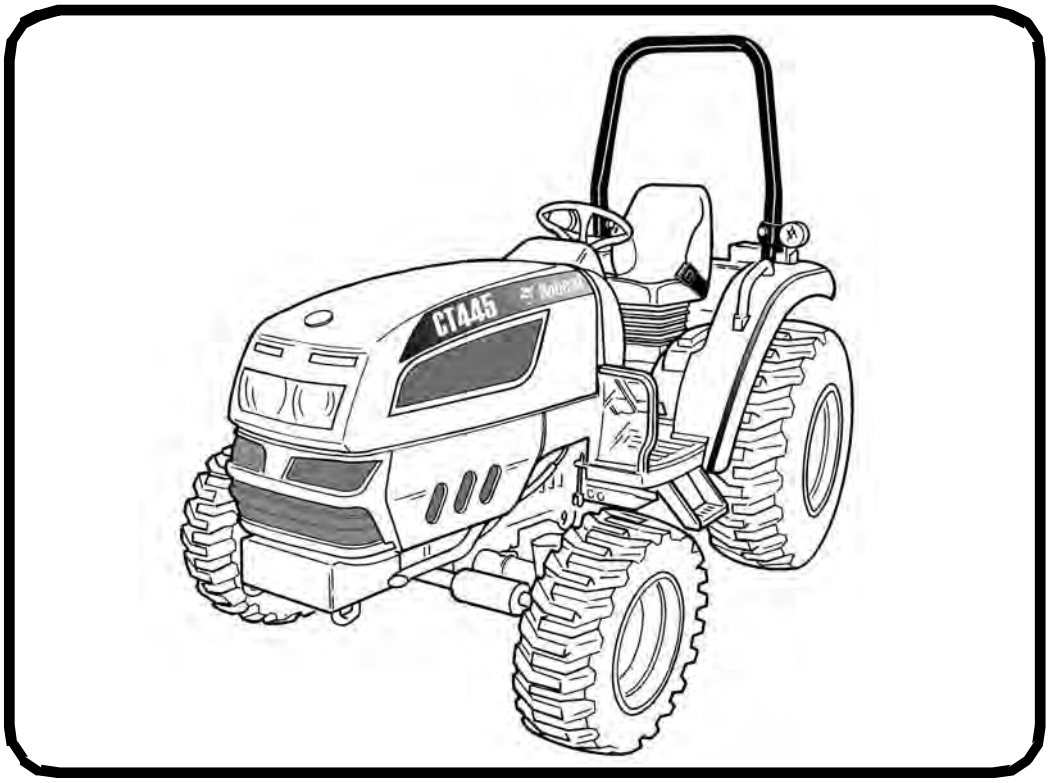
Bobcat®

Service Manual
CT440, CT445, CT450
Compact Tractor

HST - S/N ABHE11001 & Above
HST - S/N ABHL11001 & Above
HST - S/N ABHM11001 & Above
SST - S/N AKB911001 & Above
SST - S/N AKBP11001 & Above



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Printed in U.S.A.

Safety Rules For Power Take-Off (PTO) Driven Implements

- Keep PTO shields and all guards in place. Replace damaged or missing shields and guards before operating.
- Follow warnings and instructions on machine signs (decals). Replace damaged or missing decals.
- Do not wear loose or bulky clothing around the PTO or other moving parts.
- Keep bystanders away from PTO driven equipment, and never allow children near machines.
- Read and understand the manuals for the PTO driven equipment and be aware of safe operating procedures and hazards that may not be readily apparent.
- Always walk around equipment to avoid coming near a turning PTO driveline. Stepping over, leaning across or crawling under a turning PTO driveline can cause entanglement.
- Position the machine and implement hitch correctly to prevent driveline stress and separation.
- Use caution when turning. Turning too sharp can cause driveline damage.
- Use caution when raising PTO driven implement. Excessive driveline angle can cause driveline damage. Use stops if needed.

