Bobcat®

Service Manual

E08

Compact Excavator

S/N A4BP11001 & Above
S/N B4PC11001 & Above

6986785enUS (07-20) (E)

Printed in U.S.A.

T2 S5-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

LIFTING AND BLOCKING THE EXCAVATOR

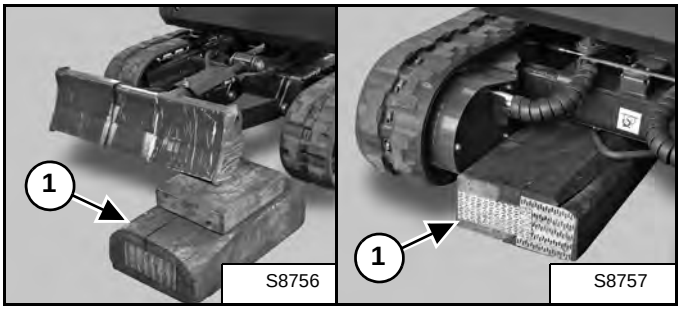
Procedure

Always park the machine on a level surface.

Figure 10-10-1

Raise one side of the machine (approximately 100 mm [4 in]) using the boom and arm as shown in **[Figure 10-10-1]**.

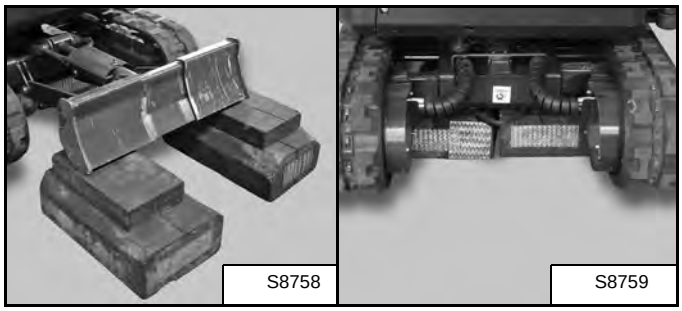
Figure 10-10-2



Raise the blade fully and install wooden blocks (Item 1) **[Figure 10-10-2]** or jackstands under the blade and the track frame. Lower the machine until all machine weight is on the wooden blocks or jackstands.

Rotate the upperstructure 180 degrees and repeat procedure for other side.

Figure 10-10-3



The machine must be blocked up as shown in **[Figure 10-10-3]**.

Stop the engine.

⚠ WARNING

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

W-2218-1195

⚠ WARNING

AVOID INJURY

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

W-2142-0903

TAILGATE

Opening And Closing The Tailgate

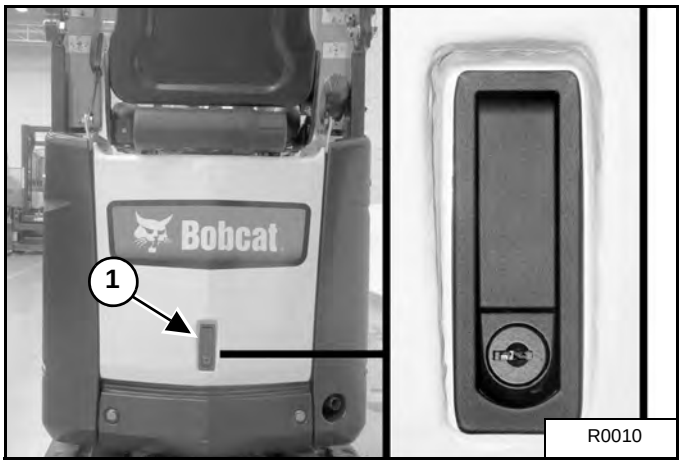
WARNING

AVOID INJURY OR DEATH

Never service or adjust the machine when the engine is running unless instructed to do so in the manual.

W-2012-0497

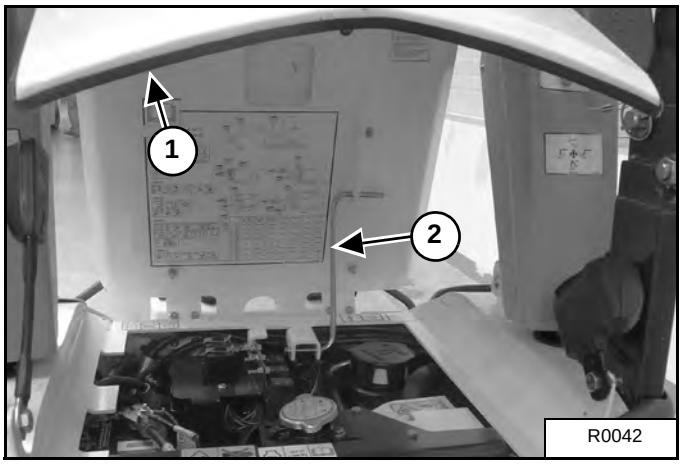
Figure 10-60-1



Release the latch (Item 1) **[Figure 10-60-1]** and pull the tailgate open.

Close the tailgate before operating the excavator.

Figure 10-60-2



Pull the tailgate (Item 1) till blocking the wedge (Item 2) **[Figure 10-60-2]**.

To close the tailgate, carefully pull the wedge, handling the tailgate, and then close it until the latch is closed again.

NOTE: The tailgate can be locked using the start key.

FUEL SYSTEM

Fuel Specifications

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

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 must 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 EN590 specifications listed below:

- Ultra low sulfur diesel fuel defined as 10 mg/kg (10 ppm) sulfur maximum.
- Diesel fuel with cetane number of 51.0 and above.

NOTE: Biodiesel blend fuel may also be used in this machine. Biodiesel blend fuel must contain no more than seven percent biodiesel mixed with ultra low sulfur petroleum based diesel. This biodiesel blend fuel is commonly marketed as B7 blended diesel fuel. B7 blended diesel fuel must meet EN590 specifications.

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 that 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:

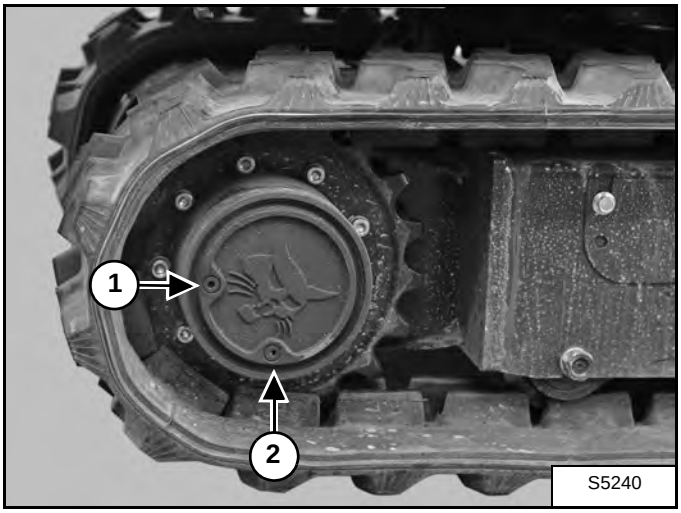
- Ensure the fuel tank is as full as possible at all times to prevent moisture from collecting in the fuel tank.
- Ensure that the fuel tank cap is securely tightened.
- Biodiesel blend fuel can damage painted surfaces, remove all spilled fuel from painted surfaces immediately.
- Drain all water from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

TRAVEL MOTOR

Checking Oil Level

Figure 10-140-1



Put the machine on a level surface with the plugs positioned as shown (Items 1 and 2) **[Figure 10-140-1]**.

Remove the top plug (Item 1) **[Figure 10-140-1]**. The oil level should be at the bottom edge of the plug hole.

Add gear lube through the plug hole if the oil level is below the hole. See Chart for capacity and type.

Install and tighten the top plug.

Repeat the procedure for the other side.

Draining The Travel Motor

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

Put the machine on a level surface with the plugs positioned as shown (Items 1 and 2) **[Figure 10-140-1]**.

Remove the bottom plug (Item 2) and top plug (Item 1) **[Figure 10-140-1]** and drain into a container. Recycle or dispose of the used lubricant in an environmentally safe manner.

After all the gear lube is removed, install the bottom plug (Item 2) **[Figure 10-140-1]**.

Add gear lube to the top plug hole (Item 1) **[Figure 10-140-1]** until the gear lube level is at the bottom edge of the plug hole. See Chart for capacity and type.

Install and tighten the top plug.

Repeat the procedure for the other side.

EXCAVATOR STORAGE AND RETURN TO SERVICE

Storage

Sometimes it may be necessary to store your Bobcat excavator for an extend period of time. Below is a list of items to perform before storage.

- Thoroughly clean the excavator including the engine compartment.
- Lubricate the excavator.
- Replace worn or damaged parts.
- Drive the excavator onto planks in a dry protected shelter.
- Lower the boom fully with the bucket flat on the ground.
- Put grease on any exposed cylinder rods.
- Put fuel stabilizer in the fuel tank and run the engine a few minutes to circulate the stabilizer to the pump and fuel injectors.
- Drain and flush the cooling system. Refill with premixed coolant.
- Replace all fluids and filters (engine, hydraulic).
- Replace all filters (i.e.: air cleaner, heater, etc.).
- Put all controls in neutral position.
- Remove the battery. Be sure the electrolyte level is correct then charge the battery. Store it in a cool dry place above freezing temperatures and charge it periodically during storage.
- Cover the exhaust pipe opening.
- Tag the machine to indicate that it is in storage condition.

Return to Service

After the Bobcat excavator has been in storage, it is necessary to follow a list of items to return the excavator to service.

- Check the engine and hydraulic oil levels; check coolant level.
- Install a fully charged battery.
- Remove grease from exposed cylinder rods.
- Check all belt tensions.
- Be sure all shields and guards are in place.
- Lubricate the excavator.
- Remove cover from exhaust pipe opening.
- Start the engine and let run for a few minutes while observing the instrument panels and systems for correct operation.
- Drive the excavator off of the planks.
- Operate machine, check for correct function.
- Stop the engine and check for leaks. Repair as needed.

HYDRAULIC/HYDROSTATIC SCHEMATIC
E08 (S/N A4BP11001 AND ABOVE)

(PRINTED MAY 2011)
V-1215legend

LEGEND

(1) HYDRAULIC RESERVOIR
(PRESSURIZED) with FILL STRAINER
Reservoir Capacity: . . . . . 2,6 L (2.75 qt)
System Capacity to center of site gauge:
. . . . . 10,1 L (10.7 qt)

(2) FILL CAP – with Breather Filter

(3) HYDRAULIC FILTER ELEMENT
10 Micron

(4) FILTER BY-PASS: 0,172 MPa (1,72 bar) (25 psi)

(5) HYDRAULIC PUMP - 2 Section Gear Pump:
Pump Section 1
10,0 Lpm (2.6 U.S. gpm) at High Engine Idle
Pump Section 2
10,0 Lpm (2.6 U.S. gpm) at High Engine Idle

(6) MAIN RELIEF VALVE (2): 18,5 MPa
(185 bar) (2683 psi)

(7) PORT RELIEF / ANTICAVITATION VALVE
Boom Cylinder (Base End): 32,2 MPa
(232 bar) (3365 psi)

(8) PORT RELIEF / ANTICAVITATION VALVE
Arm Cylinder (Base End): 22,5 MPa
(225 bar) (3262 psi)

(9) SLEW MOTOR - CROSS PORT RELIEF VALVE: 8,0 MPa (80 bar) (1160 psi)

(10) ANTICAVITATION VALVE
Boom Swing Cylinder (Rod End)

(11) ANTICAVITATION VALVE
Arm Cylinder (Rod End)

(12) CHECK VALVE

(13) ORIFICE . . . . . 1,2 mm (0.04 in)

(14) ORIFICE . . . . . 1,1 mm (0.04 in)

(15) ORIFICE . . . . . 1,1 mm (0.043 in)

(16) TRAVEL MOTOR SPOOL

(17) CHECK VALVE (Later Models Only)

(18) ORIFICE . . . . . 1,2 mm (0.04 in)
(Later Models Only)

(19) PORT RELIEF / ANTICAVITATION VALVE
Bucket Cylinder (Base End) – (Later Models Only)
23,2 MPa (232 bar) (3365 psi)

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

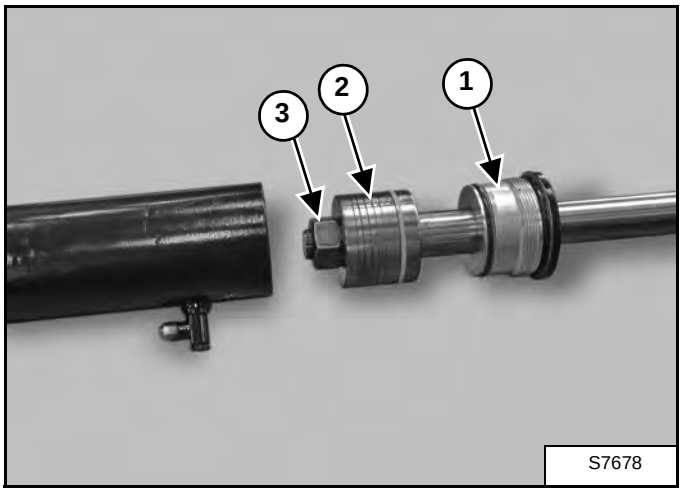
Printed in U.S.A.

Troubleshooting The Swing (Upperstructure Slew) Circuit

TROUBLESHOOTING THE SWING (UPPERSTRUCTURE SLEW) CIRCUIT		
PROBLEM	**CAUSE**	**CORRECTION**
Swing not operating.	Control console lockout engaged.	Disengage control console lockout.
	Swing lock pin engaged.	Disengage lock pin.
	Lever linkage mis-adjusted.	Readjust.
	Swing motor gear defective.	Repair or replace.
	Swing motor defective.	Repair or replace.
Swing force.	Main relief valve set too low.	Readjust or replace.
	Swing motor cross port relief valve pressure too low.	Readjust or replace.
Swing speed too slow.	Pump flow low.	Check, repair or replace.
	Blocked or restricted line to swing motor.	Replace.
	Control valve internal leakage excessive.	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.
Swing over run excessive.	Control valve spool sticking.	Repair or replace.
	Swing motor cross port relief valve set too low.	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.

Assembly (Cont'd)

Figure 20-20-23



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

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

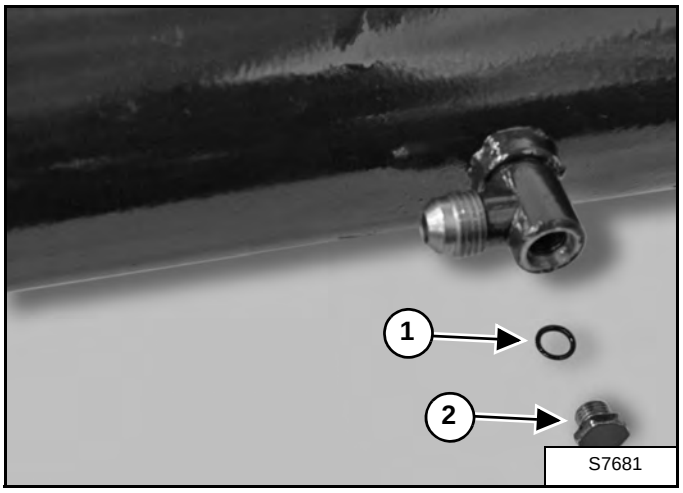
Provide an adequate support for the cylinder before tightening.

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

NOTE: Clean and dry the rod threads, from the kit install a NEW NUT with preapplied Loctite®.

Tighten the nut to 406 N•m (300 ft-lb) torque.

Figure 20-20-24



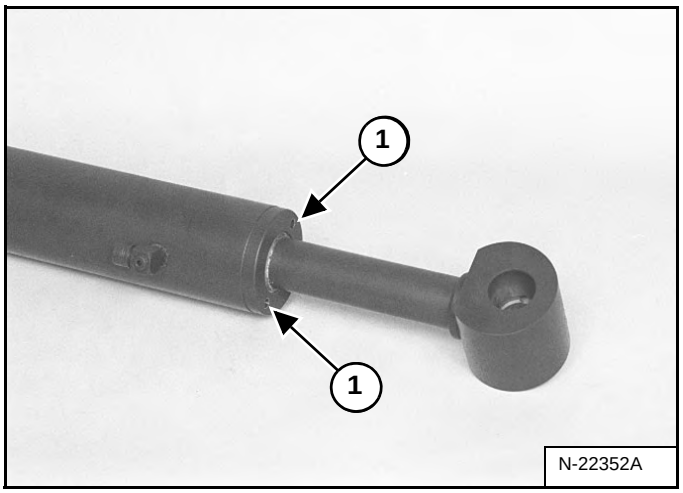
Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-20-24]**.

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

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

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

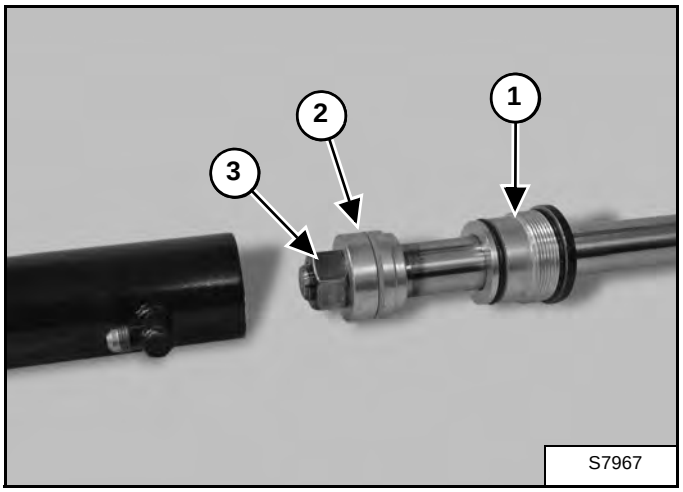
Figure 20-20-25



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-20-25]** to tighten the head. Head to be torqued until flush with end of the housing.

Assembly (Cont'd)

Figure 20-21-20



Install the head (Item 1) and the piston (Item 2) **[Figure 20-21-20]** on the rod.

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.

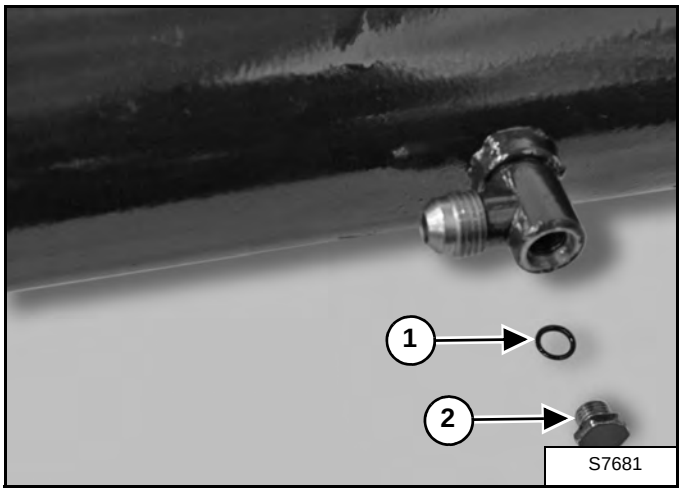
Install the nut (Item 3) **[Figure 20-21-20]**.

NOTE: Clean and dry the rod threads, from the kit install a NEW NUT with preapplied Loctite®.

Reclean thread area for Loctite® residue.

Tighten the nut to 410 N•m (300 ft-lb) torque.

Figure 20-21-21

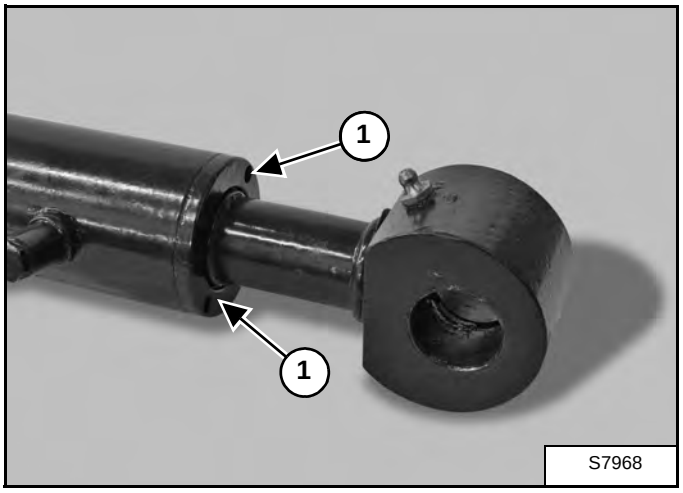


Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-21-21]**.

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

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

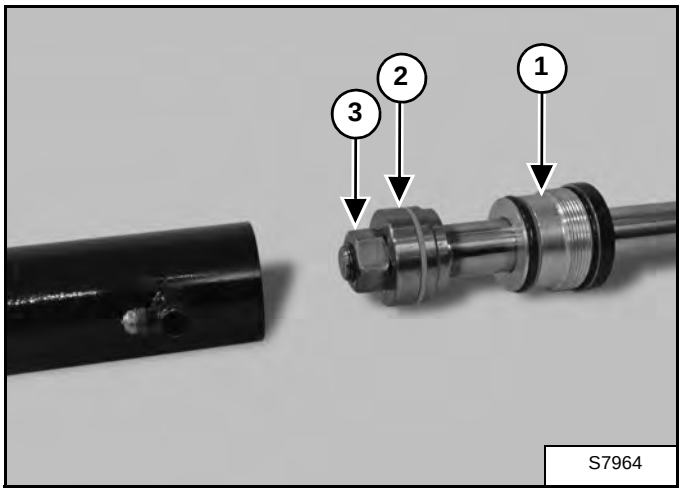
Figure 20-21-22



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-21-22]** to tighten the head. Head to be torqued until flush with end of the housing.

Assembly (Earlier Models) (Cont'd)

Figure 20-22-24



Install the head (Item 1) and the piston (Item 2) **[Figure 20-22-24]** on the rod.

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.

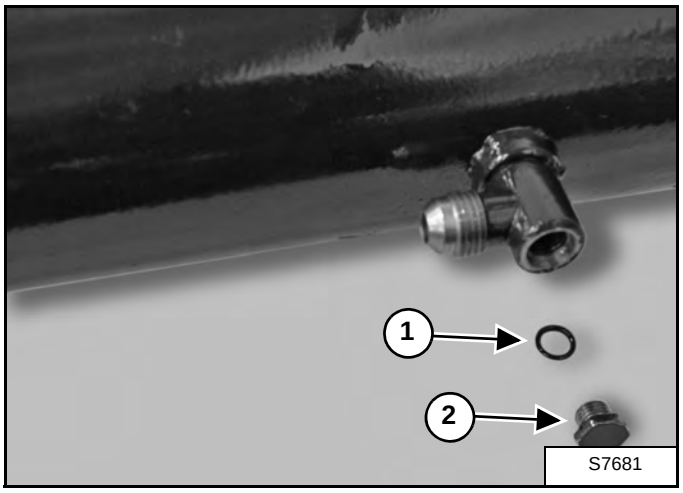
Install the nut (Item 3) **[Figure 20-22-24]**.

NOTE: Clean and dry the rod threads, from the kit install a NEW NUT with preapplied Loctite®.

Reclean thread area for Loctite® residue.

Tighten the nut to 407 N•m (300 ft-lb) torque.

Figure 20-22-25

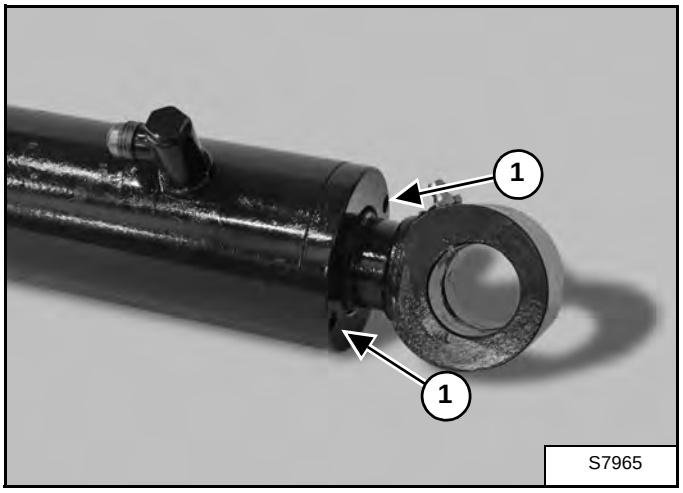


Install O-ring (Item 1) and plug (Item 2) **[Figure 20-22-25]**.

