (39.4 in)	*1262 kg (2781 lb)	*890 kg (1962 lb)	*800 kg (1763 lb) @ 4586 mm (181 in)	858 kg (1892 lb)	570 kg (1257 lb)	469 kg (1033 lb) @ 4586 mm (181 in)	815 kg (1797 lb)	543 kg (1197 lb)	446 kg (984 lb) @ 4586 mm (181 in)
Ground	*1466 kg (3232 lb)	*977 kg (2154 lb)	*853 kg (1880 lb) @ 4439 mm (175 in)	832 kg (1834 lb)	557 kg (1229 lb)	485 kg (1068 lb) @ 4439 mm (175 in)	789 kg (1739 lb)	531 kg (1171 lb)	462 kg (1019 lb) @ 4439 mm (175 in)
-1000 mm (-39.4 in)	*1422 kg (3136 lb)		*918 kg (2024 lb) @ 3972 mm (156 in)	831 kg (1832 lb)		565 kg (1245 lb) @ 3972 mm (156 in)	788 kg (1738 lb)		538 kg (1186 lb) @ 3972 mm (156 in)

779899enUS-v

TORQUE SPECIFICATION FOR BOLTS

Torque For General SAE Bolts

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Bobcat that have zinc phosphate coating are specified by the letter H following the part number.

THREAD SIZE		SAE GRADE 5	SAE GRADE 8
N•m (ft-lb)	0.250	9,0 - 10,2 (80 - 90)	12,4 - 13,6 (110 - 120)
	0.3125	20,3 - 22,6 (180 - 200)	24,2 - 27,1 (215 - 240)
N•m (ft-lb)	0.375	34 - 38 (25 - 28)	47 - 54 (35 - 40)
	0.4375	54 - 61 (40 - 45)	81 - 88 (60 - 65)
	0.500	88 - 95 (65 - 70)	122 - 136 (90 - 100)
	0.5625	122 - 136 (90 - 100)	170 - 190 (125 - 140)
	0.625	170 - 190 (125 - 140)	240 - 260 (175 - 190)
	0.750	300 - 330 (220 - 245)	410 - 450 (300 - 330)
	0.875	450 - 490 (330 - 360)	645 - 710 (475 - 525)
	1.000	645 - 710 (475 - 525)	985 - 1085 (725 - 800)
	1.125	880 - 975 (650 - 720)	1425 - 1600 (1050 - 1175)
	1.250	1200 - 1360 (900 - 1000)	2000 - 2200 (1475 - 1625)
	1.375	1630 - 1830 (1200 - 1350)	2720 - 2980 (2000 - 2200)
	1.500	2040 - 2240 (1500 - 1650)	3530 - 3870 (2600 - 2850)
	1.625	2720 - 2980 (2000 - 2800)	4680 - 5150 (3450 - 3800)
	1.750	3390 - 3730 (2500 - 2750)	5830 - 6500 (4300 - 4800)
	1.875	4270 - 4750 (3150 - 3500)	5830 - 6500 (5500 - 6100)
	2.000	5150 - 5700 (3800 - 4200)	8800 - 9800 (6500 - 7200)

HYDRAULIC FLUID SPECIFICATIONS

Specifications

Use only Bobcat hydraulic fluid.

DO NOT use automatic transmission fluids in the excavator or permanent damage to the hydraulic system will result.

Bobcat hydraulic fluid is available in:

- 9.5 L (2.5 U.S. gal) qty 2 (P/N 6903117)
- 18.9 L (5 U.S. gal) (P/N 6903118
- 208 L (55 U.S. gal) (P/N 6903119)

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

When temperatures below -18°C (0°F) are common, the excavator must be kept in a warm building. Extra warm-up time must be used each time the excavator is started during cold temperature conditions. Cold fluid will not flow easily and it makes action of the hydraulic function slower. Loss of fluid flow to the hydraulic system (Indicated by hydraulic temp / pressure lights on) can cause system damage in less than 60 seconds.

WARNING

During cold weather (0°C [32°F] and below), do not operate machine until the engine has run for at least 5 minutes at less than half throttle. This warm-up period is necessary for foot pedal operation and safe stopping. Do not operate controls during warm-up period.

When temperatures are below -30°C (-20°F), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above -18°C (0°F) if possible.

W-2027-0311