Compact Tractor Requirements and Capabilities

- Fasten seat belt securely when Roll-Over Protective Structure (ROPS) is up and locked. DO NOT wear seat belt if ROPS is down.
- Compact tractor must be equipped with sway bars or chains.
- Stop the compact tractor and engage the parking brakes. Install blocks in front of and behind the rear tires of the compact tractor. Install blocks underneath and support the implement securely before working under raised implements.
- Keep bystanders clear of moving parts and the work area. Keep children away.
- Use increased caution on slopes and near banks and ditches to prevent overturn.
- Make certain that the Slow Moving Vehicle (SMV) emblem is installed so that it is visible and legible. When transporting the equipment, use the compact tractor flashing warning lights and follow all local regulations.
- Operate this equipment with a compact tractor equipped with an approved Roll-Over Protective Structure (ROPS). Always wear seat belt when the ROPS is up. Serious injury or death could result from falling off the compact tractor.
- Before leaving the compact tractor operator's seat:
  1. Park on flat level ground.
  2. Fully lower the loader arms and put the attachment flat on the ground (if equipped).
  3. Fully lower the three-point hitch or mid-mount implements (if equipped).
  4. Lock brake pedals together and engage the parking brake.
  5. Place all controls in neutral.
  6. Stop engine, unfasten seat belt and remove the key.
- Never allow riders on the compact tractor or implement. Falling off can result in serious injury or death.
- Start the compact tractor only when properly seated in the operator's seat. Starting a compact tractor in gear can result in serious injury or death.
- Operate the compact tractor and attachments / implements from the operator's position only.
- Add the correct front ballast for rear three-point hitch implements and pull type implements. Add the correct rear ballast when using the loader and attachments. Front and rear ballast can be purchased from your compact tractor dealer.
- Do not handle large objects (such as round bales or posts) unless the loader is equipped with the proper attachment and the load is secured.
- The parking brake must be engaged before leaving the compact tractor operator's seat. Rollaway can occur because the transmission may not prevent machine movement. Lock the brake pedals together before activating the parking brake.

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TOWING THE COMPACT TRACTOR

Procedure

IMPORTANT

Never tow the compact tractor faster than 16 km/h (10 mph). Always have someone seated to steer and brake the towed compact tractor.

Tow the compact tractor for short distances only.

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NOTE: When the engine is not running, turning the steering wheel will require more effort. Power steering assist is not available when the engine is OFF.

Install a tow chain (or cable) to the front (for towing in the forward direction) or to the drawbar (for towing in the rearward direction).

The tow chain (or cable) must be rated at 1.5 times the weight of the compact tractor and implement / attachment. (See CT440 SPECIFICATIONS (HST) on Page SPEC-10-1.) *OR* (See CT445 SPECIFICATIONS (HST) on Page SPEC-11-1.) *OR* (See CT445 SPECIFICATIONS (sST) on Page SPEC-12-1.)

Enter the compact tractor and fasten the seat belt. Move both the rear and the mid-PTO levers to the disengaged (OFF) position.

Disengage the front wheel assist.

Move the speed range lever to neutral. Place all controls in neutral.

For SST Model Only: Move the F-N-R lever to neutral (N) and the gear shift lever to neutral.

Disengage the parking brake (but leave the brake pedals locked together for slowing or stopping the compact tractor).

Always have an operator seated in the operator's seat to operate the steering and brakes while towing the compact tractor. Use ROPS and fasten seat belt. Engage the parking brake and stop the engine before leaving the machine.

If the compact tractor is equipped with a loader or has an implement attached and the engine can not be started, tow the compact tractor using one of the following procedures.

Towing Compact Tractor With Loader Installed;

If possible, slightly raise the attachment off of the ground. The compact tractor will need to be towed backwards (if possible), to avoid the bucket (or attachment) from digging into the ground while towing.

Use the towing procedure described but install the tow chain to the rear of the compact tractor and tow backwards.

Towing Compact Tractor With Implement Installed;

If the engine can be started, slightly raise the implement off of the ground. The type of implement will determine which direction to tow the compact tractor.

Implements that dig into the ground will be difficult to tow and may require the implement to be disconnected from the compact tractor before towing. (Example; plow or cultivator.) If the implement must be removed before towing, use the procedure described previously and tow forward to get the compact tractor away from the implement.

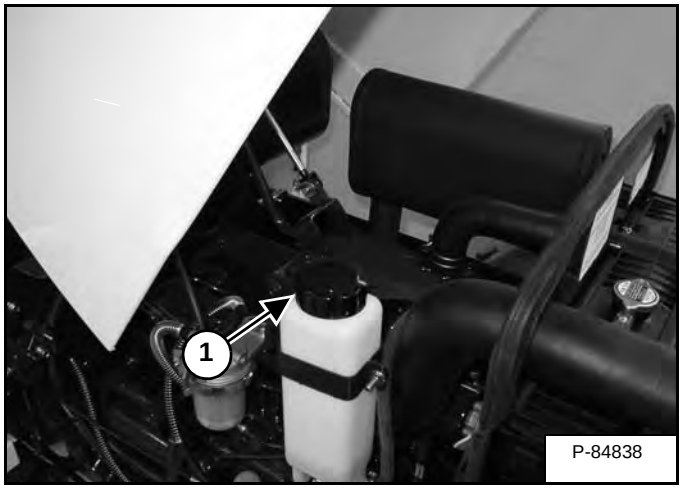
NOTE: Do not connect the tow chain (or cable) to the loader, attachment or the implement. Connect to the compact tractor only as shown. The rated strength of the tow chain or cable must be rated at 1.5 times the weight of the engine towed load (compact tractor plus the attachment or implement installed). Add the weight of the compact tractor, the loader, the attachment and / or the implement together for the total machine weight to calculate the strength of the tow chain or cable needed.