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

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

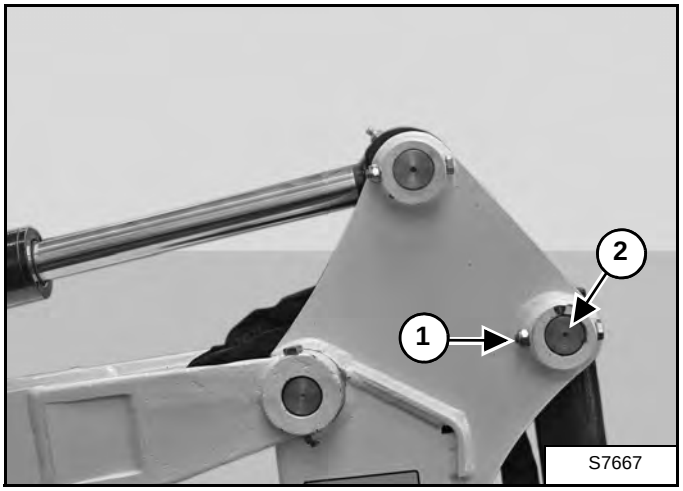
Figure 20-22-26



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-22-26]** to tighten the head. Head to be torqued until flush with end of the housing.

Removal And Installation (Cont'd)

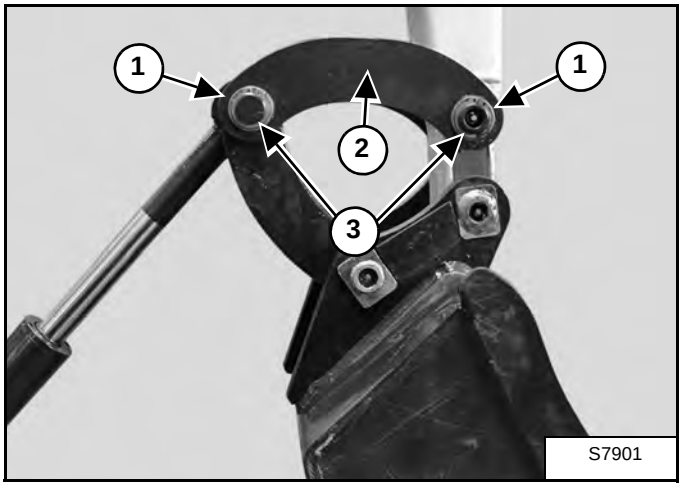
Figure 20-23-7



Remove the bolt and nut (Item 1) **[Figure 20-23-7]** from the base end pivot pin.

Remove the base end pivot pin (Item 2) **[Figure 20-23-7]** and lower the base end of the cylinder to the floor.

Figure 20-23-8



Remove the two snap rings and washers (Item 1) **[Figure 20-23-8]**.

Remove the bucket link (Item 2) **[Figure 20-23-8]**.

Remove the bucket link pins (Item 3) **[Figure 20-23-8]**.

Remove the bucket cylinder.

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

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a doctor familiar with this injury is not received immediately.

W-2145-EN-0210

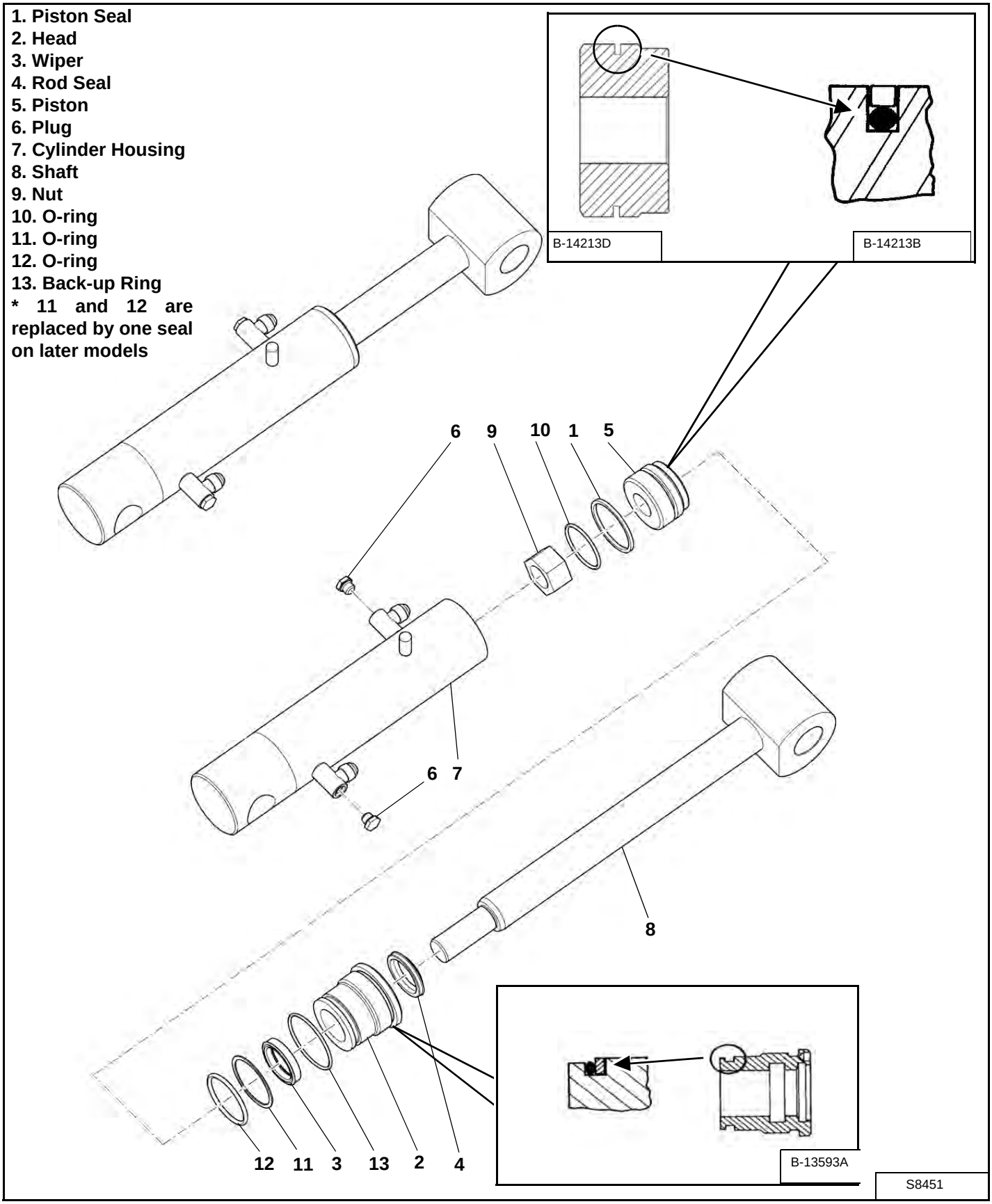
⚠ WARNING

AVOID INJURY OR DEATH

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

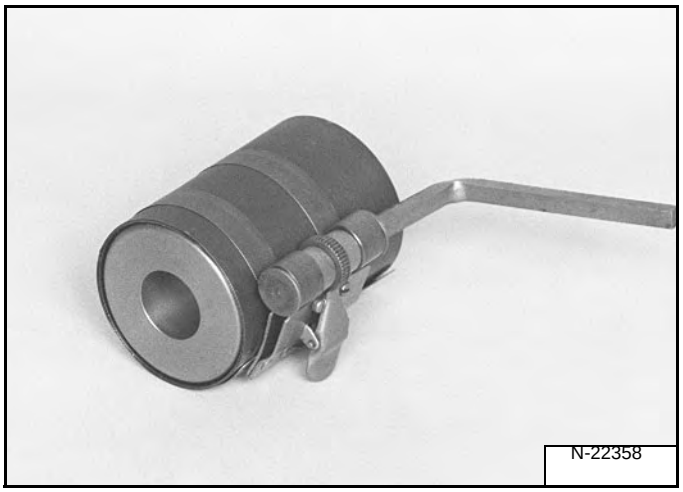
W-2103-0508

Parts Identification (Earlier Models)



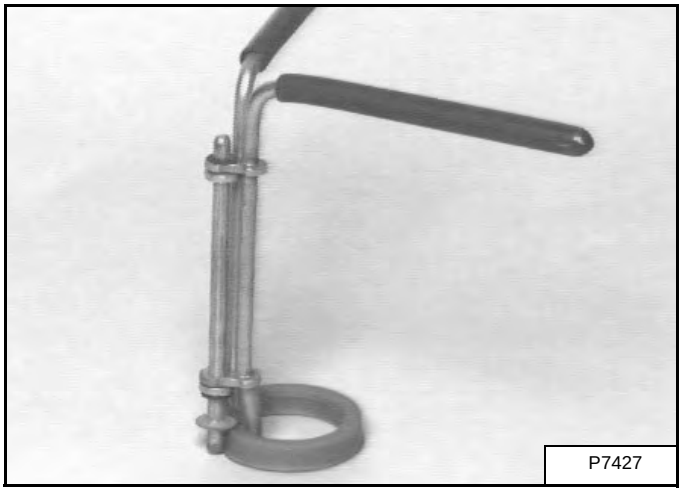
Assembly (Later Models) (Cont'd)

Figure 20-24-34



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-24-34]**.

Figure 20-24-35

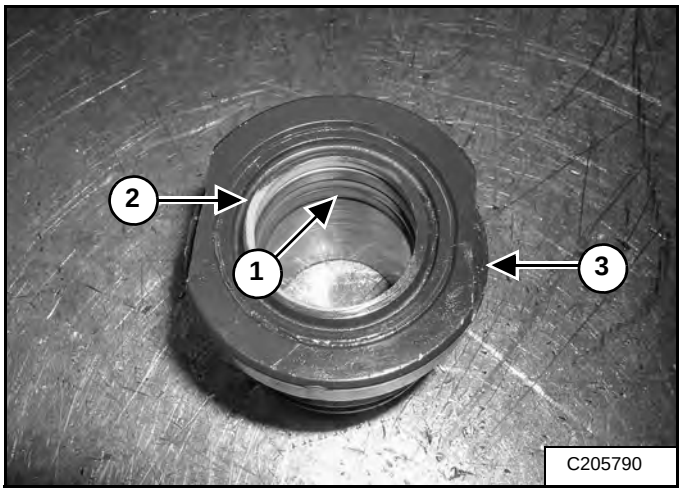


Install the rod seal on the rod seal tool **[Figure 20-24-35]**.

NOTE: Install the spring side of the seal toward the inside of the cylinder.

Rotate the handles to collapse the rod seal.

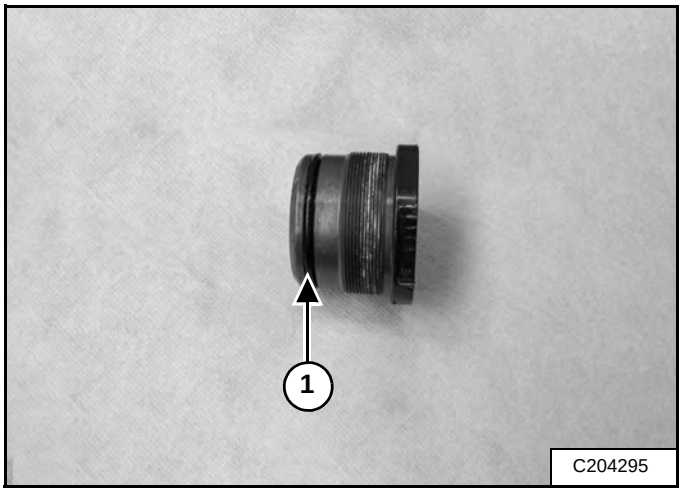
Figure 20-24-36



Install the rod seal (Item 1) and wiper seal (Item 2) in the head (Item 3) **[Figure 20-24-36]**.

Install the wiper seal with the wiper (Item 2) **[Figure 20-24-36]** toward the outside of the head.

Figure 20-24-37



Install the O-ring (Item 1) **[Figure 20-24-37]** on the head.

Assembly

Use the following tools to assemble the cylinder:

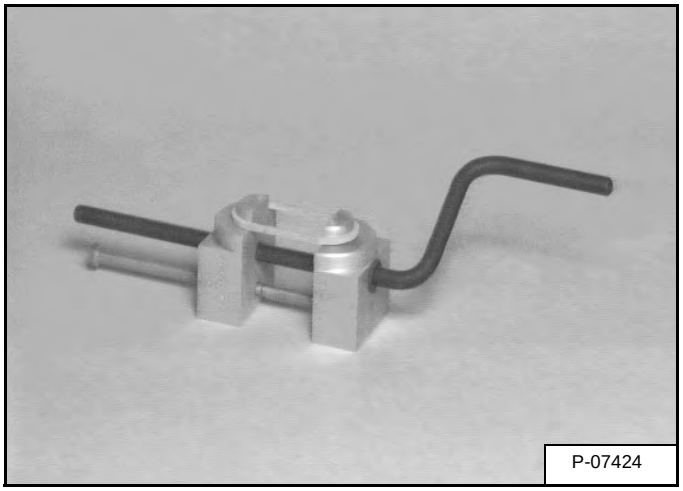
MEL1396 - Universal Seal Expander
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-1 - Standard Pins

Clean all parts in solvent and dry with compressed air.

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

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

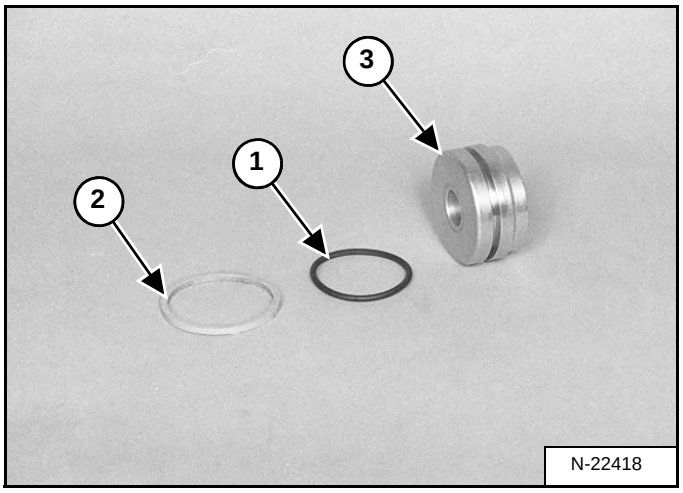
Figure 20-25-23



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-25-23]**.

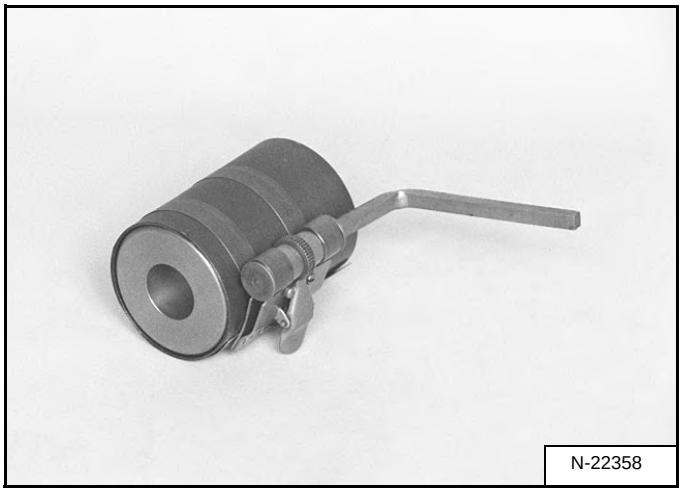
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-25-24



Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-25-24]**.

Figure 20-25-25



Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about 3 minutes **[Figure 20-25-25]**.

HYDRAULIC CONTROL VALVE

Description

The hydraulic control valve has 18,5 MPa (185 bar) (2683 psi) main relief valves for the left hand and right hand travel sections. The hydraulic control valve has two 8 MPa (80 bar) (1160 psi) work port relief valves for the slew section.The hydraulic control valve has 22,5 MPa (225 bar) (2163 psi) work port relief valve for the arm section. The hydraulic control valve has 23,2 MPa (232 bar) (3365 psi) work port relief valve for the boom (base end) section.

Removal And Installation

Lower the boom / bucket and blade to the ground.

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

IMPORTANT

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

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Remove the instrument panel.

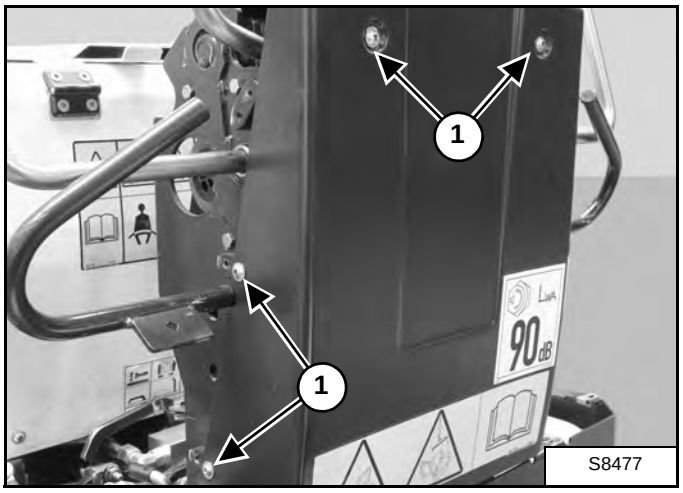
Remove the floor panels. (See FLOOR PANELS on Page 40-120-1.)

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a doctor familiar with this injury is not received immediately.

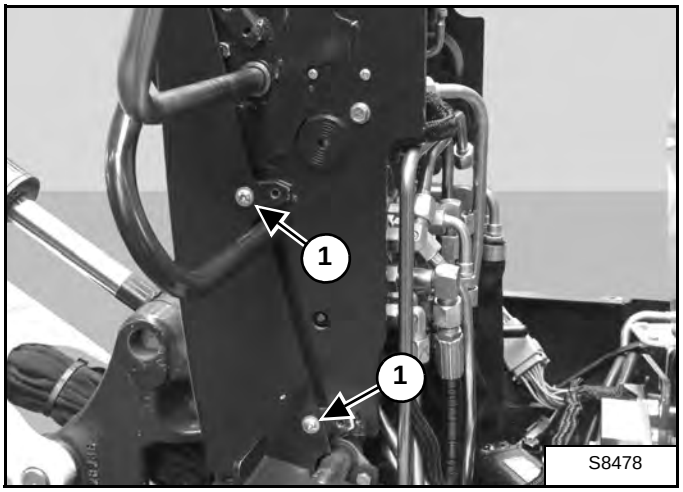
W-2145-EN-0210

Figure 20-40-1



Remove the four bolts (Item 1) **[Figure 20-40-1]** from the cover.

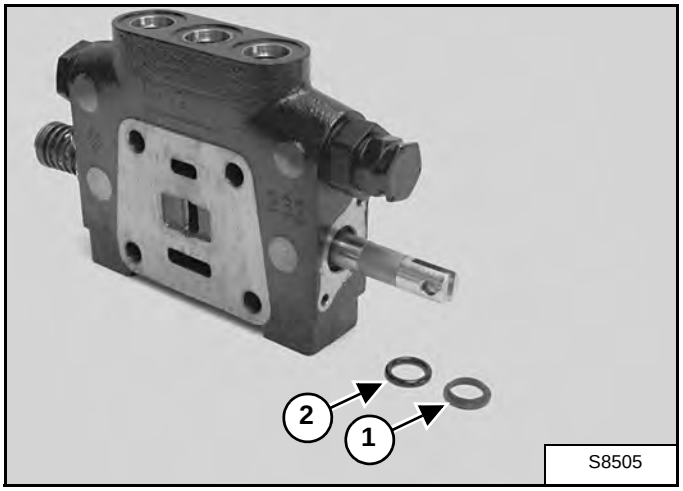
Figure 20-40-2



Remove the bolts (Item 1) **[Figure 20-40-2]** and remove the cover.

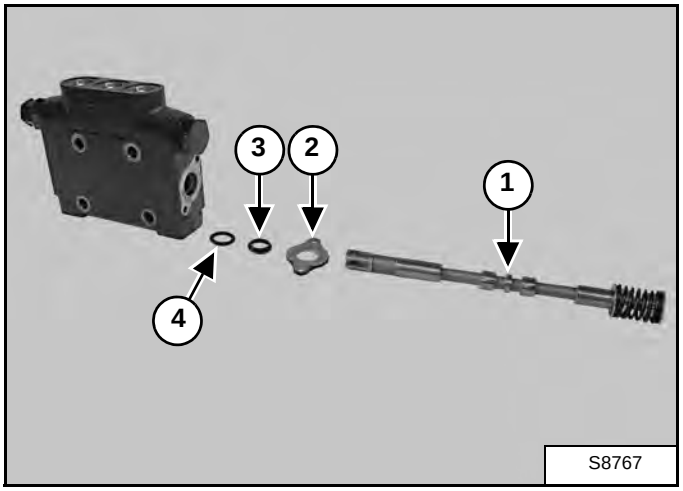
Left Travel Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-30



Remove the seal (Item 1) and O-ring (Item 2) **[Figure 20-40-30]**.

Figure 20-40-31

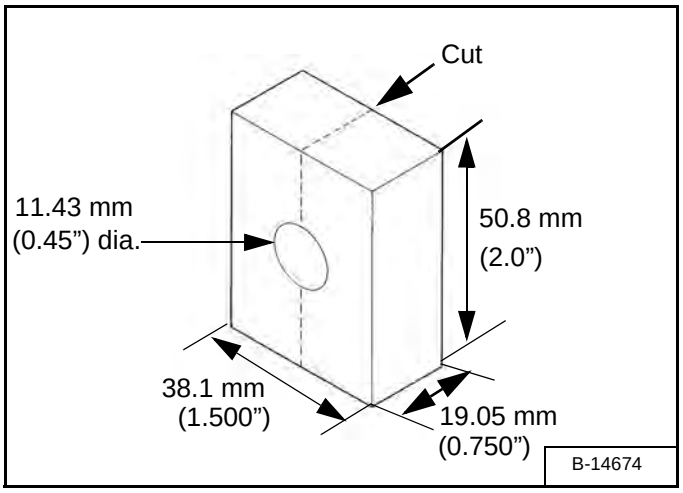


Remove the spool and spring assembly (Item 1), retaining plate (Item 2), seal (Item 3) and O-ring (Item 4) **[Figure 20-40-31]**.

The spool and valve section are not serviced separately.

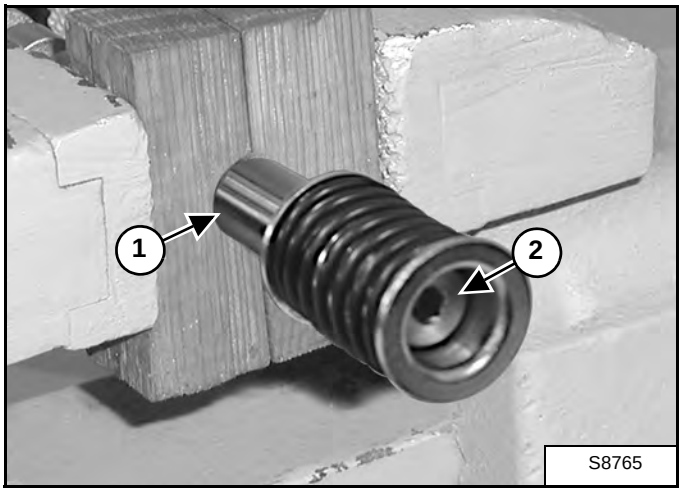
NOTE: When the spool is removed, use care not to scratch the spool surface. Do not interchange spools and valve sections.

Figure 20-40-32



To remove the spring assembly from the spool a holding fixture will have to be made from a 19 mm thick x 38 mm wide x 51 mm long a (0.750 in thick x 1.500 in wide x 2.0 in long) piece of hardwood. Drill a 11,5 mm (0.45 in) hole in the center of the hardwood block. Cut the block lengthwise **[Figure 20-40-32]**.

Figure 20-40-33



Using the wood blocks clamp the spool and spring assembly (Item 1) **[Figure 20-40-33]** in a vise.

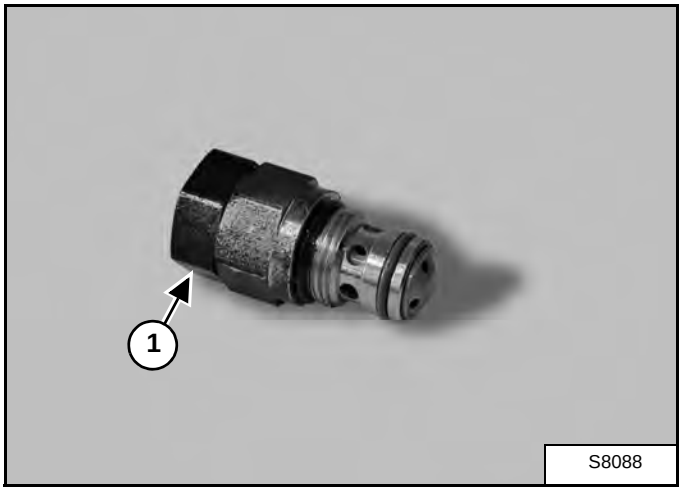
NOTE: Do not use anything other than hardwood blocks to grip the spool, or the spool will be damaged.

Loosen the bolt (Item 2) **[Figure 20-40-33]**.

Installation: Apply Loctite® 243 or equivalent and tighten the bolt to 6 N•m (53.1 in-lb) torque.