ENGINE COOLING SYSTEM

Checking Level

Open the engine cover. (See Opening And Closing on Page 10-20-1.)

Figure 10-90-1



The coolant recovery tank (Item 1) **[Figure 10-90-1]** is located on the right side of the engine.

⚠ WARNING

AVOID INJURY

Stop the engine and allow to cool before adding coolant or you can be burned.

W-2106-0907

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

Too much antifreeze reduces cooling system efficiency and may cause serious premature engine damage.

Too little antifreeze reduces the additives which protect the internal engine components; reduces the boiling point and freeze protection of the system.

Always add a premixed solution. Adding full strength concentrated coolant can cause serious premature engine damage.

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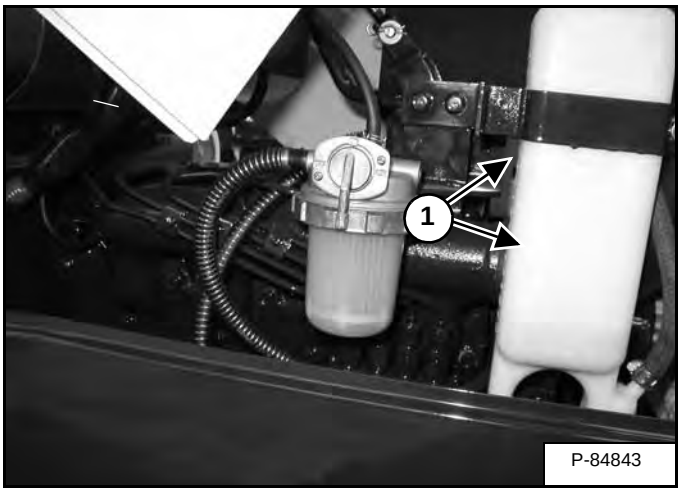
Figure 10-90-2



The coolant level in the recovery tank must be between the marks on the tank (Item 1) **[Figure 10-90-2]** when the engine is cool.

NOTE: The cooling system is factory filled with ethylene glycol coolant (green color). DO NOT mix ethylene glycol with propylene glycol.

Ethylene Glycol

Add premixed coolant; 50% water 50% ethylene glycol to the recovery tank if the coolant level is low.

One gallon (3,8 L) ethylene glycol mixed with one gallon (3,8 L) of water is the correct mixture of coolant to provide a -37°C (-34°F) freeze protection.

Use a refractometer to check the condition of ethylene glycol in your cooling system.

⚠ 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

HYDRAULIC / HYDROSTATIC / TRANSMISSION SYSTEM

Checking And Adding Fluid

Use only recommended fluid in the hydraulic / hydrostatic / transmission system. (See Chart on Page SPEC-50-1.)

Park the compact tractor on a flat level surface, lower the loader arms (if equipped) and lower implement (if equipped).

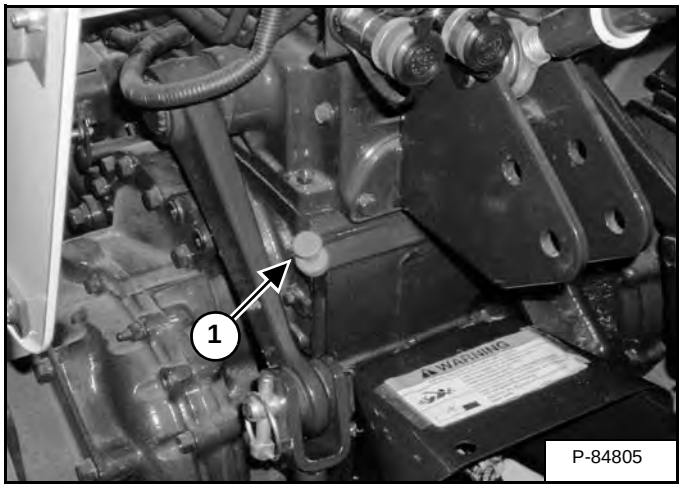
NOTE: Failure to use the proper transmission / differential fluid may result in diminished brake performance.

Lock brake pedals together and engage the parking brake.

Place all controls in the neutral position.

Stop the engine.

Figure 10-120-1



Check the fluid level at the dipstick (Item 1) **[Figure 10-120-1]**.

Keep the oil level between the marks on the dipstick.

Transmission / Differential Fluid Chart

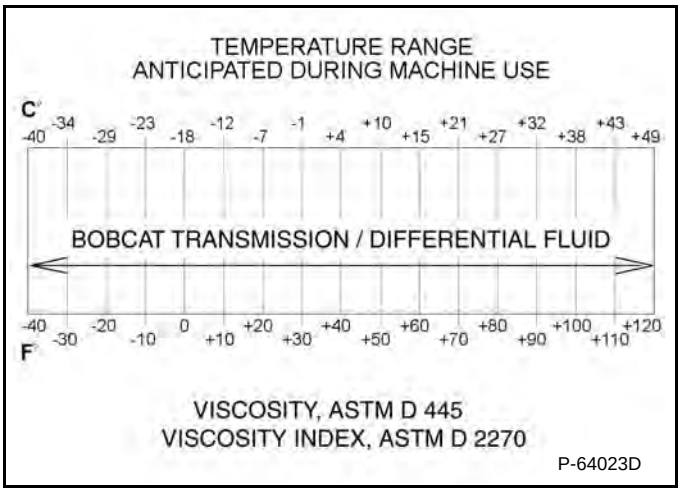
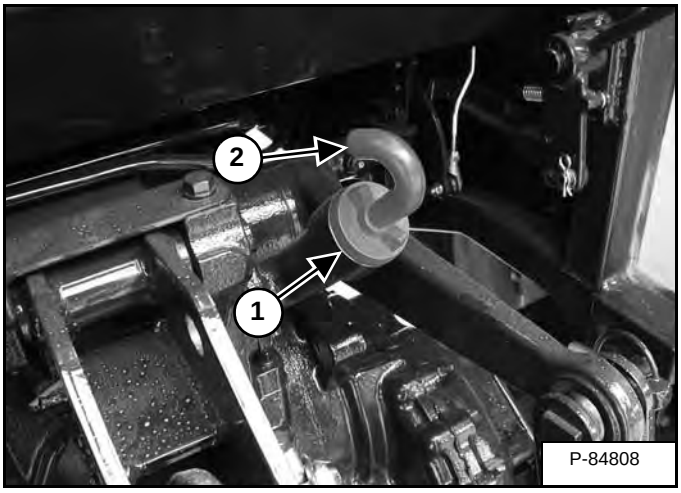


Figure 10-120-2



If needed, remove the fill cap (Item 1) **[Figure 10-120-2]** and add fluid. (See chart above.)

NOTE: When installing the fill cap (Item 1), position it as shown. The fill cap has a breather hole (Item 2) [Figure 10-120-2] that needs to be in the up position.

AIR CONDITIONING BELT

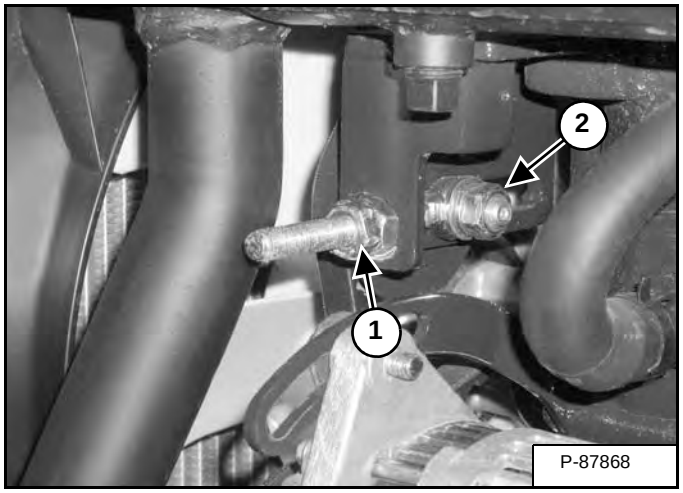
Belt Adjustment

Stop the engine and engage the parking brake.

Open the engine cover. (See Opening And Closing on Page 10-20-1.)