Arm Valve Section Disassembly And Assembly (Cont'd)

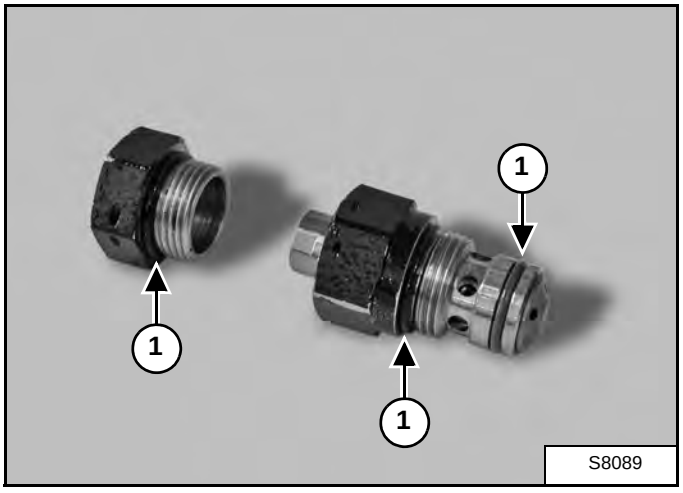
Figure 20-40-65



Remove the plug (Item 1) **[Figure 20-40-65]** from the port relief valve.

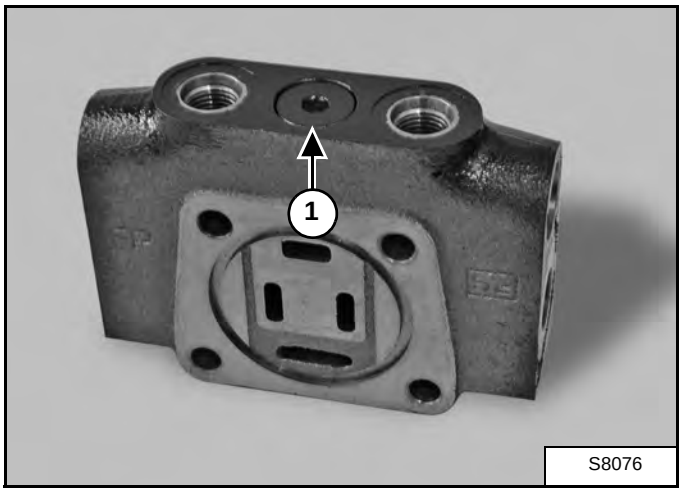
Installation: Tighten the plug to 25 N•m (18 ft-lb) torque.

Figure 20-40-66



Remove the O-rings (Item 1) **[Figure 20-40-66]**.

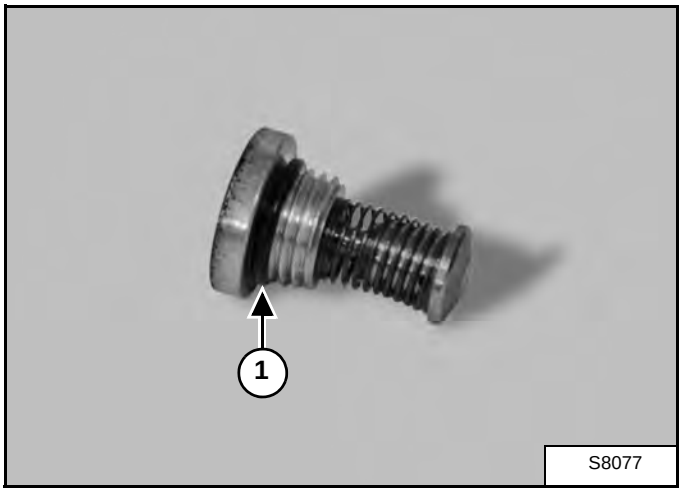
Figure 20-40-67



Remove the check valve (Item 1) **[Figure 20-40-67]**.

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

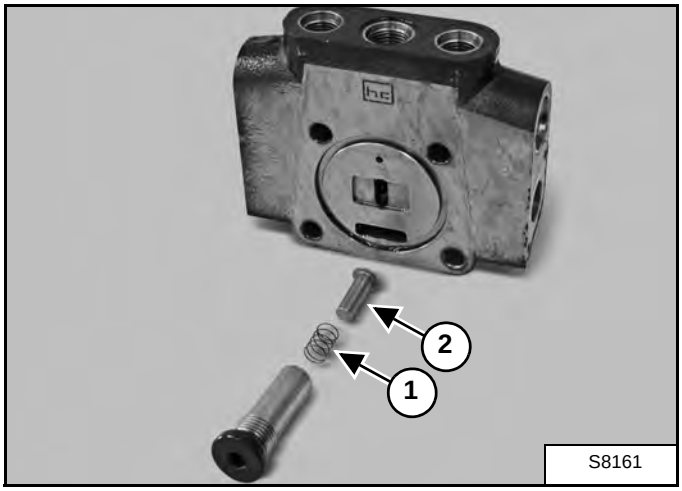
Figure 20-40-68



Remove the O-ring (Item 1) **[Figure 20-40-68]** from the check valve.

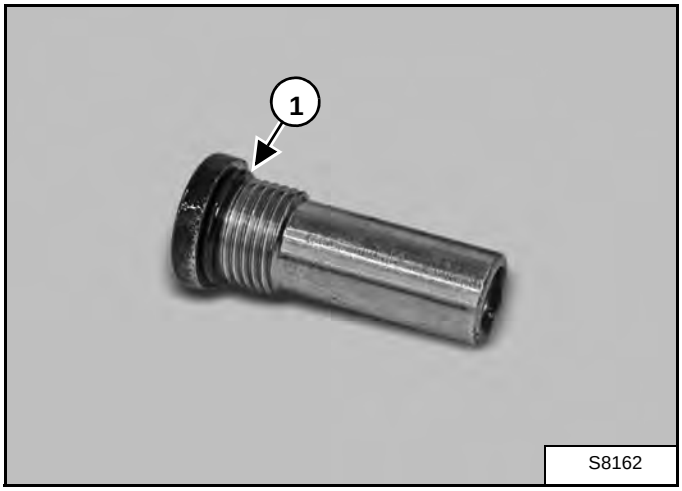
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-101



Remove the spring (Item 1) and spring seat (Item 2) **[Figure 20-40-101]**.

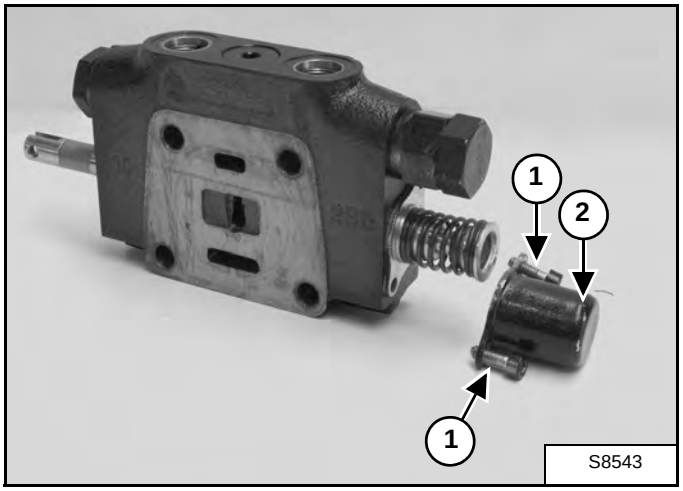
Figure 20-40-102



Remove the O-ring (Item 1) **[Figure 20-40-102]**.

Boom Valve Section Disassembly And Assembly (Cont'd)

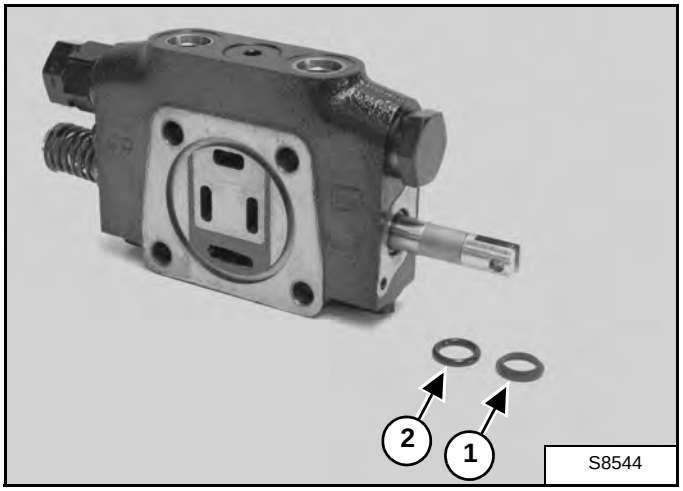
Figure 20-40-131



Loosen the bolts (Item 1) and remove cap and screw assembly (Item 2) **[Figure 20-40-131]**.

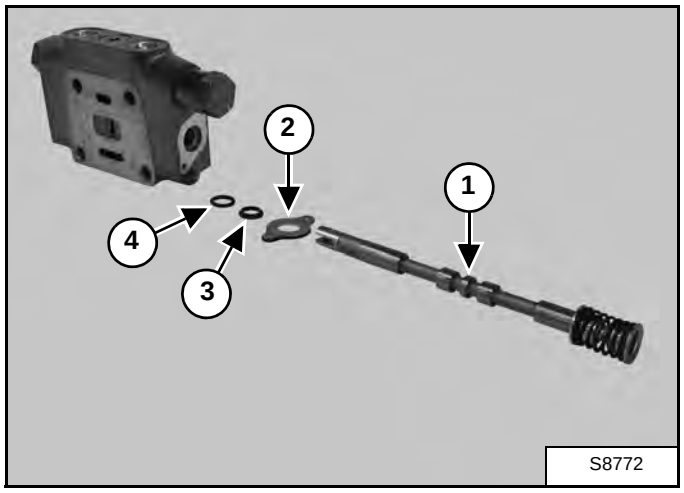
Installation: Tighten the bolts to 6,5 N•m (57.5 in-lb) torque.

Figure 20-40-132



Remove the seal (Item 1) and O-ring (Item 2) **[Figure 20-40-132]**.

Figure 20-40-133

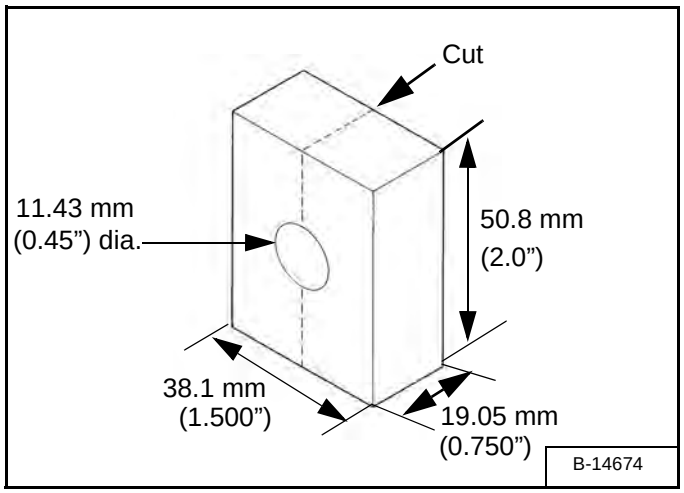


Remove the spool and spring assembly (Item 1), retaining plate (Item 2), seal (Item 3) and O-ring (Item 4) **[Figure 20-40-133]**.

The spool and valve section are not serviced separately.

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

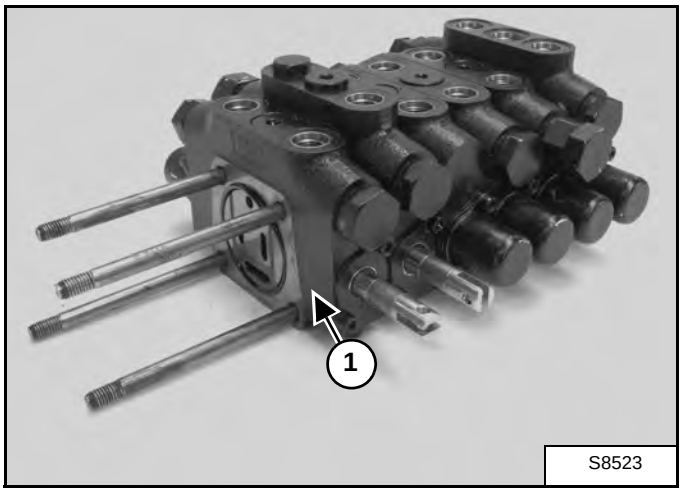
Figure 20-40-134



To remove the spring assembly from the spool a holding fixture will have to be made from a 19 mm thick x 38 mm wide x 51 mm long a (0.750 in thick x 1.500 in wide x 2.0 in long) piece of hardwood. Drill a 11,5 mm (0.45 in) hole in the center of the hardwood block. Cut the block lengthwise **[Figure 20-40-134]**.

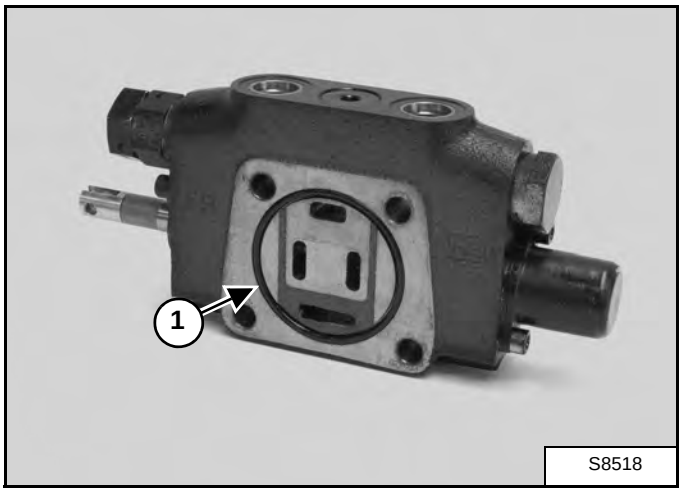
Assembly (Cont'd)

Figure 20-40-167



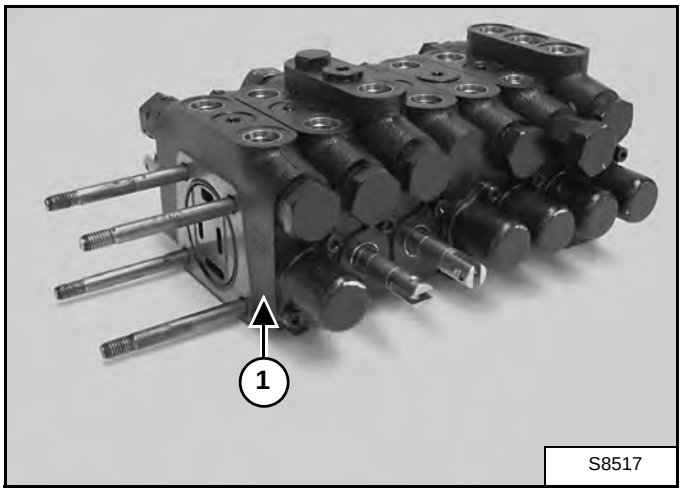
Install the boom swing valve section (Item 1) **[Figure 20-40-167]** on the tie rods.

Figure 20-40-168



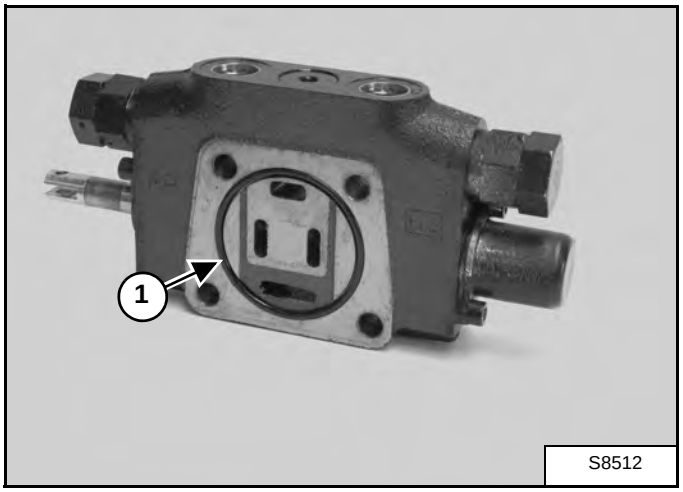
Install the O-ring (Item 1) **[Figure 20-40-168]** on the arm valve section.

Figure 20-40-169



Install the arm valve section (Item 1) **[Figure 20-40-169]** on the tie rods.

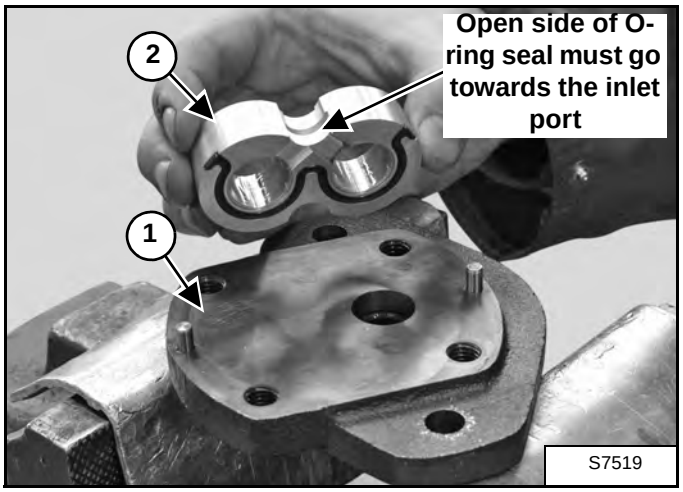
Figure 20-40-170



Install the O-ring (Item 1) **[Figure 20-40-170]** on the slew valve section.

Assembly (Cont'd)

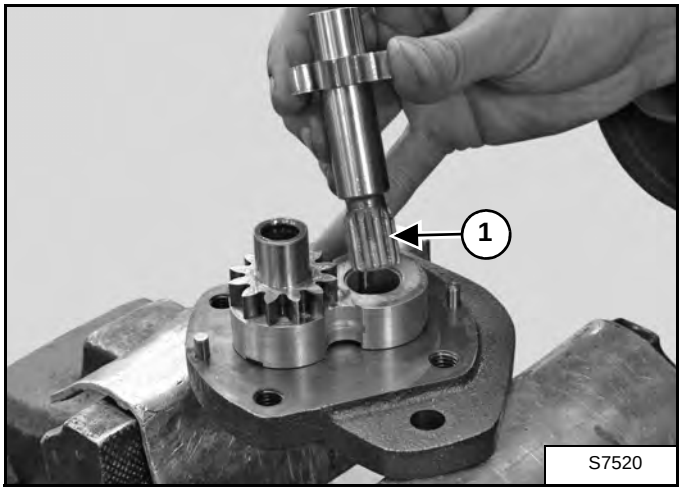
Figure 20-50-17



Put the mounting flange, oil seal side down (Item 1) **[Figure 20-50-17]** in a protected jaw vise.

Install the lower bearing (Item 2) **[Figure 20-50-17]**, seal side down, on the mounting flange (or separating plate). The open side of the O-ring seal must point toward the inlet port side (marked side) of the pump.

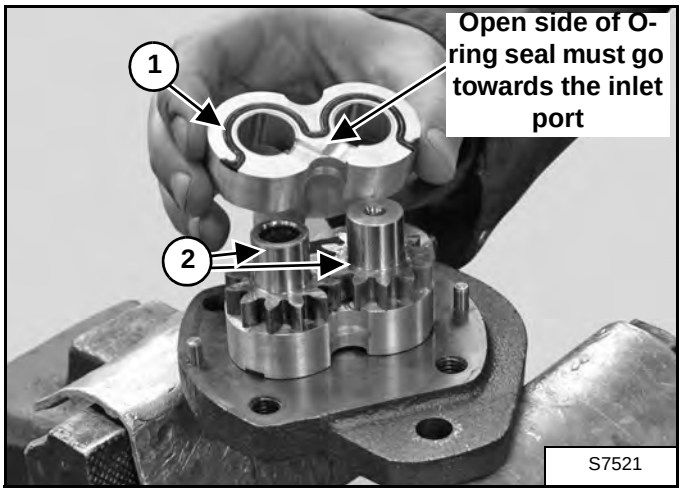
Figure 20-50-18



Tape the splined end (Item 1) **[Figure 20-50-18]** of the drive gear to make sure that the splines will not damage the oil seal during installation.

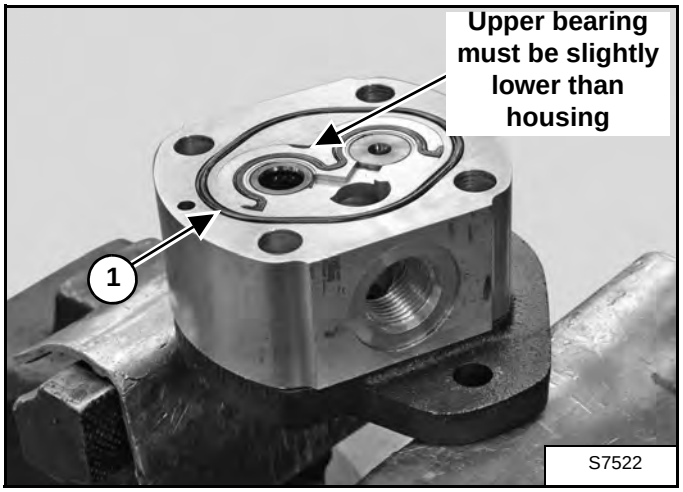
Apply oil to the drive gear and idler gear and to the side faces of the gears. Install the gears into the lower bearing **[Figure 20-50-18]**.

Figure 20-50-19



Install the upper bearing (Item 1), seal side up, on the drive and idler gears (Item 2) **[Figure 20-50-19]**. The open side of the O-ring seal must point toward the inlet port side (marked side) of the pump.

Figure 20-50-20



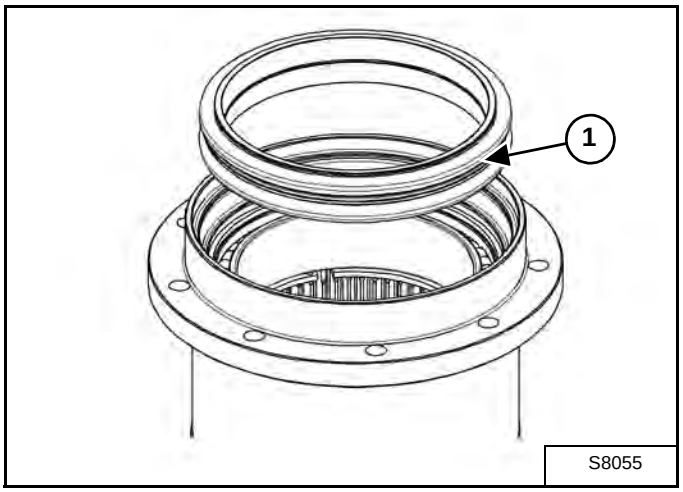
Install O-rings (Item 1) **[Figure 20-50-20]** on each end of the gear housing.

Align the marks made during disassembly on the gear housing and mounting flange (or separating plate). Carefully install the gear housing over the bearings and gears **[Figure 20-50-20]**.

NOTE: The upper bearing must be slightly lower than the gear housing. If the bearing is higher than the housing, disassemble the pump section to verify that the O-ring seal, back-up ring, or O-ring have not moved out of position.

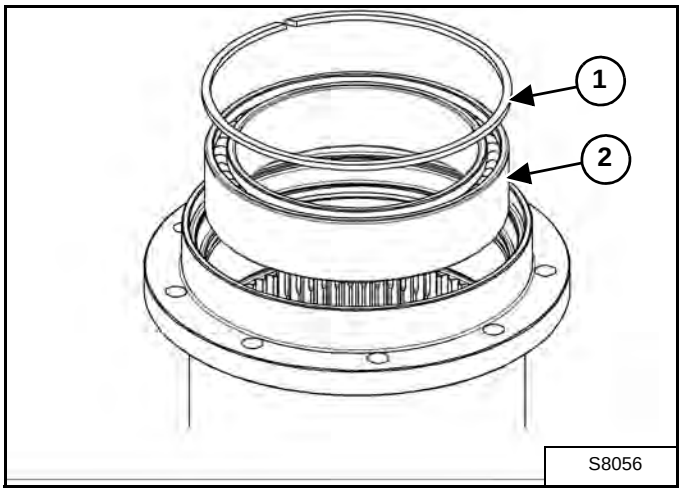
Disassembly (Cont'd)

Figure 20-60-15



Remove the front seal (Item 1) **[Figure 20-60-15]** from the ring gear.