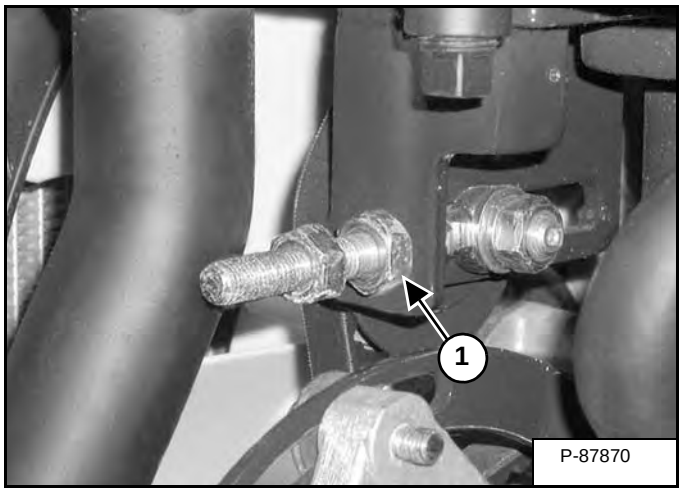
Remove the left side engine panel. (See Removal And Installation on Page 50-100-1.)

Figure 10-161-1



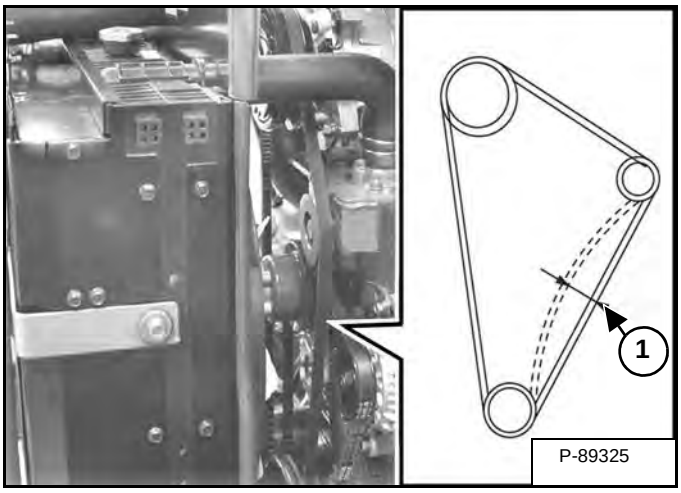
Loosen the jam nut (Item 1) on the belt tensioner and the nut (Item 2) **[Figure 10-161-1]** on the pulley.

Figure 10-161-2



Turn the inner nut (Item 1) **[Figure 10-161-2]** clockwise to tighten the belt or counterclockwise to loosen the belt.

Figure 10-161-3



The tension is correct with 8 mm (5/16 in) belt movement at mid span (Item 1) **[Figure 10-161-3]** when 67 N (15 lb) force is applied to the belt.

After adjustment is made, tighten the jam nut (Item 1) and the nut (Item 2) **[Figure 10-161-1]** on the pulley.

Belt Replacement

Loosen the jam nut (Item 1) on the belt tensioner and the nut (Item 2) **[Figure 10-161-1]** on the pulley.

Loosen the adjusting nut (Item 1) **[Figure 10-161-2]** completely.

Remove the belt.

SAFETY INTERLOCK SYSTEM - OPERATING

Inspection And Maintenance (HST)

⚠ WARNING

AVOID INJURY OR DEATH

The Safety Interlock System must shut off the engine if the operator leaves the operator's seat unless: the parking brake is engaged, the mid-PTO lever is disengaged, and the speed range lever is in neutral. Contact your dealer for service if the Safety Interlock System does not function properly. DO NOT MODIFY THE SYSTEM.

W-2749-0708

The Safety Interlock System - Operating:

The engine must shut off if the operator leaves the operator's seat, unless all the following conditions are present:

1. The parking brake is engaged.

2. The mid-PTO lever (if equipped) is in the disengaged (OFF) position.

3. The speed range lever is in the neutral position.

If the engine does not shut off when the operator leaves the operator's seat without all of the above conditions present, the compact tractor must be serviced by your Bobcat dealer.

Inspecting Procedure:

Perform this procedure on flat level ground and make sure the area is clear of bystanders.

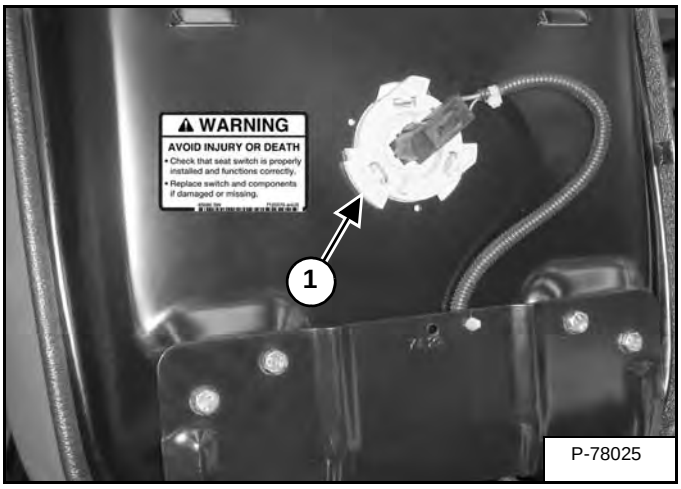
1. Sit in the operator's seat and fasten the seat belt - Engage the parking brake - Place all controls in neutral - Move engine speed control lever to low engine speed - Start the engine - Release the Parking Brake - Unfasten the seat belt and raise off the operator's seat; THE ENGINE MUST STOP.