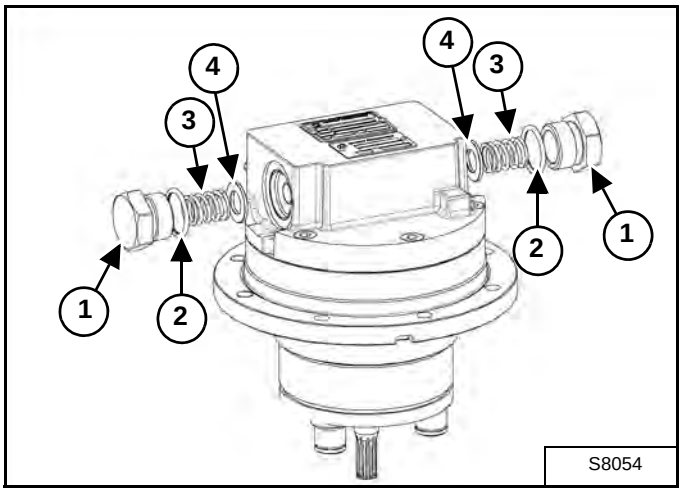
Figure 20-60-16



Remove the retaining ring (Item 1) **[Figure 20-60-16]** from the ring gear.

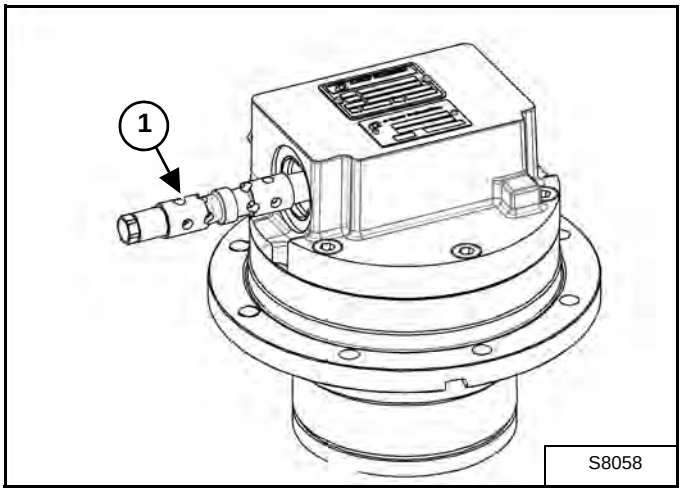
Remove the ball bearing (Item 2) **[Figure 20-60-16]** by pushing from underneath.

Figure 20-60-17



Remove the plugs (Item 1), O-rings (Item 2), springs (Item 3), washers (Item 4) **[Figure 20-60-17]**.

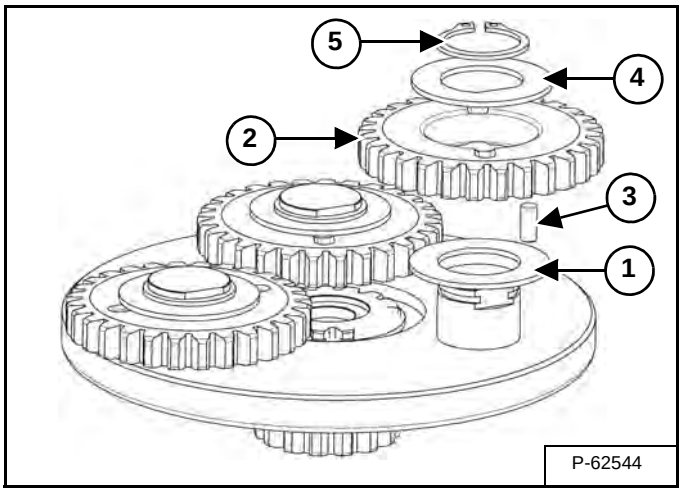
Figure 20-60-18



Remove the counterbalance valve (Item 1) **[Figure 20-60-18]** from the motor cover.

Assembly (Cont'd)

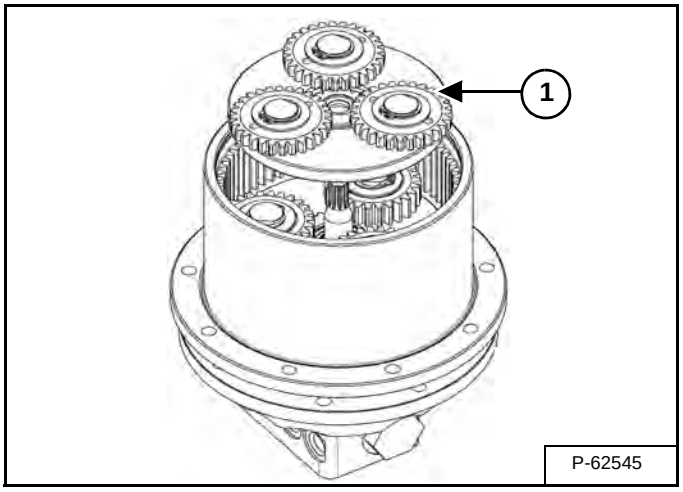
Figure 20-60-52



Install the thrust washers (Item 1), planetary gears (Item 2), needle bearings (Item 3), anti-rotation washers (Item 4) and external snap rings (Item 5) **[Figure 20-60-52]** on the primary stage planetary carrier assembly.

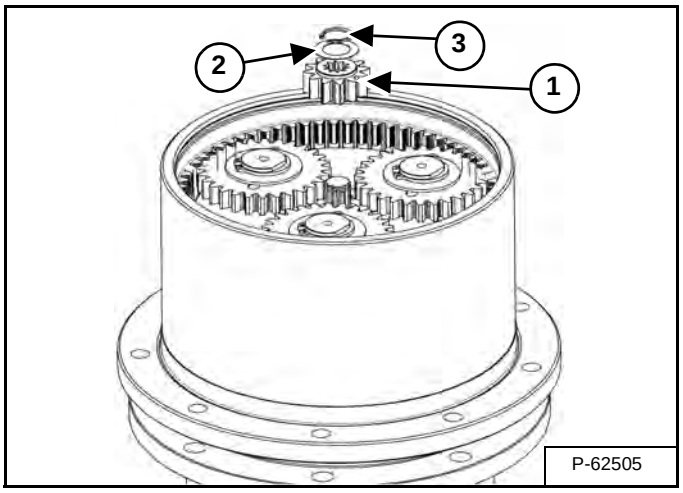
NOTE: Install the snap rings so the opening of the snap ring is towards the outside.

Figure 20-60-53



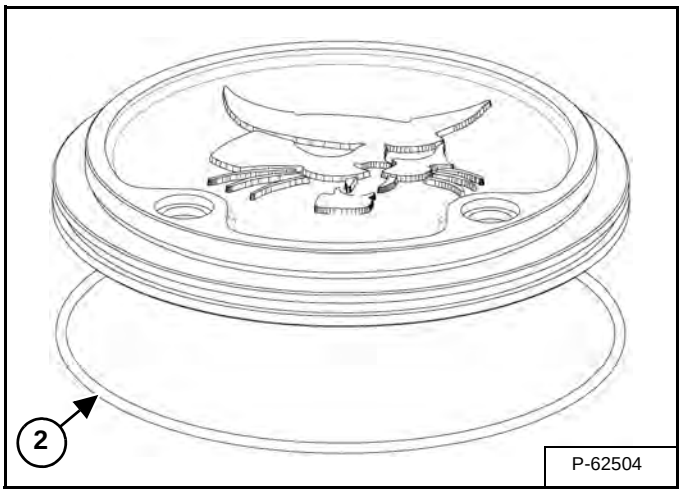
Install the primary planetary assembly (Item 1) **[Figure 20-60-53]**.

Figure 20-60-54



Install the sun gear (Item 1), shims (theoretical shimming 0,5 mm [0.02 in] (Item 2) and retaining ring (Item 3) **[Figure 20-60-54]**.

Figure 20-60-55



Install the O-ring (Item 1) **[Figure 20-60-55]** on the cover.

SWIVEL JOINT (S/N A4BP11468 - A4BP11672)

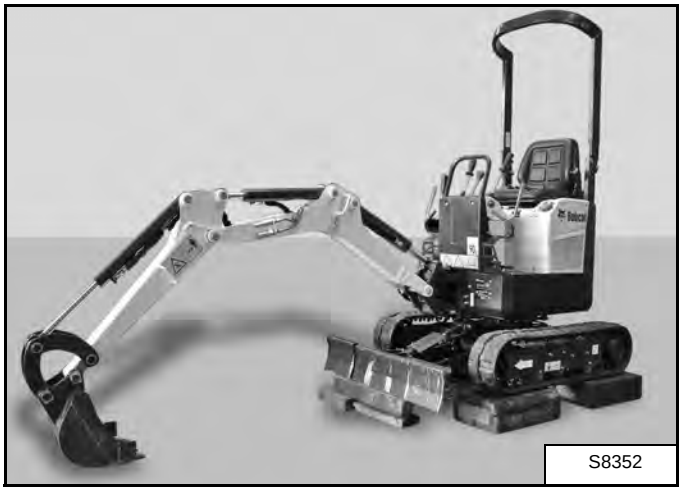
Description

The swivel joint is located under the floor panels and mounted to the upperstructure. The swivel joint directs hydraulic fluid to the undercarriage components while allowing the upperstructure to rotate.

Removal And Installation

Expand the track frame fully.

Figure 20-71-1



Place blocks under the excavator tracks and blade **[Figure 20-71-1]**.

Lower the boom / bucket to the ground.

Relieve hydraulic pressure.

Remove the muffler. (See MUFFLER on Page 60-20-1.)

Remove the floor panels. (See FLOOR PANELS on Page 40-120-1.)

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

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a doctor familiar with this injury is not received immediately.

W-2145-EN-0210

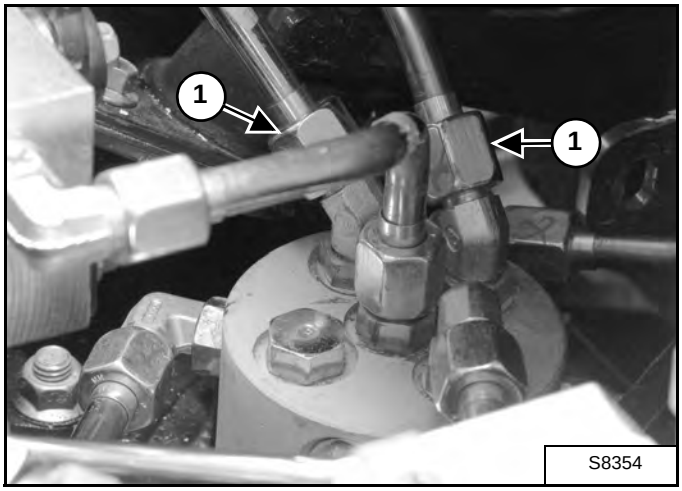
IMPORTANT

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

Mark all hoses and tubelines for ease of assembly.

Figure 20-71-2

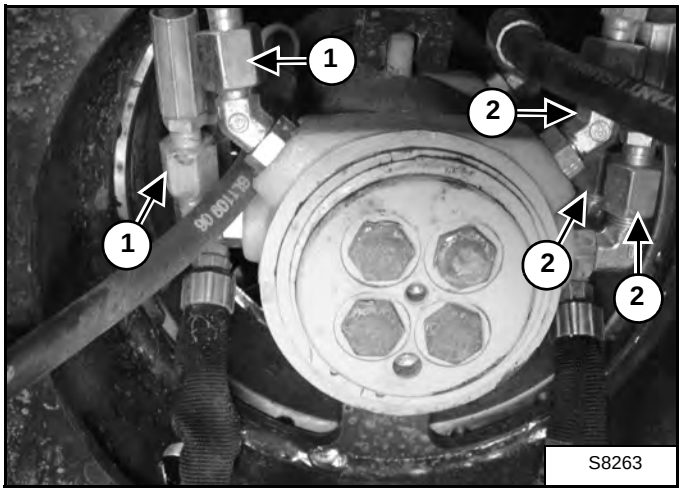


Remove the two tubelines (Item 1) **[Figure 20-71-2]** from the top of the swivel joint.

SWIVEL JOINT (S/N A4BP11117 - A4BP11467) (CONT'D)

Removal And Installation (Cont'd)

Figure 20-72-7

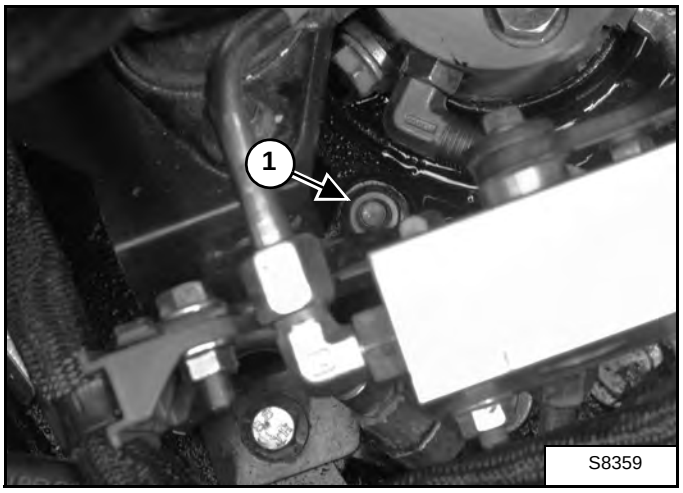


Remove the five hoses (Item 1) **[Figure 20-72-7]** from the left side of the swivel joint.

Remove the five hoses (Item 2) **[Figure 20-72-7]** from the right side of the swivel joint.

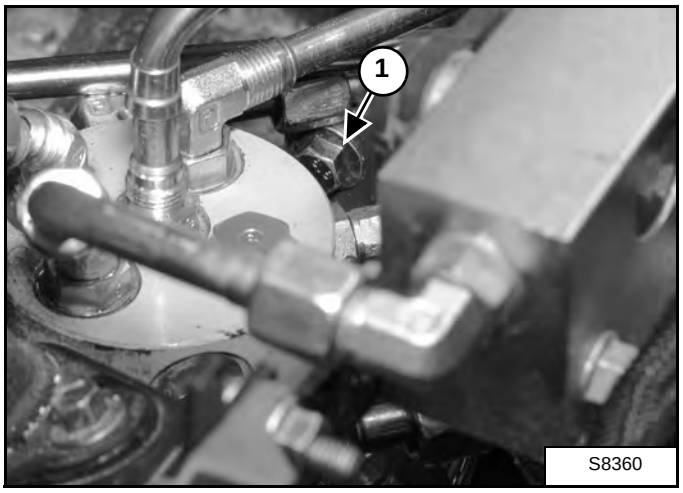
NOTE: Support the swivel joint on the bottom side of the excavator to prevent the swivel joint from falling when the three nuts are being removed.

Figure 20-72-8



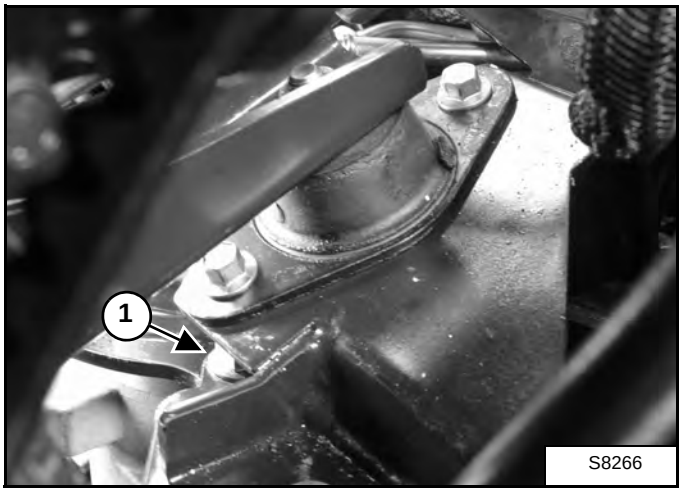
Remove the bolt and nut (Item 1) **[Figure 20-72-8]**.

Figure 20-72-9



Remove the bolt and nut (Item 1) **[Figure 20-72-9]**.

Figure 20-72-10



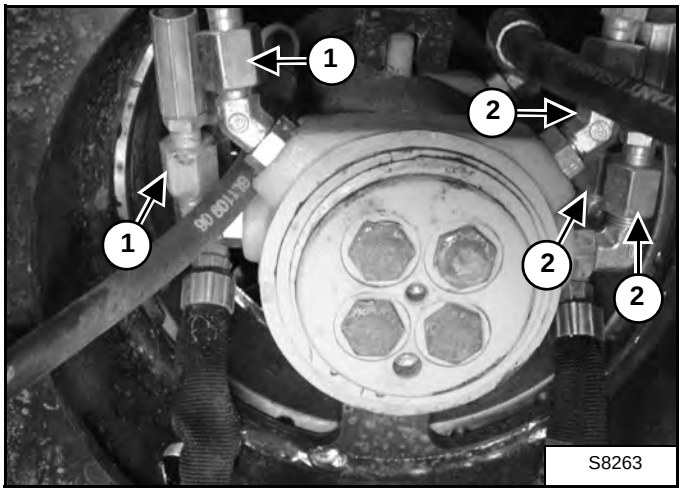
Remove the bolt and nut (Item 1) **[Figure 20-72-10]**.

Slide the swivel joint out through the bottom of the excavator.

SWIVEL JOINT (S/N A4BP11001 - A4BP11117) (CONT'D)

Removal And Installation (Cont'd)

Figure 20-73-7

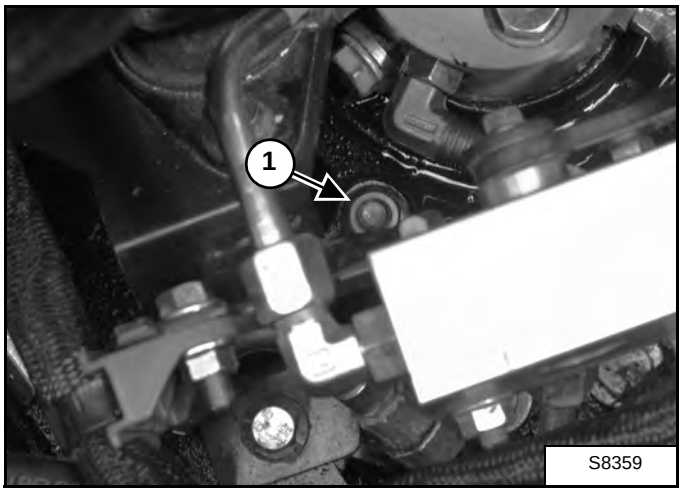


Remove the five hoses (Item 1) **[Figure 20-73-7]** from the left side of the swivel joint.

Remove the five hoses (Item 2) **[Figure 20-73-7]** from the right side of the swivel joint.

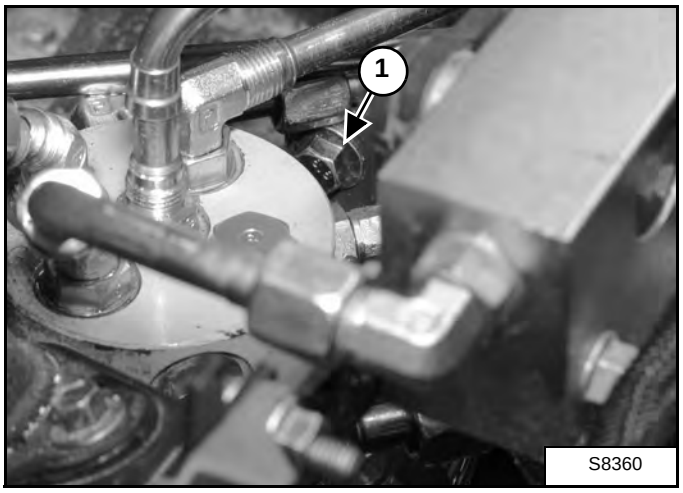
NOTE: Support the swivel joint on the bottom side of the excavator to prevent the swivel joint from falling when the three nuts are being removed.

Figure 20-73-8



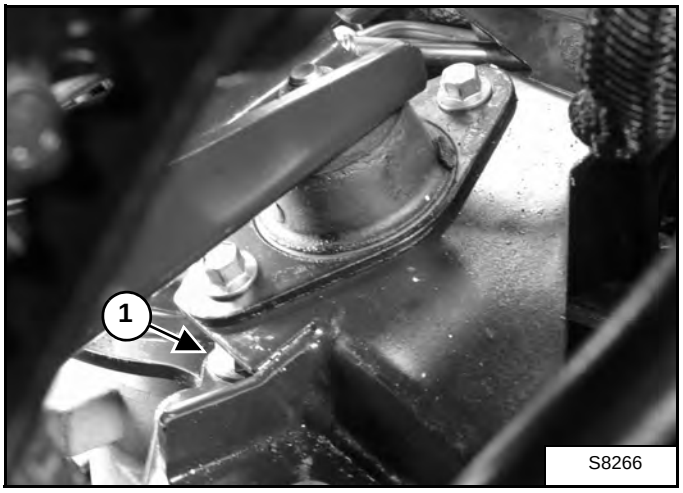
Remove the bolt and nut (Item 1) **[Figure 20-73-8]**.

Figure 20-73-9



Remove the bolt and nut (Item 1) **[Figure 20-73-9]**.

Figure 20-73-10

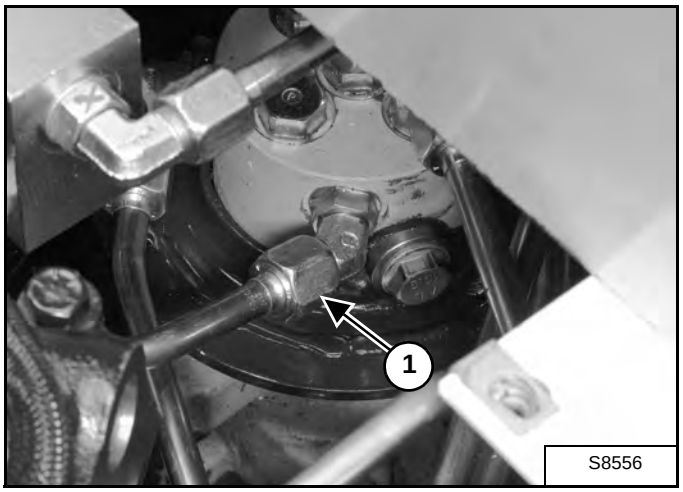


Remove the bolt and nut (Item 1) **[Figure 20-73-10]**.

Slide the swivel joint out through the bottom of the excavator.

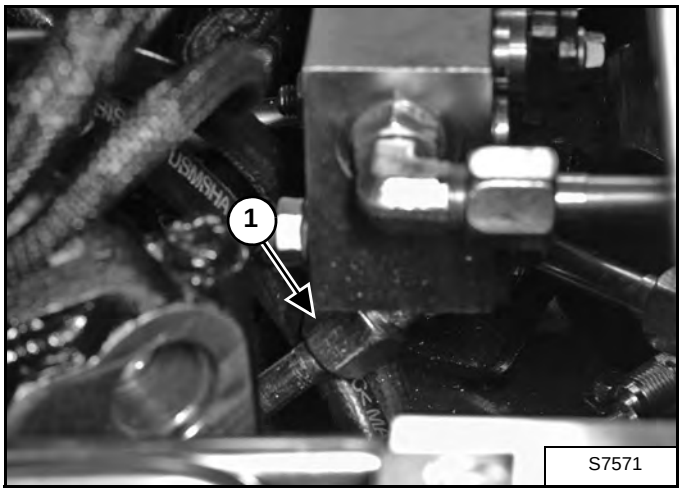
Removal And Installation (Cont'd)

Figure 20-80-8



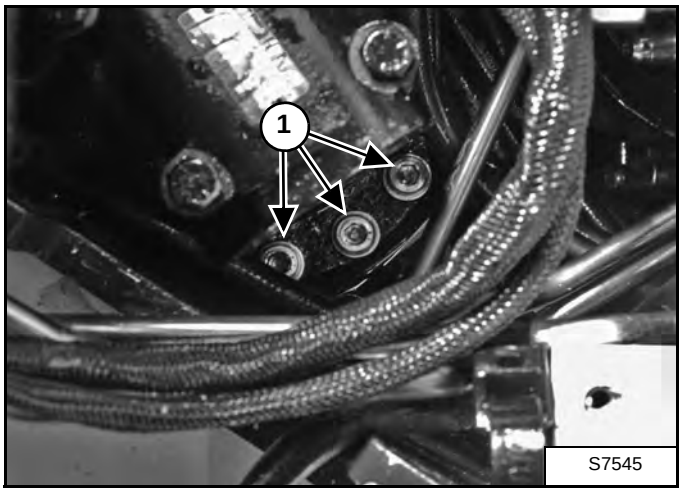
Mark and remove the tubeline (Item 1) **[Figure 20-80-8]**.

Figure 20-80-9



Mark and remove the tubeline (Item 1) **[Figure 20-80-9]** from the track expand valve.

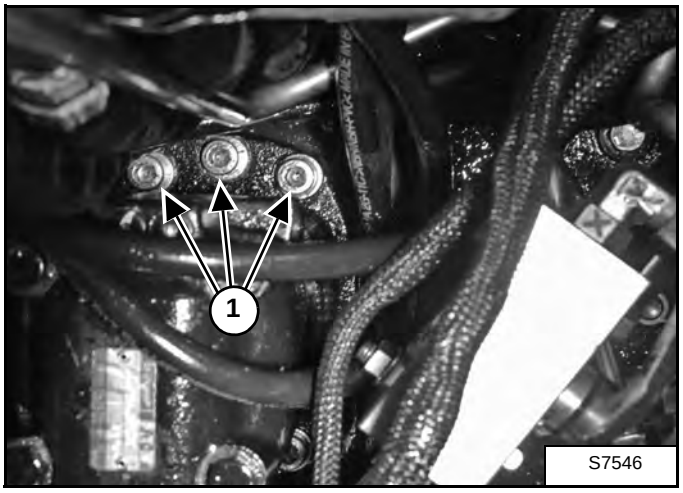
Figure 20-80-10



Remove the three bolts (Item 1) **[Figure 20-80-10]** from the slew motor.

Installation: Tighten the bolts to 71 - 79 N•m (52.5 - 58.5 ft-lb) torque.

Figure 20-80-11



Remove the three bolts (Item 1) **[Figure 20-80-11]** from the slew motor.

Installation: Tighten the bolts to 71 - 79 N•m (52.5 - 58.5 ft-lb) torque.

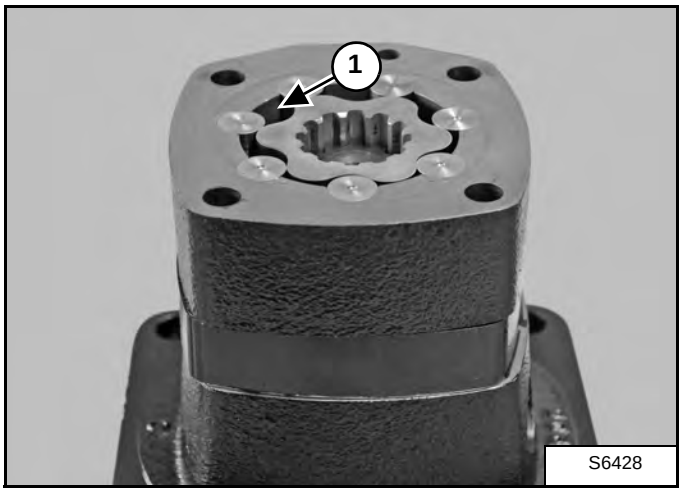
Remove the slew motor from the excavator.

Assembly (Cont'd)

Motor Timing

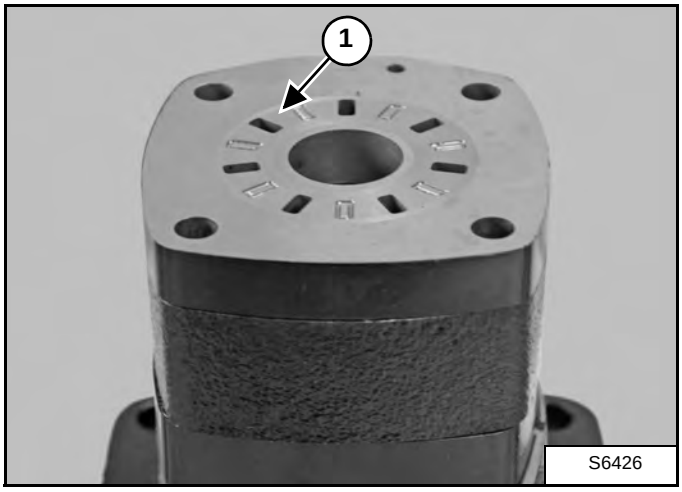
The direction that the output shaft rotates is determined by timing. Time the motor as follows:

Figure 20-80-45



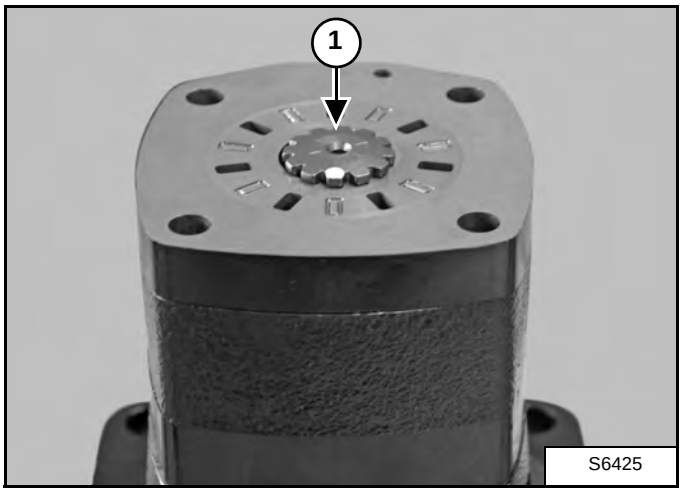
Locate the largest open pocket in the Geroler® (Item 1) **[Figure 20-80-45]**.

Figure 20-80-46



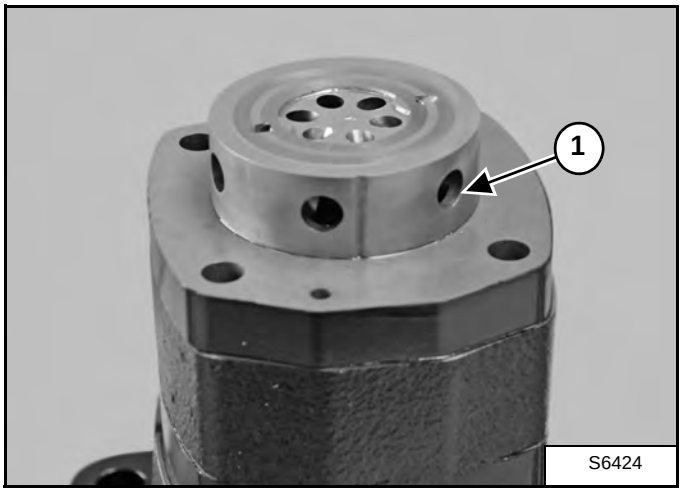
Install the valve plate and locate the open slot (Item 1) **[Figure 20-80-46]** that is over the largest open Geroler® pocket.

Figure 20-80-47



Install the drive (Item 1) **[Figure 20-80-47]**.

Figure 20-80-48



NOTE: Picture position has changed 180°.

Align one of the side openings (Item 1) **[Figure 20-80-48]** in the valve with the valve plate slot that is over the largest open Geroler® pocket.

Engage the valve with the valve drive by rotating it 15° clockwise until the spline teeth mesh.

NOTE: If the valve is turned clockwise the motor will rotate in the opposite direction.

BLADE / TRACK EXPAND VALVE

Description

The blade / track expand valve diverts hydraulic fluid to either the blade or track expansion function with the control handle situated in the middle of the floor panels.

The blade / track expand valve is located directly underneath the floor panels in the middle of the excavator.

Block Removal And Installation

Lower the boom / bucket and blade to the ground.

With the engine off, turn the start key to the ON position and move blade lever to relieve hydraulic pressure.

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

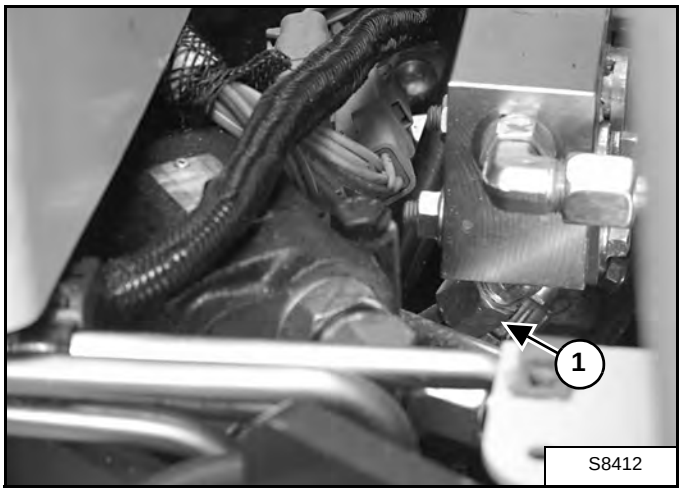
Remove the floor panels. (See FLOOR PANELS on Page 40-120-1.)

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a doctor familiar with this injury is not received immediately.

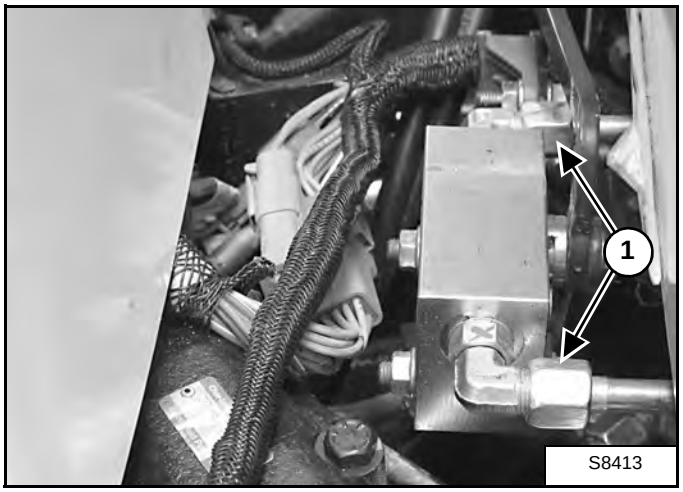
W-2145-EN-0210

Figure 20-110-1



Disconnect the tubeline (Item 1) **[Figure 20-110-1]** from the underside of the valve.

Figure 20-110-2



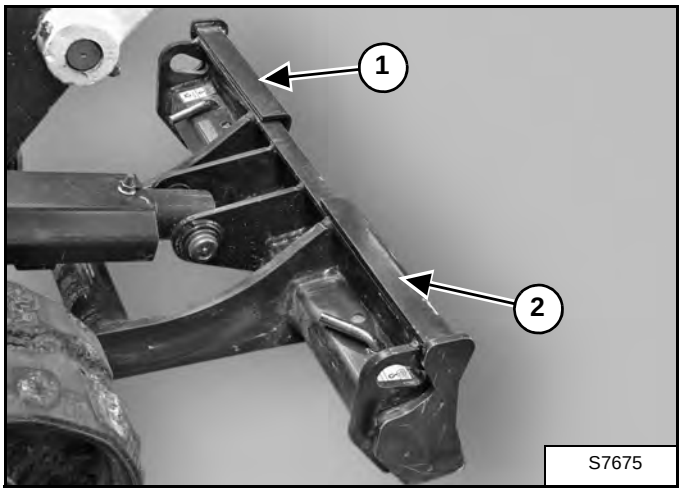
Disconnect the tubelines (Item 1) **[Figure 20-110-2]**.

BLADE

Description

The blade extensions are used to match the track width to the blade width. Retract the blade extensions when transporting the excavator or when a narrow operating width is needed. Under normal operating conditions, the blade width should match the track width.

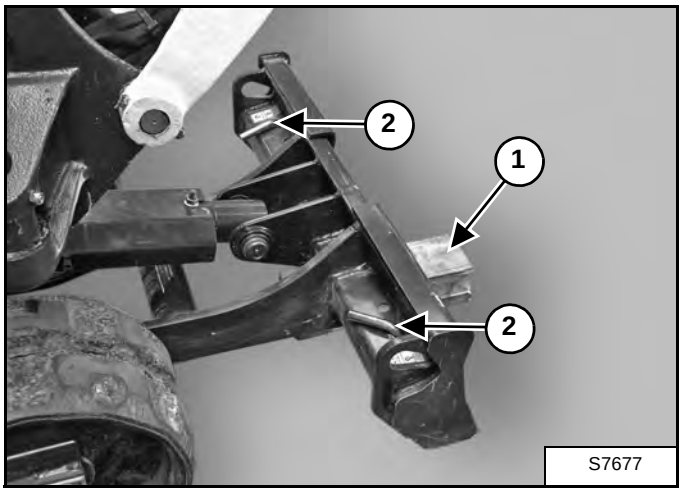
Figure 30-10-1



The blade extensions (Items 1 and 2) **[Figure 30-10-1]** are located on the blade.

Extension Removal And Installation

Figure 30-10-2



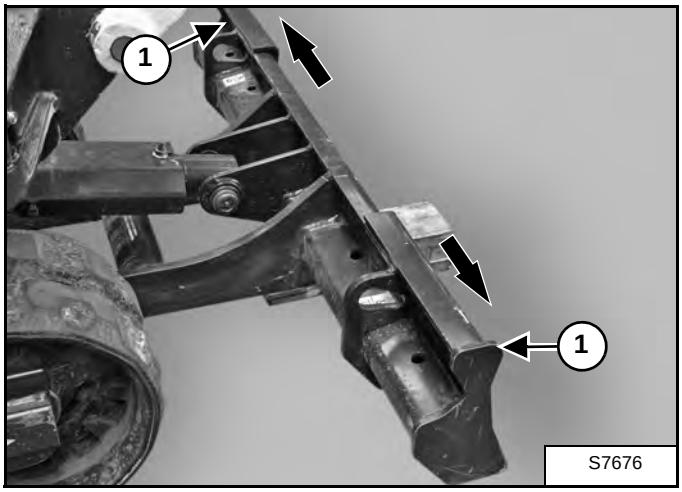
Put a block (Item 1) **[Figure 30-10-2]** under the blade.

Fully lower the blade to the block.

Stop the engine.

Remove the pin (Item 2) **[Figure 30-10-2]** from the blade extensions.

Figure 30-10-3

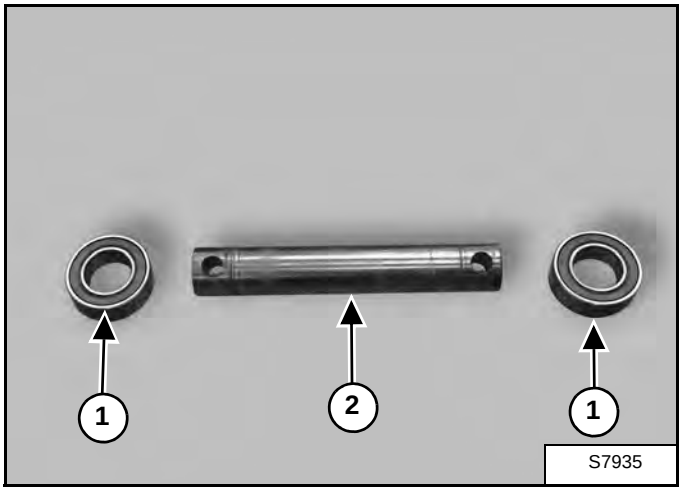


Remove the blade extensions (Item 1) **[Figure 30-10-3]** from the blade.

Idler Assembly

Clean all parts in solvent and dry with compressed air.

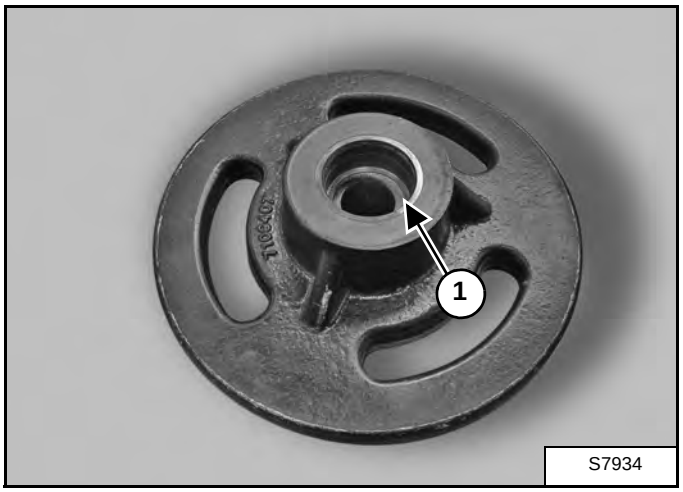
Figure 30-20-20



Inspect the bearings (Item 1) and shaft (Item 2) **[Figure 30-20-20]** for wear or damage. Replace any worn or damaged parts.

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

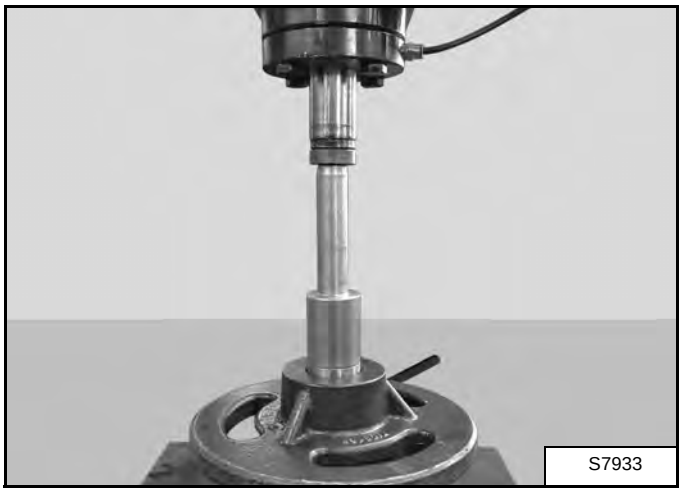
Figure 30-20-21



Remove all paint and corrosion from the bearing and seal surface (Item 1) **[Figure 30-20-21]** on both sides of the idler. If necessary, replace the track idler.

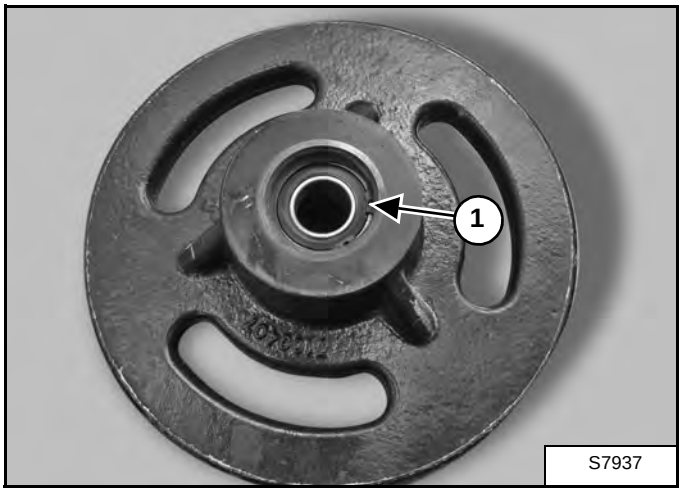
NOTE: Left-Hand Side Idler and Right-Hand Side Idler are different. For ordering, a different P/N exists for each side.

Figure 30-20-22



Using a press or driving tool, install the bearing in the idler **[Figure 30-20-22]** on both sides of the idler.

Figure 30-20-23



Install the snap ring (Item 1) **[Figure 30-20-23]** on both sides of the idler.

Track Damage Identification (Cont'd)

Lug Abrasion

Damage:

Figure 30-30-16

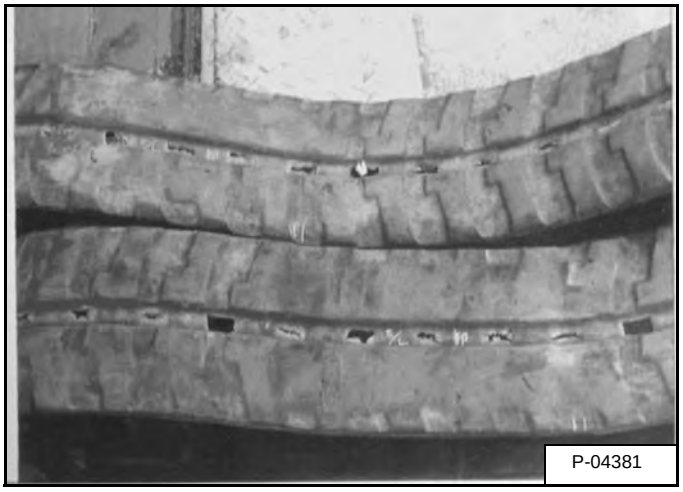
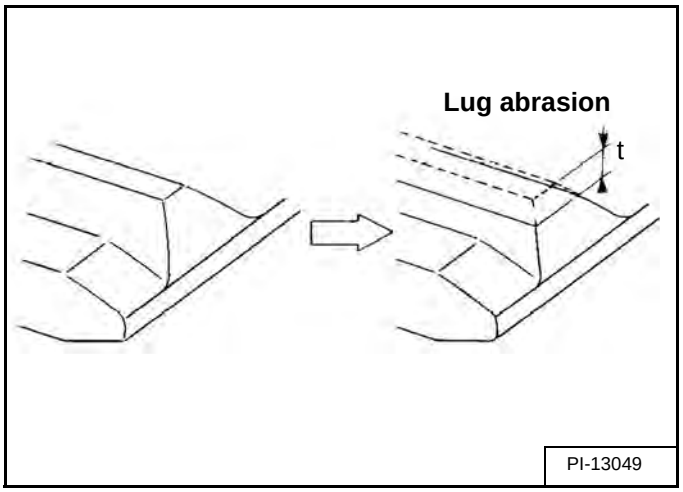


Figure 30-30-17



As operation time increases, the lug side undergoes abrasion **[Figure 30-30-16]** and **[Figure 30-30-17]**.

Replacement:

No replacement is required.

Causes Of The Damage:

Lug abrasion will occur as operation time increases. Even as lug abrasion increases, the rubber track can be used. However, as the traction performance deteriorates, it is highly recommended to replace the abraded tracks with new ones when the lug height becomes less than 5 mm (0.196 in).

Prevention:

In order to prevent the rubber track from abnormal or premature abrasion, the following operating conditions should be avoided:

Making quick and repeated turns on concrete and asphalt roads.

Driving up and down hilly paths with slippage.

Making frequent turns on paths covered with rocks and wood.

UPPERSTRUCTURE

Description

The upperstructure includes all the components in or attached to the frame and connects to the slew bearing. The slew bearing divides the upperstructure from the undercarriage, which includes the track frame components.

Removal

Fully extend the cylinders of the bucket and arm. Fully retract the cylinder of the boom.

Lower the blade to the ground.

Remove the battery. (See Removal And Installation on Page 50-20-4.)

Remove the TOPS. (See Removal And Installation on Page 40-20-1.)

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

Remove the seat. (See Removal And Installation on Page 40-30-1.)

Remove the floor panels. (See FLOOR PANELS on Page 40-120-1.)

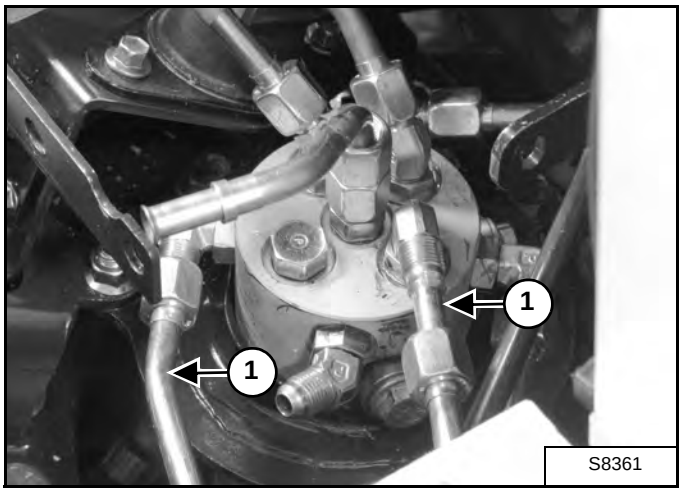
Remove the slew motor. (See Removal And Installation on Page 20-80-1.)

Remove the track expand valve. (See Block Removal And Installation on Page 20-111-1.)

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

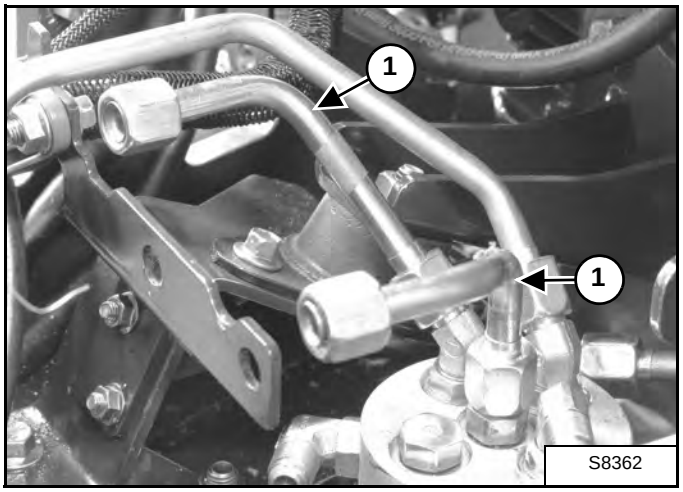
Remove the lower right hand side cover. (See Lower Right Side Cover Removal And Installation on Page 40-210-3.)

Figure 40-10-1



Remove the two tubelines (Item 1) **[Figure 40-10-1]** from the swivel joint.