2. Sit in the operator's seat and fasten the seat belt - Engage the parking brake - Place all controls in neutral - Move engine speed control lever to low engine speed - Start the engine - Move the mid-PTO lever to the ON position (if equipped) - Unfasten the seat belt and raise off the operator's seat; THE ENGINE MUST STOP.

3. Sit in the operator's seat and fasten the seat belt - Engage the parking brake - Place all controls in neutral - Move engine speed control lever to low engine speed - Start the engine - Move the speed range lever to LOW (L) speed range - Unfasten the seat belt and raise off the operator's seat; THE ENGINE MUST STOP. Repeat this step for MEDIUM (M) and HIGH (H) speed ranges.

If the engine does not shut off after performing any of the above procedures, FURTHER TROUBLESHOOTING MUST BE DONE.

Figure 10-210-1



The seat switch (Item 1) **[Figure 10-210-1]** is installed in the bottom of the seat. Replace the seat switch and components if damaged or missing. See your Bobcat dealer for parts.

⚠ WARNING

AVOID INJURY OR DEATH

- **Check that seat switch is properly installed and functions correctly.**
- **Replace switch and components if damaged or missing.**

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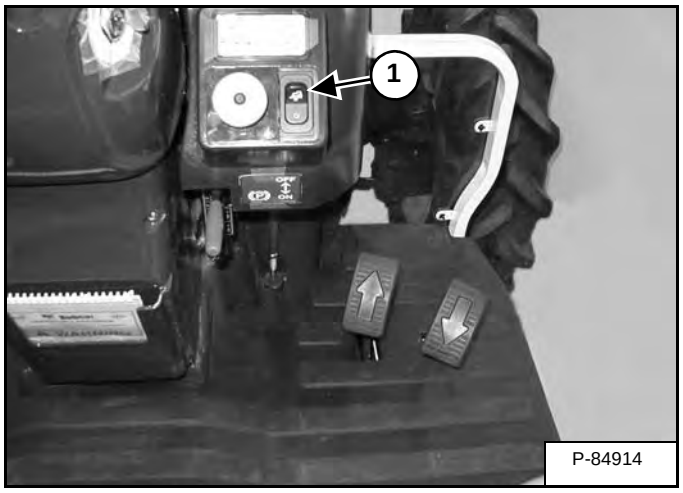
CRUISE CONTROL (HST ONLY)