Figure 40-10-2

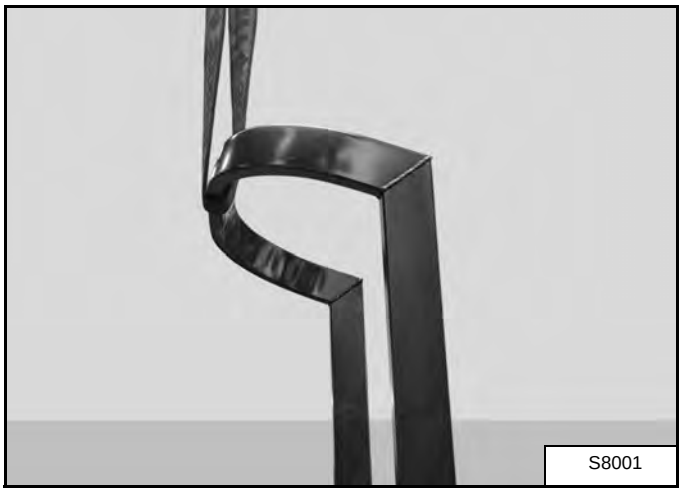


Remove the two tubelines (Item 1) **[Figure 40-10-2]** from the swivel joint.

TOPS

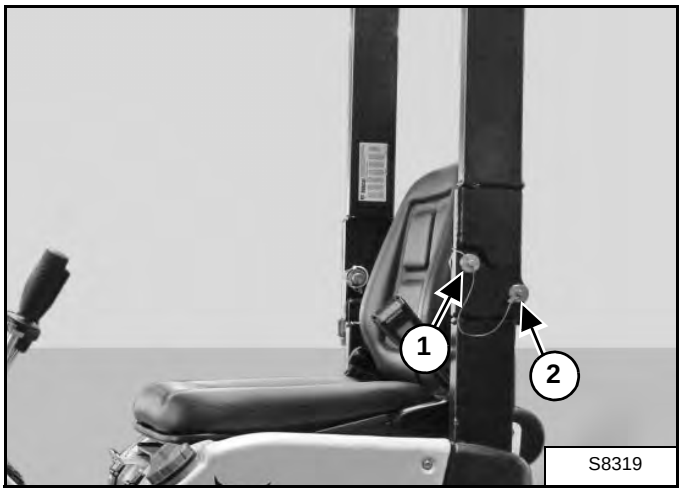
Removal And Installation

Figure 40-20-1



Put a strap around the TOPS to support while removing **[Figure 40-20-1]**.

Figure 40-20-2



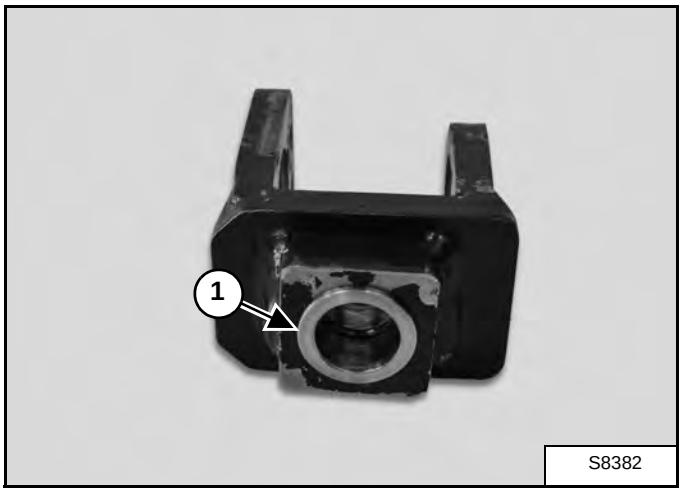
Remove the pin (Item 1), bolt and nut (Item 2) **[Figure 40-20-2]** from both sides of the TOPS.

Installation: Tighten the bolts to 215 N•m (159 ft-lb) torque.

Remove the TOPS from the excavator.

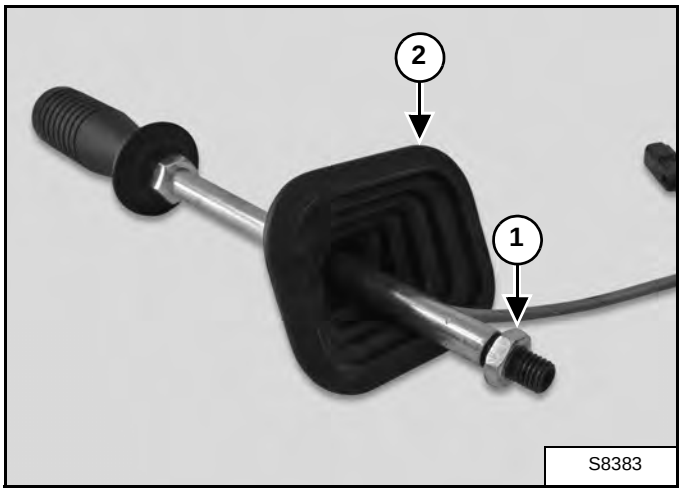
Disassembly And Assembly (Cont'd)

Figure 40-50-8



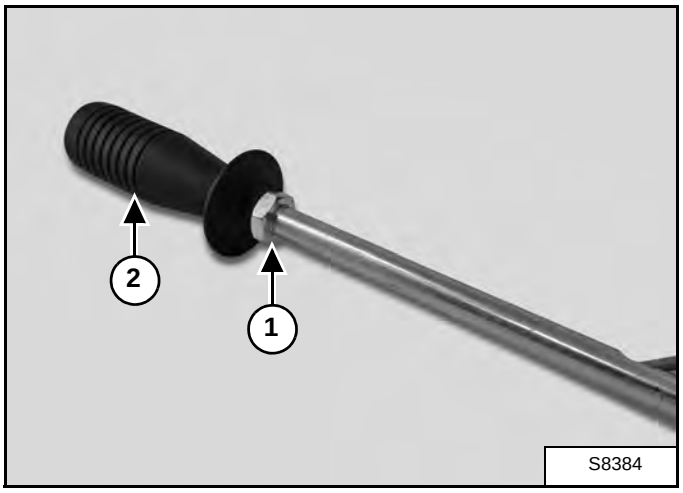
Remove the two bushings (Item 1) **[Figure 40-50-8]** from the bracket.

Figure 40-50-9



Remove the nut (Item 1) and dust boot (Item 2) **[Figure 40-50-9]** from the rod.

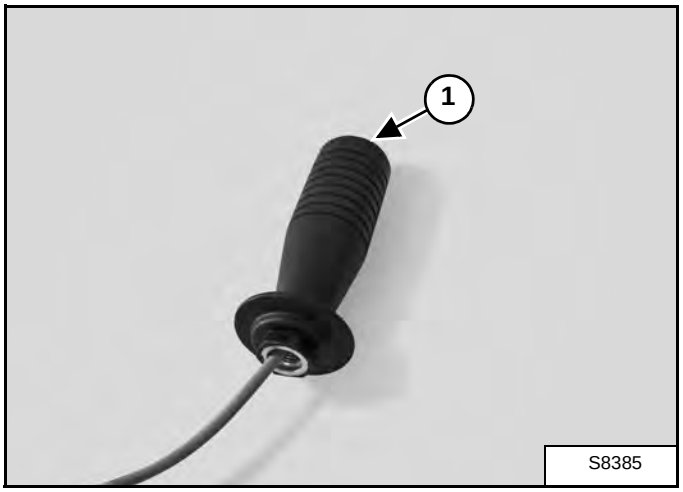
Figure 40-50-10



Loosen the nut (Item 1) **[Figure 40-50-10]**.

Remove the handle (Item 2) and nut (Item 1) **[Figure 40-50-10]** from the rod.

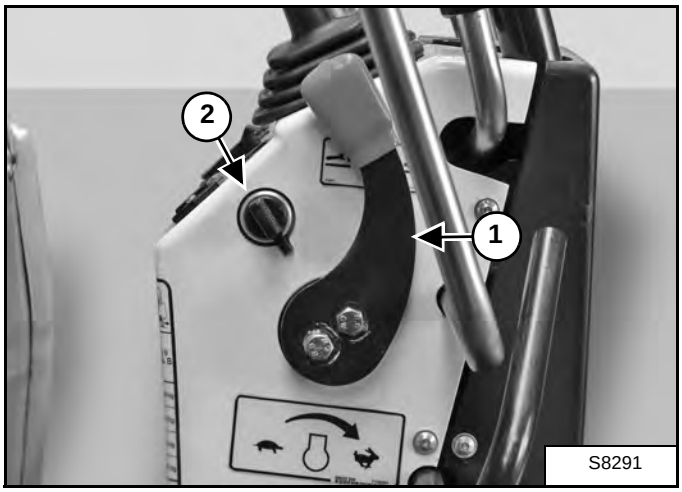
Figure 40-50-11



Remove the end cap (Item 1) **[Figure 40-50-11]** from the handle.

Cable Installation (Cont'd)

Figure 40-60-22



Check if throttle lever (Item 1) does not interfere with space in front of 12V socket (Item 2) **[Figure 40-60-22]**.

Figure 40-60-23

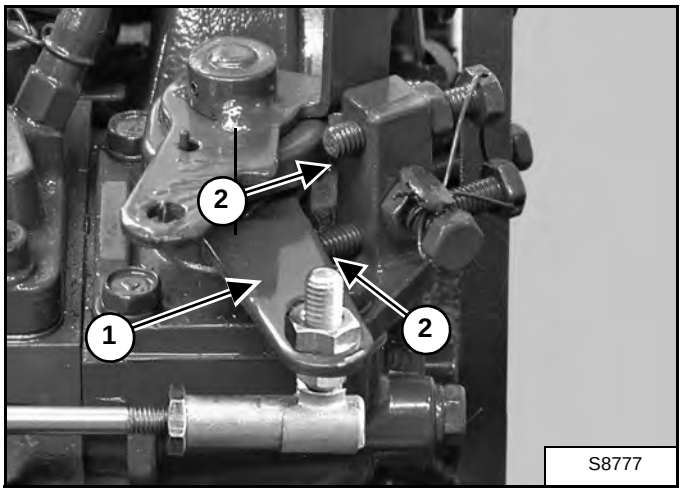
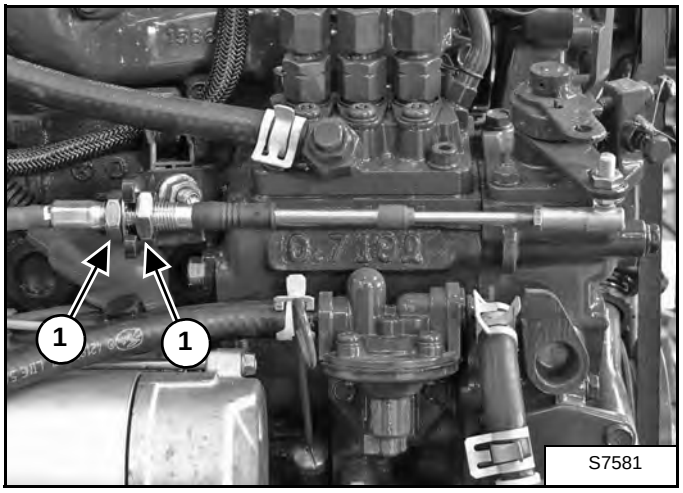


Figure 40-60-24



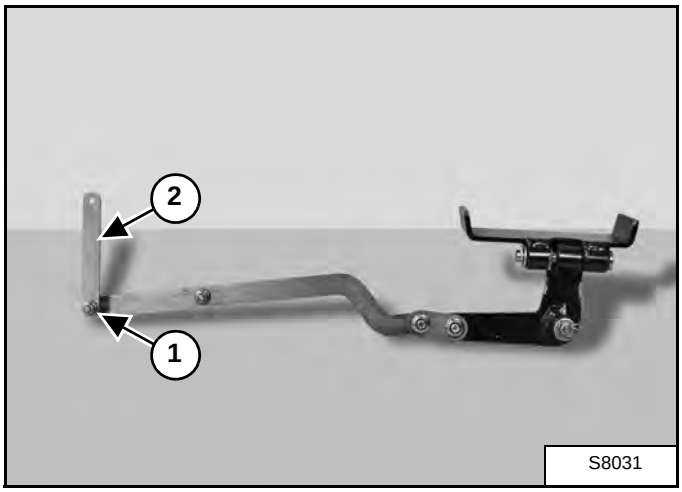
Move throttle lever (Item 1) **[Figure 40-60-22]** and check if injection pump control lever (Item 1) reaches both end positions (Item 2) **[Figure 40-60-23]**.

If not, set the correct end position of the throttle lever by using the nuts (Item 1) **[Figure 40-60-24]**.

When correct setting is obtained fully tighten the nuts (Item 1) **[Figure 40-60-24]**.

Control Linkage Disassembly And Assembly

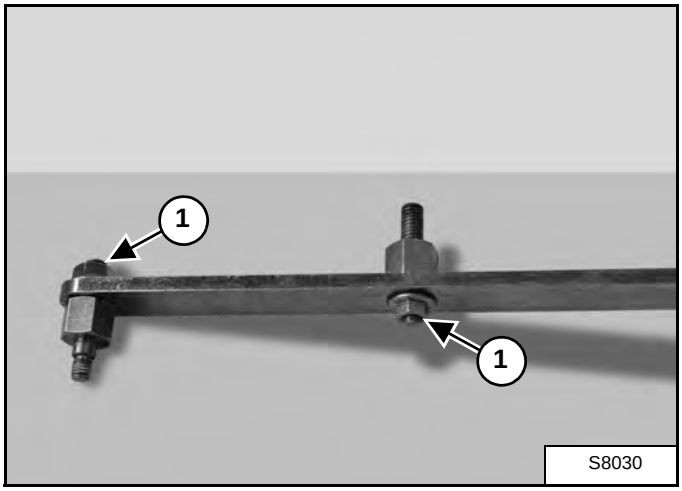
Figure 40-90-6



Remove the nut (Item 1) and linkage (Item 2) **[Figure 40-90-6]**.

Installation: Tighten the nut to 5,5 N•m (48.68 in-lb) torque.

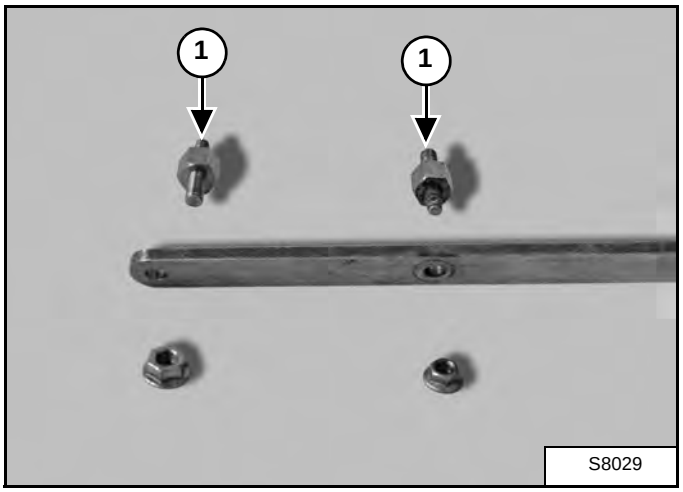
Figure 40-90-7



Remove the two nuts (Item 1) **[Figure 40-90-7]**.

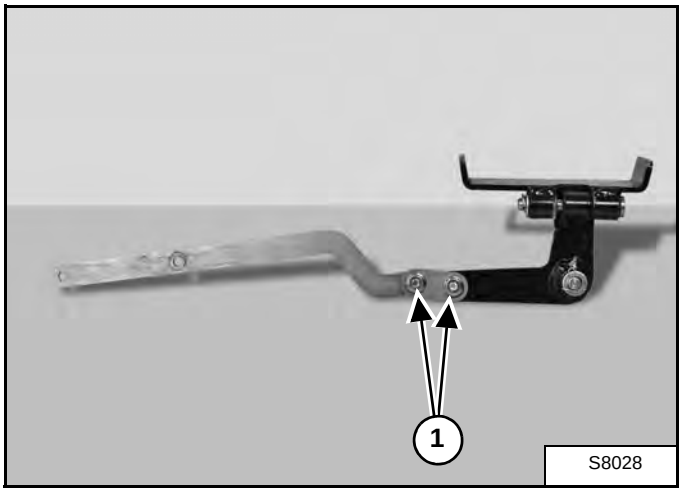
Installation: Tighten the nuts to 5,5 N•m (48.68 in-lb) torque.

Figure 40-90-8



Remove the two pivot pins (Item 1) **[Figure 40-90-8]**.

Figure 40-90-9

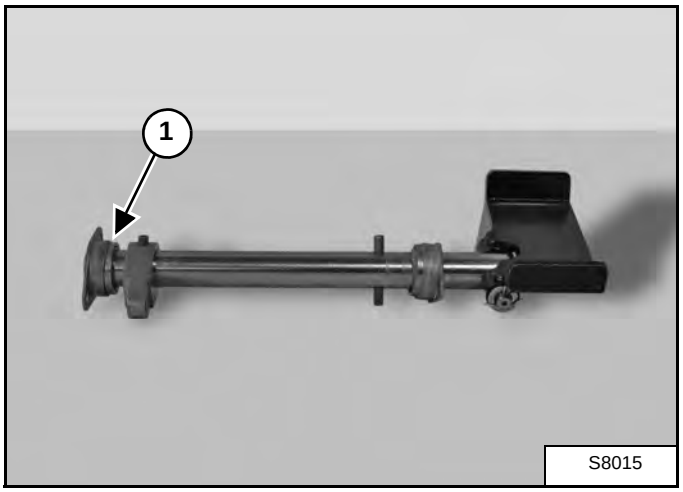


Remove the nut (Item 1) **[Figure 40-90-9]**.

Installation: Tighten the nut to 5,5 N•m (48.68 in-lb) torque.

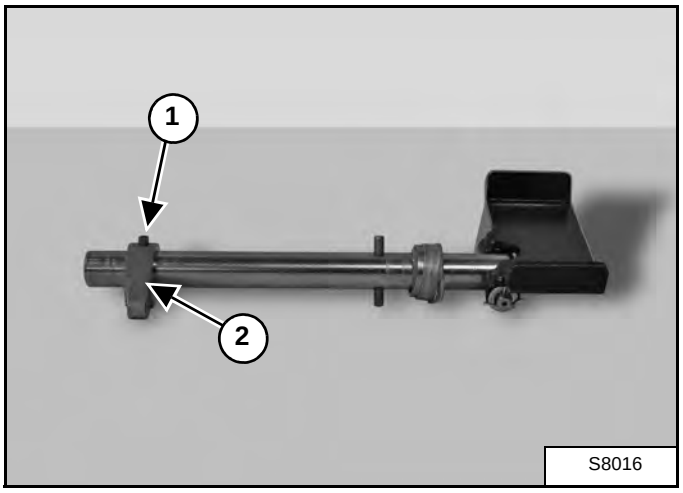
Control Linkage Disassembly And Assembly

Figure 40-110-8



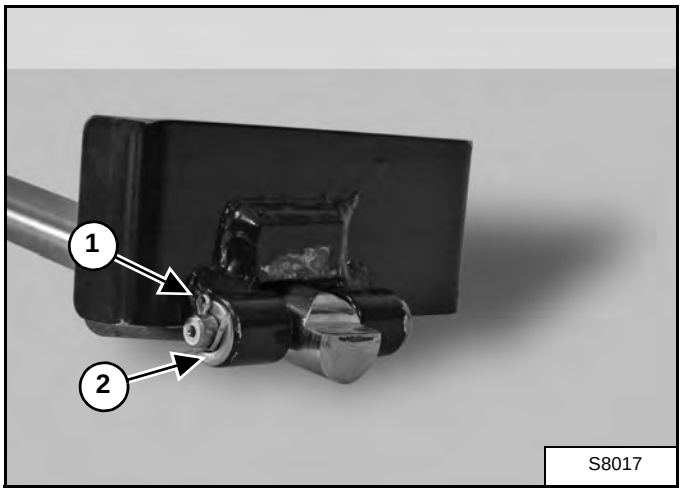
Remove the bearing (Item 1) **[Figure 40-110-8]** from the shaft.

Figure 40-110-9



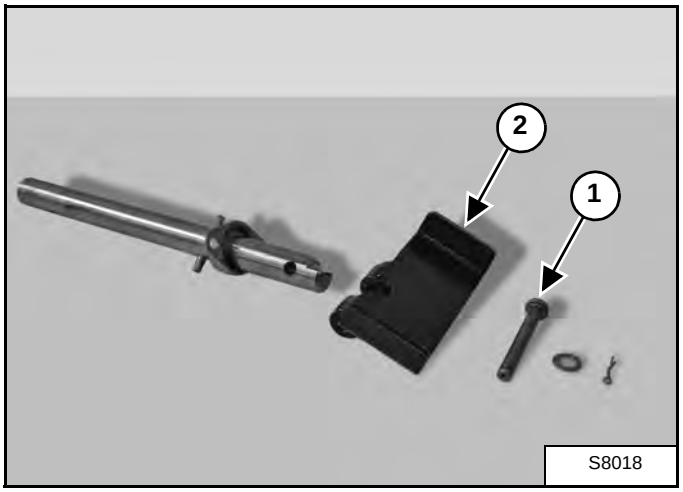
Remove the pin (Item 1) and bellcrank (Item 2) **[Figure 40-110-9]** from the shaft.

Figure 40-110-10



Remove the cotter pin (Item 1) and washer (Item 2) **[Figure 40-110-10]** from the shaft.

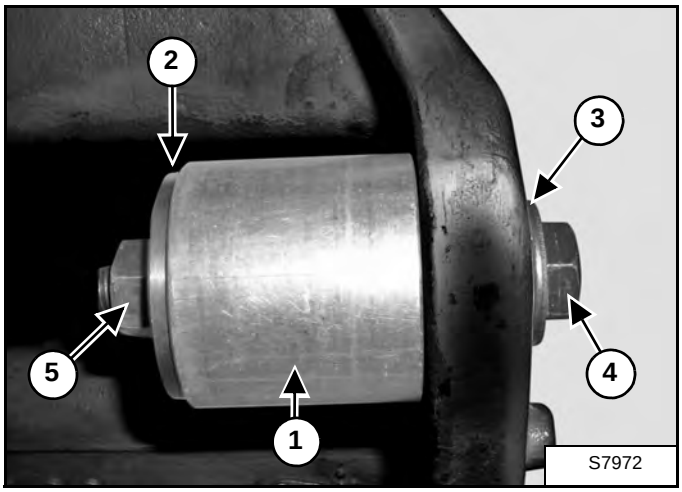
Figure 40-110-11



Remove the pin (Item 1) and pedal (Item 2) **[Figure 40-110-11]**.

Bushing Removal (Cont'd)

Figure 40-150-6



Install the spacer (Item 1) and washer (Item 2) **[Figure 40-150-6]** over the flanged end of the bushing.

The spacer (Item 1) **[Figure 40-150-6]** must be centered over the bushing to avoid contact between the bushing and the spacer during removal.

Install the washer (Item 3) **[Figure 40-150-6]** on the opposite end of the bushing. This washer must be centered on the bushing and must not contact the casting.

Install the bolt (Item 4) and the nut (Item 5) **[Figure 40-150-6]** through the washers and spacer.

Tighten the bolt and nut to remove the bushing from the casting.

Install the bushing so the flanged edge of bushing is seated in the casting. The flanged edge of the bushings must be installed from the top and bottom of the upperstructure casting.

Bushing Installation

Apply a film of grease to the outer diameter of the bushing and the inner diameter of the casting.

Center the bushing in the casting hole.

NOTE: Make sure the bushing is centered into the casting hole and is started in the hole evenly and square.

Put the washer (Item 3) over the flanged end of the bushing. Put the washer (Item 2) **[Figure 40-150-6]** over the bushing hole casting, center the washer over the bushing hole.

Install the bolt (Item 4) through the washers and the bushing and install the nut (Item 5) **[Figure 40-150-6]**.

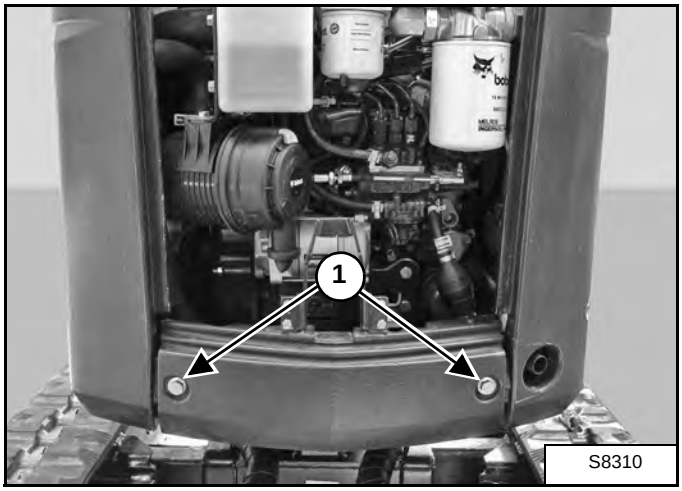
Tighten the bolt and nut until the bushing is seated in the casting.

COUNTERWEIGHTS

Rear Counterweight Removal And Installation

Open the tailgate.

Figure 40-200-1



Remove the nuts and bolts (Item 1) **[Figure 40-200-1]** from the rear counterweight.