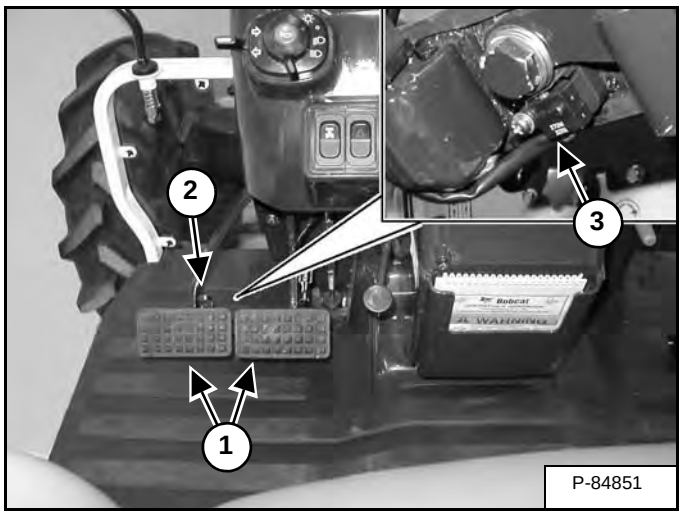
Inspection And Maintenance

Figure 10-250-1



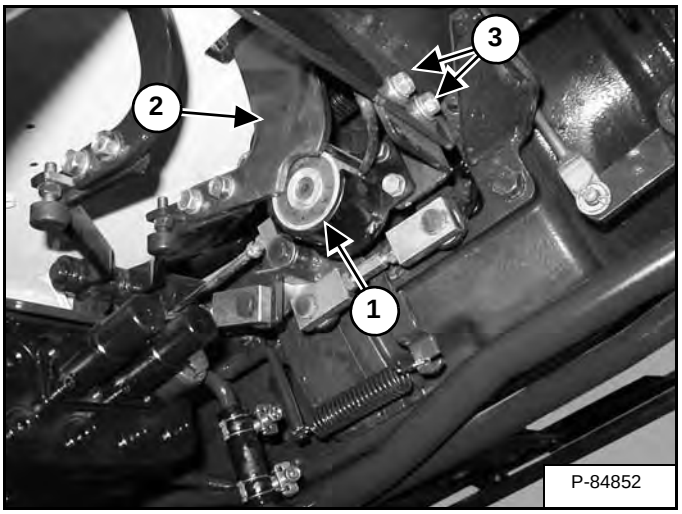
If the cruise control switch (Item 1) **[Figure 10-250-1]** does not maintain the selected speed, the cruise control will need to be adjusted.

Figure 10-250-2



NOTE: The brake pedals (Item 1) must be in the locked position with the lock lever (Item 2) and the unlocked brake pedal switch (Item 3) [Figure 10-250-2] engaged to activate the cruise control. If the brake pedals are not locked together, the switch will not allow power to the cruise control switch. Make sure the switch is activated before proceeding with any additional adjustment procedures.

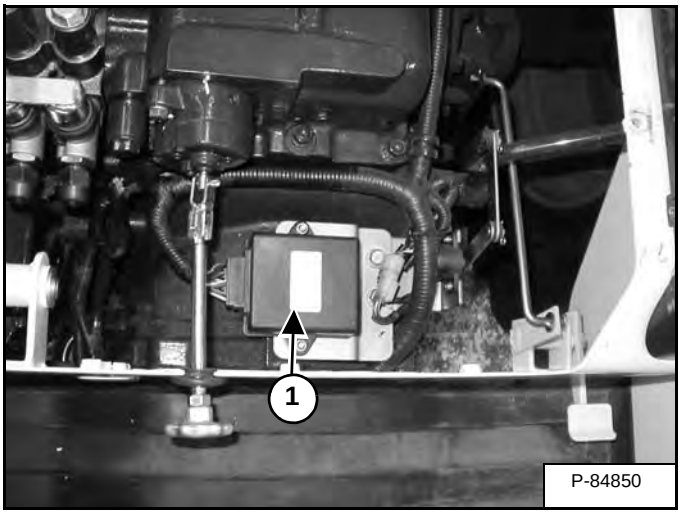
Figure 10-250-3



The cruise control is controlled by a magnet (Item 1) that holds the forward travel pedal (Item 2) **[Figure 10-250-3]** in the selected forward travel speed position.

If adjustment is needed, loosen the bolts (Item 3) **[Figure 10-250-3]** and position the magnet so there is 1,0 - 1,5 mm (0.039- 0.059 in) clearance between the side of the forward travel pedal and the face of the magnet. Tighten the bolts after adjustment is made.

Figure 10-250-4



The controller (Item 1) **[Figure 10-250-4]** located below the operator's seat, also controls the cruise control magnet. If the cruise control will still not maintain the selected speed, the controller may be defective.

The cruise control must disengage when both brake pedals are pressed or the cruise control switch is moved to the OFF position. If the system does not function properly, further troubleshooting and testing must be done.