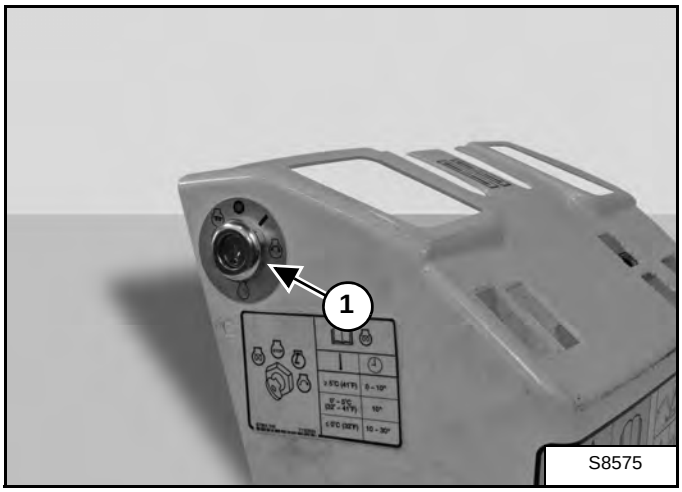
Installation: Tighten the bolts and nuts to 105 - 115 N•m (78 - 85 ft-lb) torque.

Remove the rear counterweight.

NOTE: Approximate weight of the rear counterweight is 20 kg (44 lb).

Disassembly And Assembly (Cont'd)

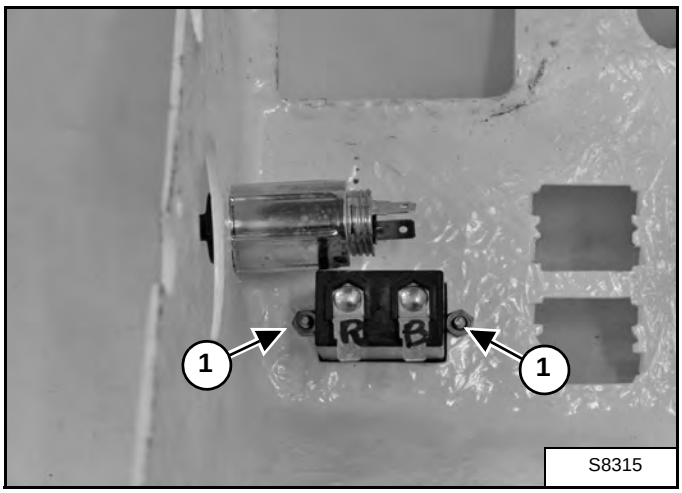
Figure 40-220-8



Remove the nut (Item 1) **[Figure 40-220-8]** from the key switch.

Remove the key switch from the instrument panel.

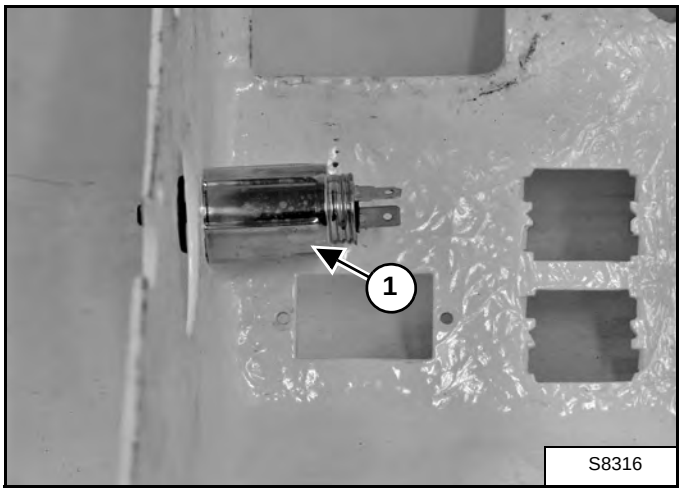
Figure 40-220-9



Remove the two nuts (Item 1) **[Figure 40-220-9]** from the hourmeter.

Remove the hourmeter from the instrument panel.

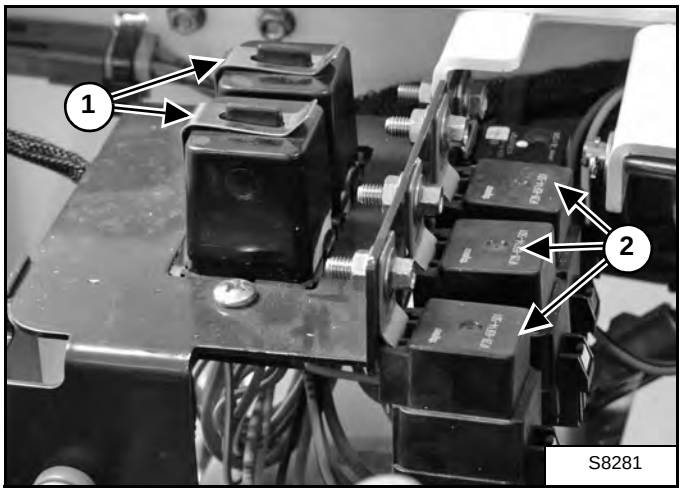
Figure 40-220-10



Remove the accessory socket (Item 1) **[Figure 40-220-10]** from the instrument panel.

Description

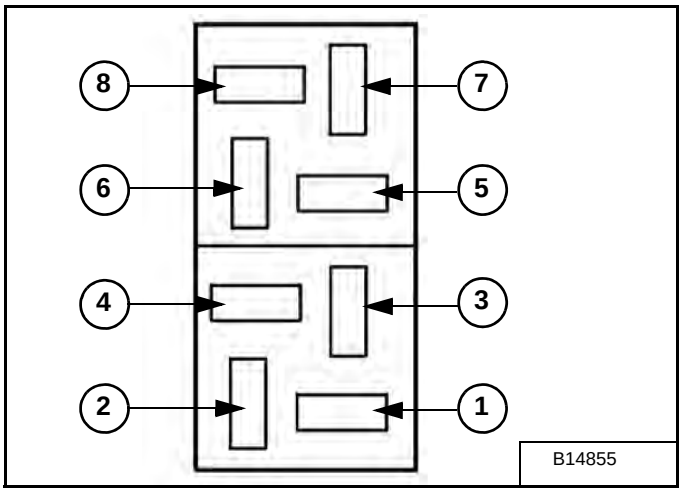
Figure 50-10-1



The excavator has a 12 volt, negative ground electrical system. The electrical system is controlled by fuses and relays located on top of the engine compartment (items 1 and 2) **[Figure 50-10-1]** The fuses will protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

Fuse And Relay Location / Identification

Figure 50-10-2



1. **Power Socket** - 15 A
2. **Ignition** - 10 A (SW)
3. **Timer** - 25 A (UNSW)
4. **Beacon** - 10 A
5. **Switch Power** - 10 A
6. **Valves horn** - 10 A
7. **Switched timer** - 10 A
8. **Light** - 10 A

Always replace fuses using the same type and capacity.

The three electrical relays (Item 2) **[Figure 50-10-1]** are located in the engine compartment below the tailgate to the right. The three relays control the starter, glow plugs and switched power circuits.

Alternator Regulator Test

Disconnect the fuel stop solenoid connector.

Turn the lights on (if equipped) and crank the engine for 30 seconds to discharge the battery.

Connect the fuel stop solenoid connector.

Start the engine and run at full rpm.

The ammeter reading should be around 35 amp and slowly decrease with alternator output.

If ammeter reading is low or does not decrease with time, replace the alternator's regulator.

Disconnect the negative (-) cable from the battery.

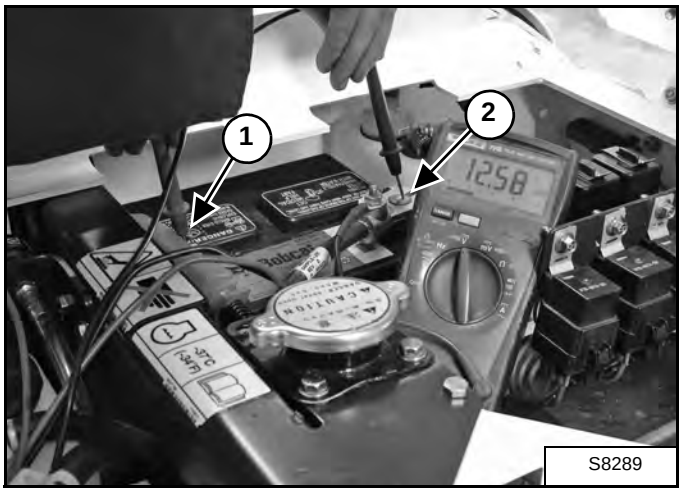
Reconnect the alternator wires.

Reconnect the negative (-) cable from the battery.

NOTE: The alternator regulator test can also be run using a voltmeter.

Alternator Regulator Test With Voltmeter

Figure 50-30-5



Connect the positive (+) voltmeter lead to the positive (+) battery terminal (Item 1) **[Figure 50-30-5]**.

Connect the negative (-) voltmeter lead to the negative (-) battery terminal (Item 2) **[Figure 50-30-5]**.

Start the engine and run at full rpm.

The voltmeter should read between 13,9 and 14,7 volt.

If the voltmeter reading is not within this range, replace the alternator's regulator.

IMPORTANT

Damage to the alternator can occur if:

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

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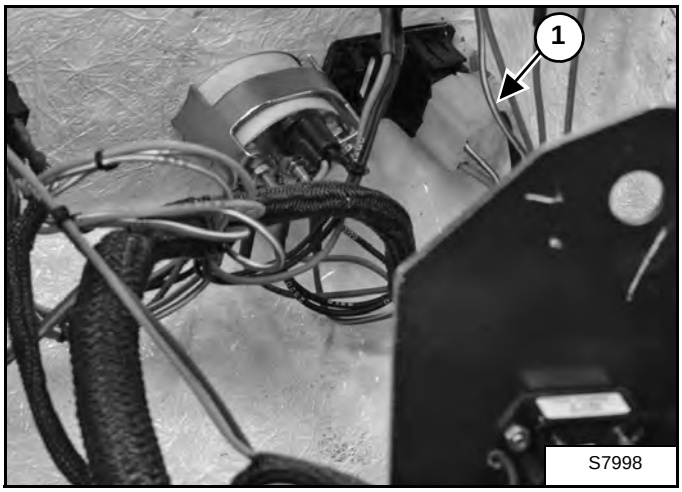
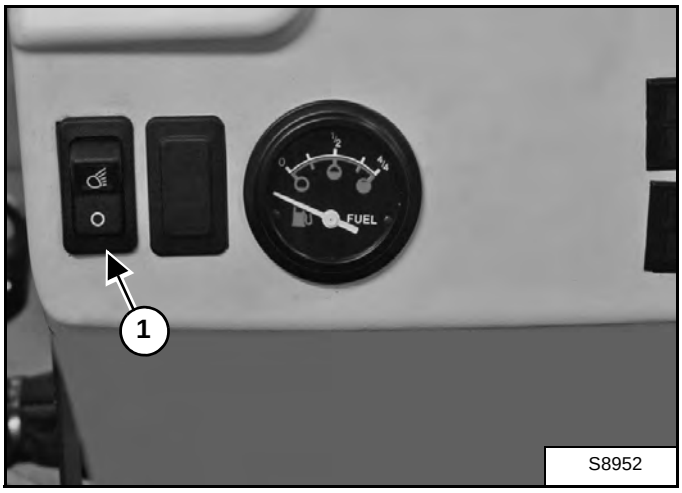
Light Switch Removal And Installation (Cont'd)

Figure 50-50-9



Pull back the instrument panel and disconnect the light switch connector (Item 1) **[Figure 50-50-9]**.

Figure 50-50-10



Remove the light switch (Item 1) **[Figure 50-50-10]** from the instrument panel.

Specifications (Cont'd)

Thermostat

Opening Temperature	
Starting	70 - 73°C (157 - 163°F)
Full Open	85°C (185°F)

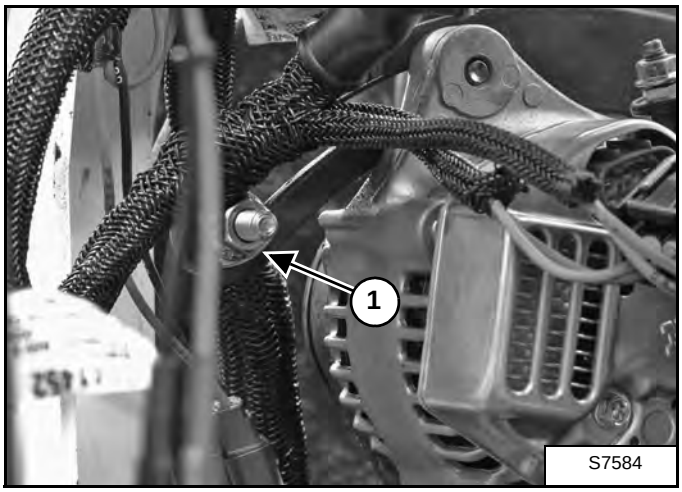
Engine Bolt Torque

	N•m	ft-lb
Camshaft Retainer Plate Bolts	18 - 21	14 - 15
* Connecting Rod Bolts	27 - 30	20 - 22
* Crankshaft Bolt	98 - 108	72 - 80
* Cylinder Head Bolts	38 - 42	28 - 31
* Flywheel Bolts	53,9 - 58,8	39.8 - 43.4
Fuel Camshaft Retainer Bolts	6,8 - 8,1	5 - 6
Fuel Injection Tubeline Fittings	25 - 34	18 - 25
Glow Plugs	8 - 15	6 - 11
* Idle Gear Shaft Bolt	10 - 11	7 - 8
Injection Nozzle	49 - 69	36 - 51
Injection Pump Mounting Nuts	24 - 27	18 - 20
* Main Bearing Bolts	27 - 30	20 - 22
* Main Bearing Case Bolts	13 - 16	9 - 12
Oil Switch	15 - 20	11 - 15
Rear Bearing Case Cover Bolts	10 - 11	7 - 8

* Lightly Oiled Threads

Removal And Installation (Cont'd)

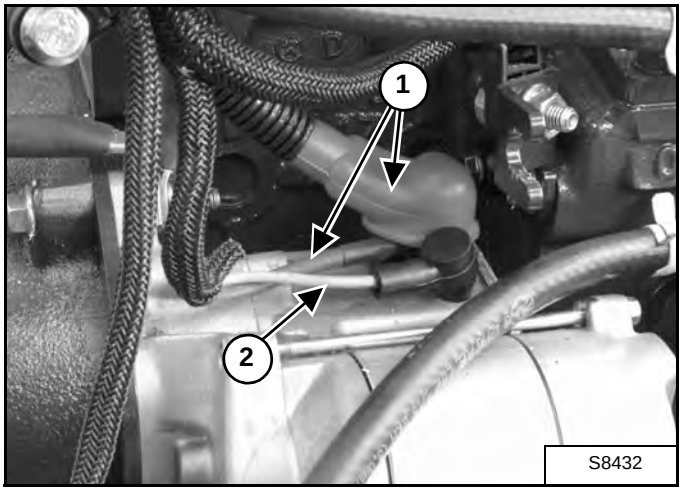
Figure 60-10-24



Remove the bolt and nut (Item 1) **[Figure 60-10-24]** from the alternator bracket.

Move the wire harness out of the way of the engine and alternator.

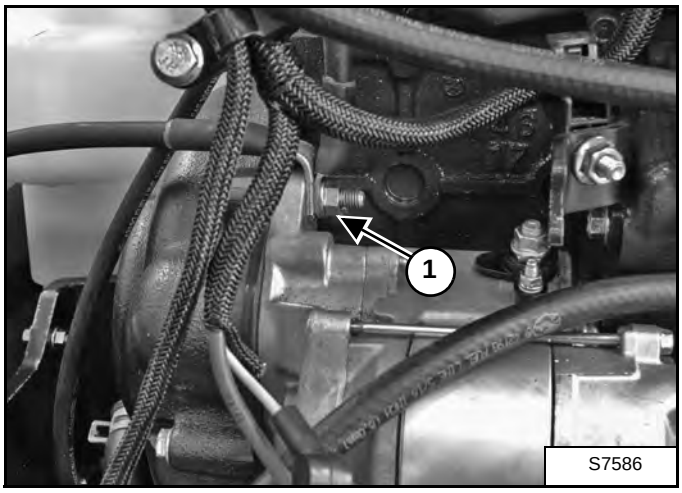
Figure 60-10-25



Mark the wires for ease of installation.

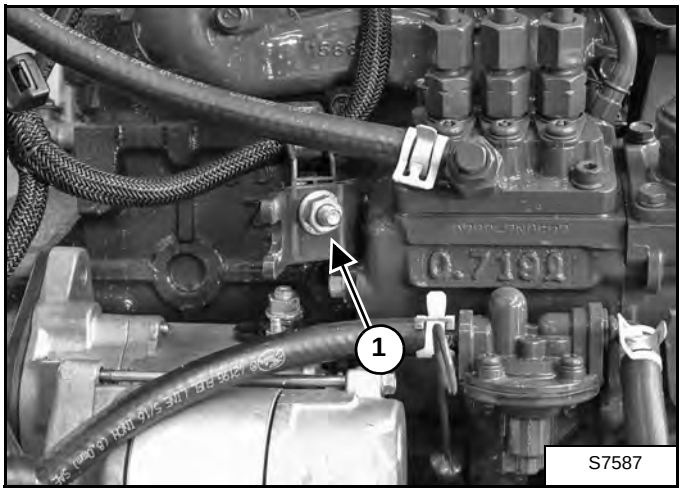
Remove the wires (Item 1) and (Item 2) **[Figure 60-10-25]** from the starter.

Figure 60-10-26



Remove the grounding wires (Item 1) **[Figure 60-10-26]** from the starter mounting bolt.

Figure 60-10-27



Remove nut and bolt (Item 1) **[Figure 60-10-27]** from cable clamp.

Move the wire harness out of the way of the engine.

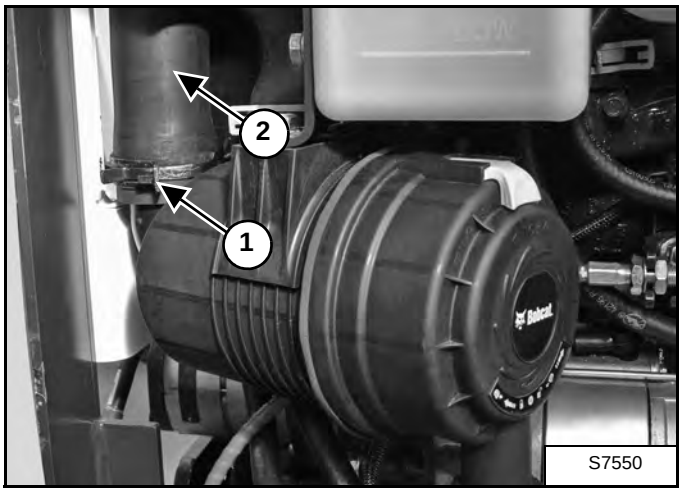
AIR CLEANER

Removal And Installation

Open the tailgate.

Remove the left hand side counterweight. (See Left Side Counterweight Removal And Installation on Page 40-200-2.)

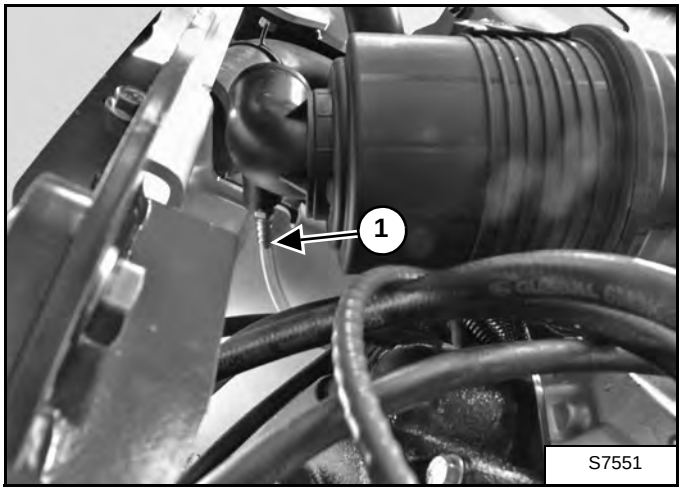
Figure 60-30-1



Remove the hose clamp (Item 1) and hose (Item 2) **[Figure 60-30-1]**.

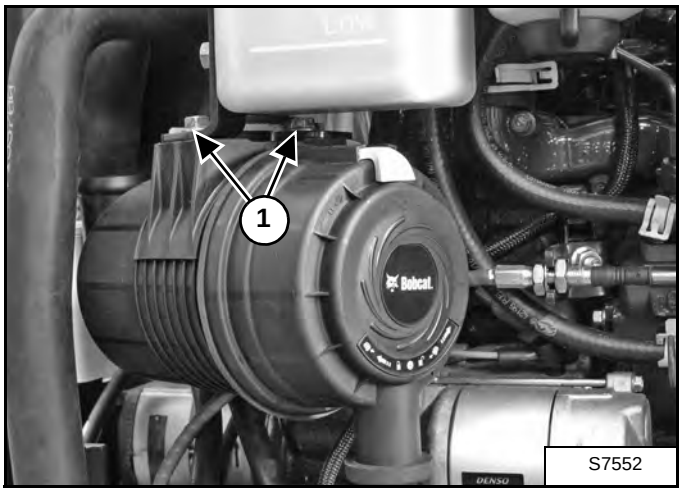
NOTE: Plug intake hose to avoid contamination from getting in.

Figure 60-30-2



Remove the hose (Item 1) **[Figure 60-30-2]** from the back of the air cleaner.

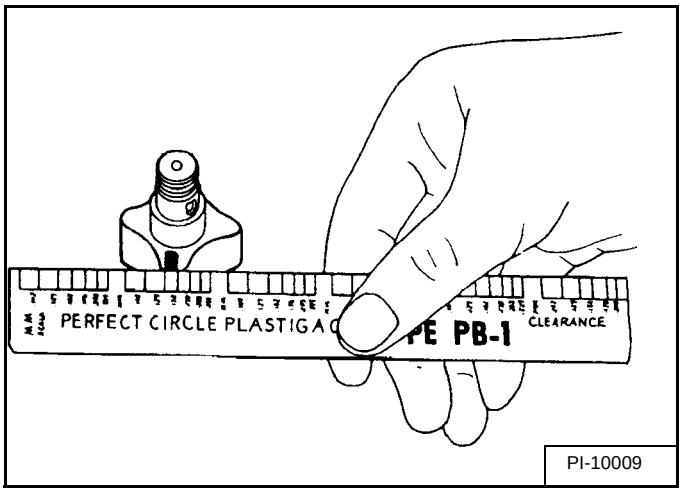
Figure 60-30-3



Remove the two bolts (Item 1) **[Figure 60-30-3]** and remove the air cleaner and hose assembly from the excavator.

Oil Pump, Service (Cont'd)

Figure 60-50-8



Put a piece of press gauge on the rotor face **[Figure 60-50-8]**.

Install the cover and tighten the bolts.

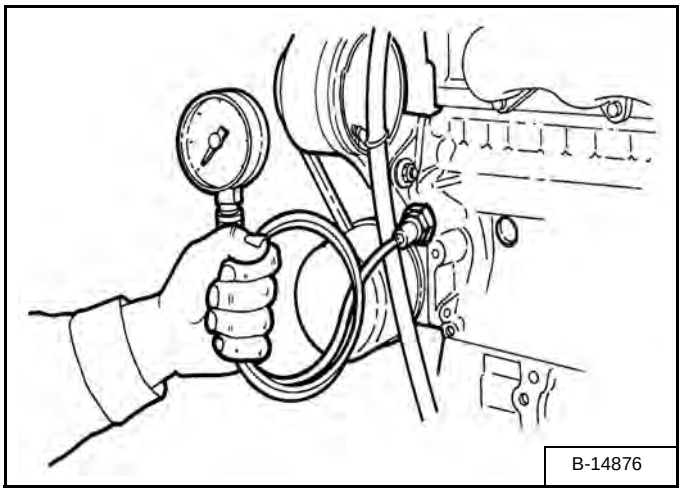
Remove the cover carefully. Measure the width of the press gauge **[Figure 60-50-8]**.

If the clearance exceeds the factory limit replace the oil pump rotor assembly.

End Clearance	0,08 - 0,14 mm (0.003 - 0.005 in)

Engine Oil Pressure, Testing

Figure 60-50-9



Remove the oil pressure sensor.

Install a pressure gauge **[Figure 60-50-9]**.

Start the engine and run until it is at operating temperature.

Measure oil pressure at both idling and rated speeds.

If the oil pressure is less than the allowable limit, check the following item:

- Engine Oil Insufficient
- Oil Pump Defective
- Oil Galley Plugged
- Oil Strainer Plugged
- Excessive Oil Clearance
- Foreign Matter in Relief Valve
- Oil Filer Cartridge plugged

At Idle Speed Allowable Limit	48,3 kPa (0,48 bar) (7 psi)
At Rated Speed	193 - 441,3 kPa (2 - 4 bar) (28 - 64 psi)
Allowable Limit	144,8 kPa (1 bar) (21 psi)

Installation: After checking engine oil pressure, tighten oil pressure sensor to 15 - 20 N•m (11 - 15 ft-lb) torque.

Fuel Injector Nozzle Pressure - Checking

IMPORTANT

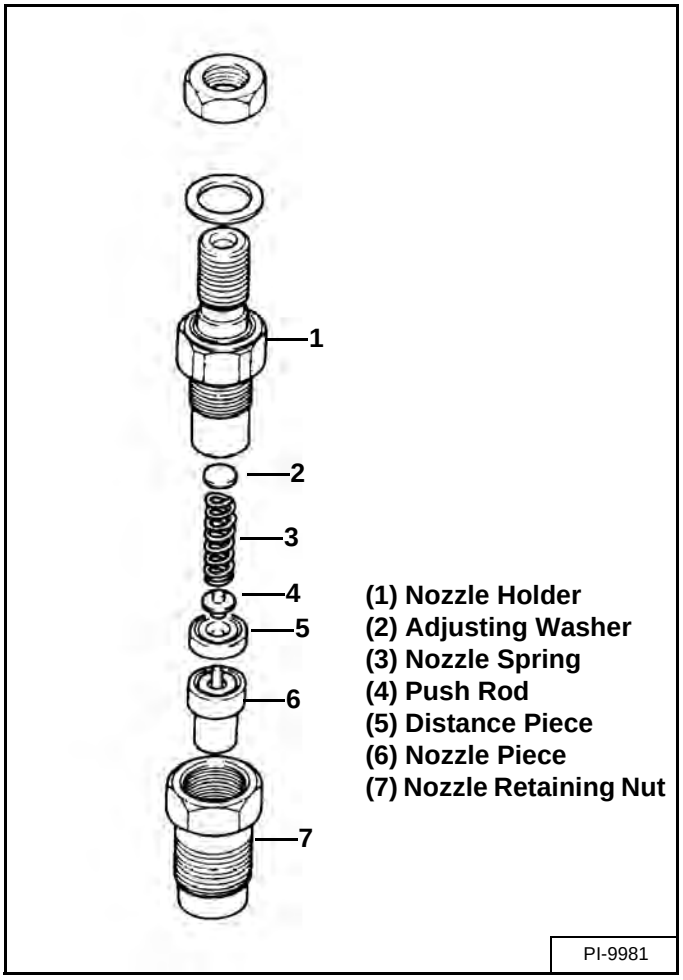
Do not disassemble or test the fuel injector nozzles unless you have the correct service and testing tools.

I-2027-0284

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

MEL10018 - Injector Nozzle Tester

Figure 60-60-23

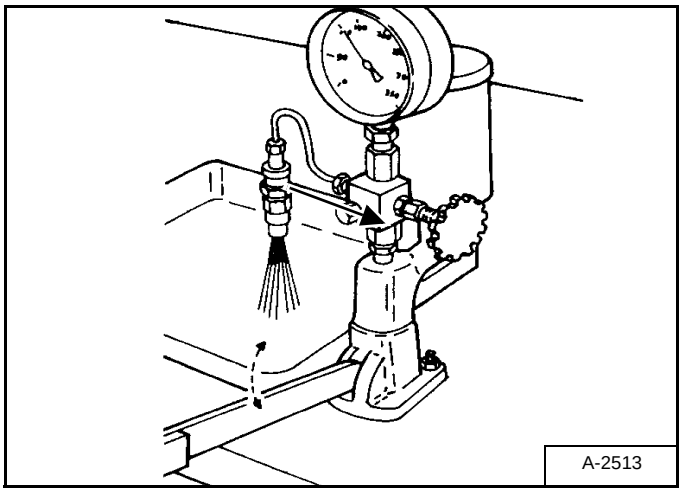


The nozzle release pressure can be adjusted by adding or removing washer(s) (Item 2) from the top of the nozzle spring (Item 3) **[Figure 60-60-23]**.

Each spacer will change the release pressure by about 234,4 kPa (2,3 bar) (34 psi).

Fuel Injection Pressure.	13,7 - 14,7 MPa (137 - 147 bar) (1991 - 2134 psi)

Figure 60-60-24



Assemble the injector nozzle. Connect the nozzle to the tester with the nozzle down **[Figure 60-60-24]**.

Operate the hand lever at a slow rate and record the opening pressure. If the pressure is not correct, disassemble the nozzle and add or remove the spacer (Item 2) **[Figure 60-60-23]** as needed.

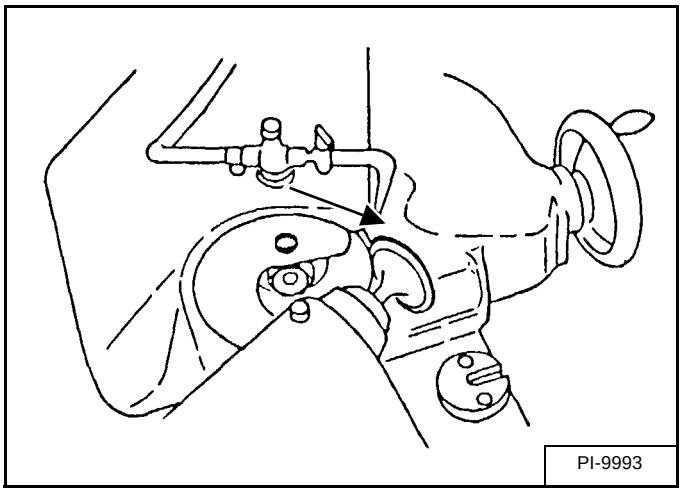
NOTE: When assembling the injector nozzle, tighten the retainer nut (Item 1) [Figure 60-60-23] to 25,3 - 28,9 N•m (23.5 - 28.9 ft-lb) torque. Any higher torque will cause slow action of the valve.

When the injector nozzle is assembled, tighten the nozzle body to 49 - 69 N•m (36 - 51 ft-lb) torque.

Check for inside leakage. Operate the hand lever until the pressure 12,7 MPa (127 bar) (1849 psi). Keep the nozzle under this pressure for 10 seconds, check to see if fuel leaks from the nozzle. If fuel leaks, replace the nozzle.

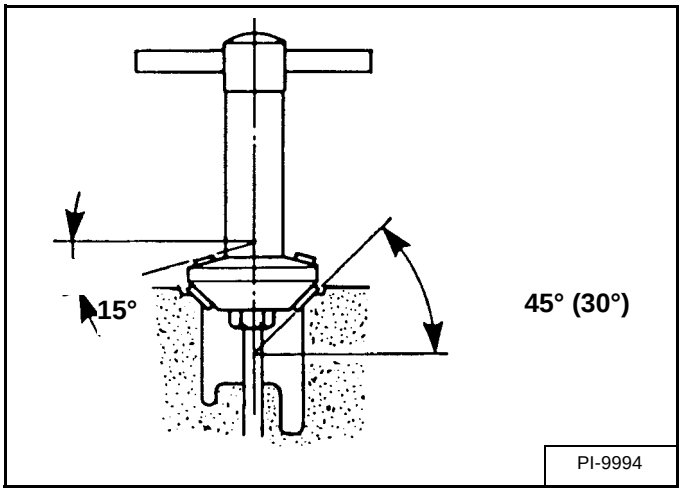
Valve And Valve Seat Reconditioning

Figure 60-70-24



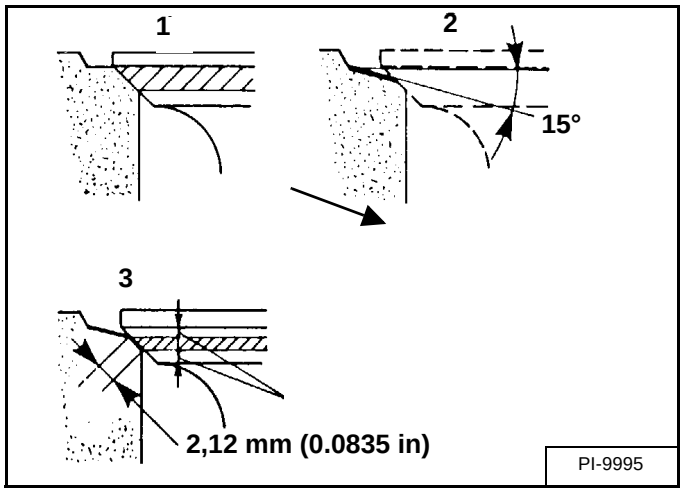
Grind the valve face to the correct angle using a valve refacer **[Figure 60-70-24]** and **[Figure 60-70-26]**.

Figure 60-70-25



Grind the valve surface in the cylinder head to the correct angle **[Figure 60-70-25]**.

Figure 60-70-26



Check the seat surface and valve face (Item 1) **[Figure 60-70-26]**.

If the seat surface is too wide, use a 15 degree cutter (Item 2) to get the correct width (Item 3) **[Figure 60-70-26]**.

Valve Seat Width

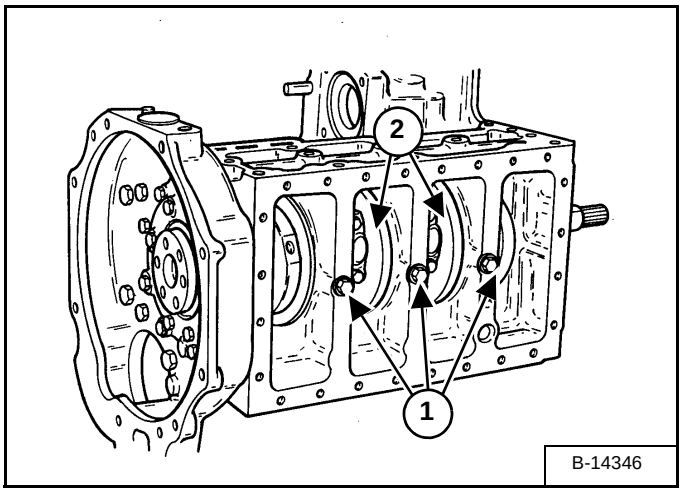
Intake	2,12 mm (0.0835 in)
Exhaust	2,12 mm (0.0835 in)

Valve Seat and Face Angle

Intake	45°
Exhaust	45°

Crankshaft And Bearings Removal And Installation (Cont'd)

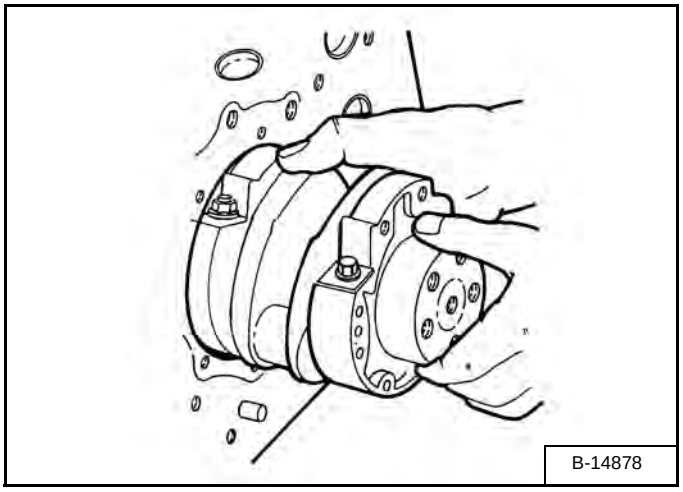
Figure 60-80-19



Remove the main bearing case bolt (Item 1) **[Figure 60-80-19]**.

Installation: Align the bearing case hole (Item 2) **[Figure 60-80-19]** with the hole in the block. Put oil on the bolt threads and tighten to 27 - 30 N•m (20 - 22 ft-lb) torque.

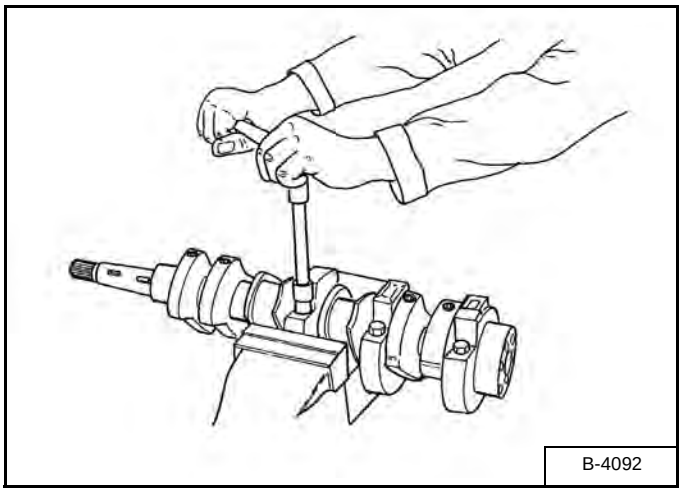
Figure 60-80-20



Remove the crankshaft / main bearing assembly from the engine block **[Figure 60-80-20]**.

Mark the bearing case halves for correct installation.

Figure 60-80-21

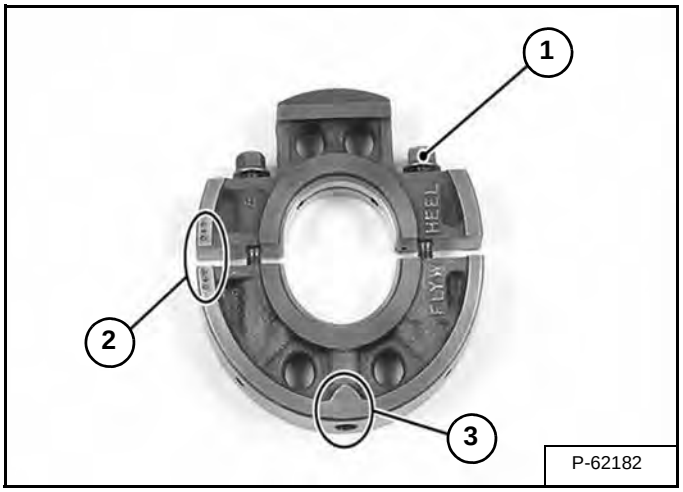


Remove the two bearing case bolts **[Figure 60-80-21]**.

Remove the bearing case and bearing.

Installation: Tighten the bearing case bolts (Item 1) **[Figure 60-80-22]** to 13 - 16 N•m (9 - 12 ft-lb) torque.

Figure 60-80-22



Installation: When installing the main bearing case assemblies, face the mark FLYWHEEL to the flywheel side of the engine block **[Figure 60-80-22]**. Be sure the thrust washer with its oil grooves face outward.

Identification marks on the main bearing case assemblies are the alignment number (Item 2) and the marking "1" or "2" (Item 3) **[Figure 60-80-22]** can be found on the main bearing case assemblies to ensure proper assembly.

FLYWHEEL AND HOUSING

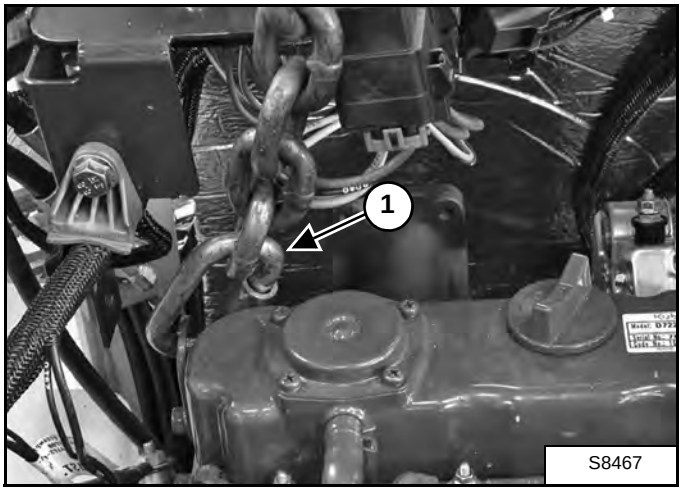
Removal And Installation

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

Remove the hydraulic pump. (See Removal And Installation on Page 20-50-3.)

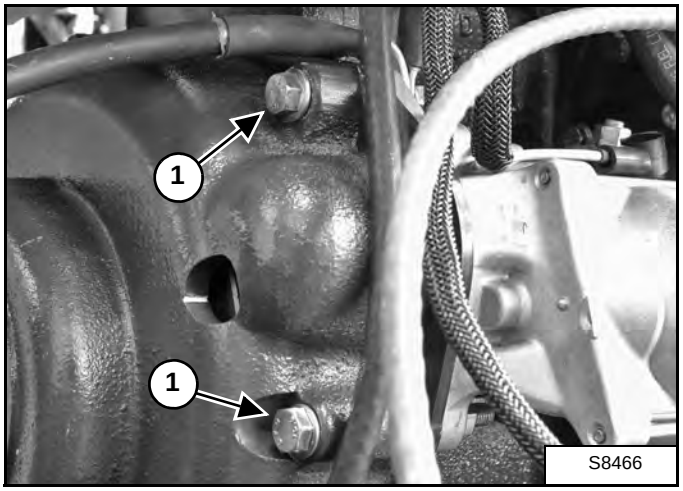
Remove the spark arrester muffler. (See MUFFLER on Page 60-20-1.)

Figure 60-100-1



Install a chain hoist to the engine lifting eye to support the engine (Item 1) **[Figure 60-100-1]**.

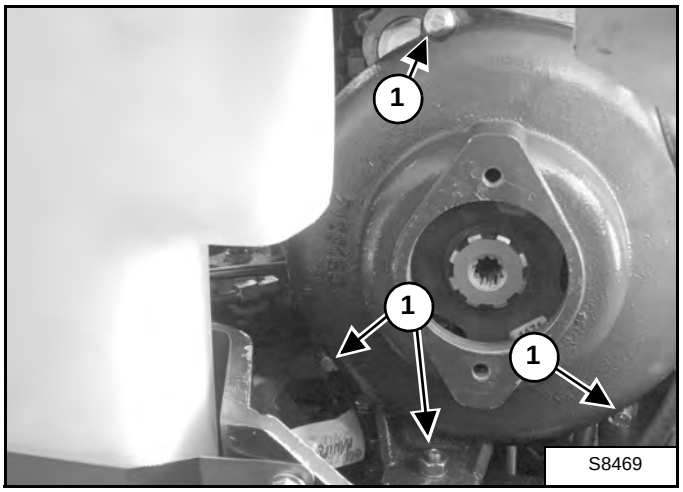
Figure 60-100-2



Remove the mount bolts and nuts (Item 1) **[Figure 60-100-2]**.

Installation: Tighten the bolts and nuts to 24 - 26 N•m (18 - 19 ft-lb) torque.

Figure 60-100-3



Remove the four flywheel housing bolts (Item 1) **[Figure 60-100-3]**.

Installation: Tighten the bolts to 24 - 26 N•m (18 - 19 ft-lb) torque.

Remove the flywheel housing.

Engine

Serial Number	A4BP11001 & Above	B4PC11001 & Above
Make / Model	Kubota / D722-E2B-BCZ-6 (Tier 2)	Kubota / D722-E4B-BCZ-6 (Stage 5)
Fuel	Diesel	Diesel
Cooling	Liquid	Liquid
Horsepower: – Gross power (ISO 14396) – Gross power (SAE J1995) – Net power (SAE J1349 / ISO 9249)	 7,5 kW (10.0 hp) @ 2000 rpm 7,6 kW (10.2 hp) @ 2000 rpm 7,4 kW (9.9 hp) @ 2000 rpm	 7,5 kW (10.0 hp) @ 2000 rpm 7,6 kW (10.2 hp) @ 2000 rpm 7,4 kW (9.9 hp) @ 2000 rpm
Maximum governed speed	2000 rpm	2000 rpm
High idle speed	2370 rpm	2370 rpm
Low idle speed	1300 - 1400 rpm	1300 – 1400 rpm
Torque: – Gross torque (SAE J1995) – Net torque (SAE J1349 / ISO 9249)	 40,1 N•m (39.6 lb-ft) @ 1600 rpm 39,1 N•m (28.8 lb-ft) @ 1600 rpm	 40,1 N•m (39.6 lb-ft) @ 1600 rpm 39,1 N•m (28.8 lb-ft) @ 1600 rpm
Number of cylinders	3	3
Displacement	0,72 L (43.9 in^3)	0,72 L (43.9 in^3)
Bore	67 mm (5.64 in)	67 mm (2.6 in)
Stroke	68 mm (5.68 in)	68 mm (2.7 in)
Lubrication	Forced lubrication with cartridge type filter	Forced lubrication with cartridge type filter
Crankcase ventilation	Closed breathing	Closed breathing
Air filter	Dual dry replaceable paper cartridge	Dual dry replaceable paper cartridge
Ignition	Compression ignited (diesel)	Compression ignited (diesel)
Starting aid	Intake air heater	Intake air heater

Electrical

Alternator	12 V - 40 A - open frame with internal regulator
Battery	12 V - 530 A cold cranking current - 75 min reserve capacity
Starter	12 V - reduction drive - 1,4 kW

Hydraulic System

Pump Type	Double gear pump
Pump capacity	21,0 L/min @ 2000 RPM (2.6 U.S. gpm)
System relief pressure	18500 kPa (185 bar) (2683 psi)
Joystick control pressure	3000 kPa (30 bar) (435 psi)
System relief pressure for slew circuits	8400 kPa (84 bar) (1218 psi)
Main hydraulic filter bypass	172 kPa (1.72 bar) (25 psi)
Boom base and arm rod port relief	23200 kPa (232 bar) (3365 psi)
Arm base port relief	22500 kPa (225 bar) (3263 psi)
Control valve	Nine-spool parallel type, open centre
Hydraulic filter	Full-flow replaceable
Fluid lines	SAE standard tubelines, hoses, and fittings
Auxiliary flow	20,0 L/min (5.3 U.S. gpm)
Pump Type	Double gear pump

HYDRAULIC CONNECTION SPECIFICATIONS

O-ring Face Seal Connection

IMPORTANT

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

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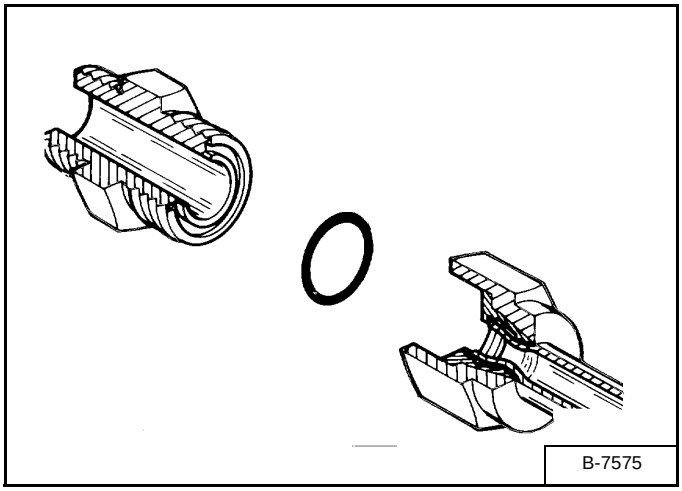
Figure SPEC-40-1



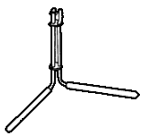
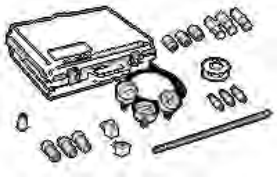
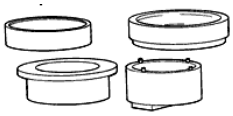
When the fitting is tightened, you can feel when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use petroleum jelly to hold the O-ring in position until the fittings are assembled **[Figure SPEC-40-1]**.

Figure SPEC-40-2

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

SERVICE TOOLS REQUIRED (CONT'D)

Hydraulic Tools (Cont'd)

TOOL PART NUMBER	DESCRIPTION	MODELS USED ON	COMMENT	IMAGE
MEL1033	Rod Seal Installation Tool	E08 - E85		
MEL1355	Hydraulic Test Kit		This test kit includes various gauges, adapters, couplers and hoses that are used when testing hydraulic functions. MEL1355 Includes: MEL1355-1 thru MEL1355-12	
MEL1355-2	1000 psi gauge			
MEL1355-3	5000 psi gauge			
MEL1355-12	Coupler			
MEL1412	Seal Installation Tool	E32, E35	Used for installing Travel Motor Seal	
MEL1413	Seal Installation Tool	E26	Used for installing Travel Motor Seal	
MEL1553	Travel Motor Tool Kit	E42 - E55	MEL1553 Includes: MEL1553-1 thru MEL1553-4	
MEL1553-1	Motor Seal Installation Tool		Included with MEL1553	
MEL1553-2	Motor Seal Installation Tool		Included with MEL1553	
MEL1553-3	Motor Seal Installation Tool		Included with MEL1553	
MEL1553-4	Motor Seal Installation Tool		Included with MEL1553	
6675936 (MEL1560)	Bleed Tool	E08 - E55	Machines with two track tension fittings.	

See BobcatDealerNET.com for parts ordering information. (For EMEA dealers see the Bobcat Special Tools Catalogue and Doosan Shop for parts ordering information.)

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