HYDRAULIC SYSTEM

Troubleshooting The Hydraulic Circuit

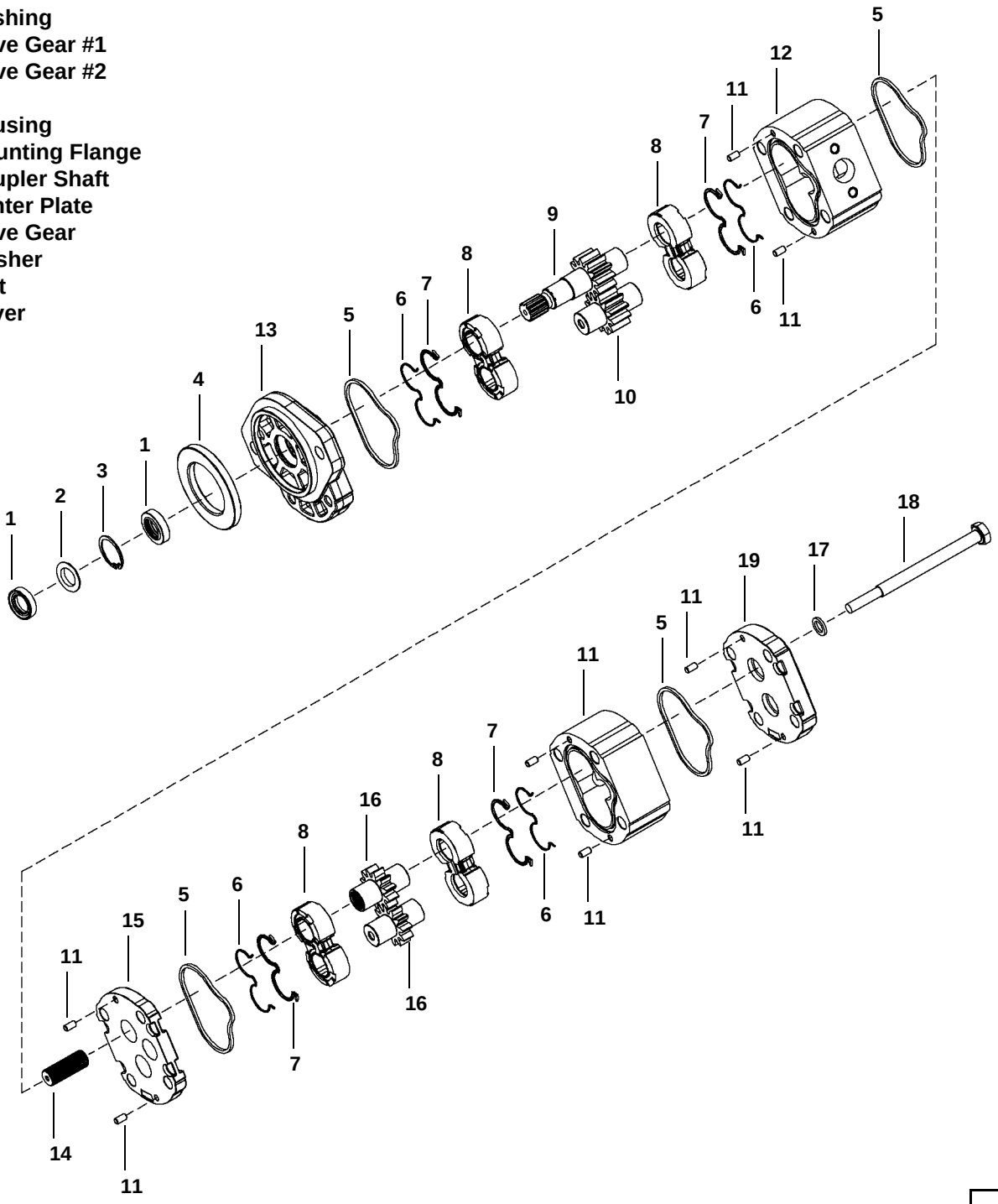
PROBLEM	CAUSE	CORRECTION
No hydraulic operation at one or more circuits	Hydraulic oil level low	Refill with correct oil
	Hydraulic pump drive coupling damaged	Replace
	Hydraulic pump defective	Repair or replace
	Main relief valve defective	Readjust or replace
Hydraulic power insufficient to one or more circuits	Main relief valve pressure setting incorrect	Readjust or replace
All hydraulic speed too slow	Hydraulic oil level or viscosity incorrect	Fill to correct level and use correct viscosity oil
	Engine rpm reduced	Readjust or replace
	Control valve linkage defective Hydraulic pump volume low	Check, repair or replace Check, repair or replace
Oil temperature too high	Oil cooler or radiator fins plugged	Clean oil cooler external surface
	Hydraulic oil level low	Fill to correct level
	Non recommended hydraulic oil	Replace
	Relief valve excessively activated	Use proper operating procedures
	One or more relief valves not set correctly	Readjust or replace
	Extreme operating conditions. High ambient temperature (i.e.: Enclosed structure)	
	Engine accessory drive belt loose	Tighten belt

Troubleshooting The Joystick Valve Circuit

PROBLEM	CAUSE	CORRECTION
External leakage control kit or opposite side	Worn spool seal due to mechanical actuation or high back pressure	Locate the leakage and replace the seal. Check back pressure level.
Excessive internal leakage on A and B ports	Increase clearance between spools and body due to high wear	Replace the direction control valve and check the oil contamination level
Dropping load during transition while raising	High leakage of the load check valve	Remove the load check valve and clean the seat
Inability to build pressure on A and B ports	Main pressure relief valve blocked open	Remove and clean or replace the main relief valve
	Low pump pressure and flow	Check the pump and circuit

Parts Identification

1. Seal
2. Washer
3. Snap Ring
4. Ring
5. Quad Ring
6. Back-up Ring
7. Seal
8. Bushing
9. Drive Gear #1
10. Drive Gear #2
11. Pin
12. Housing
13. Mounting Flange
14. Coupler Shaft
15. Center Plate
16. Drive Gear
17. Washer
18. Bolt
19. Cover



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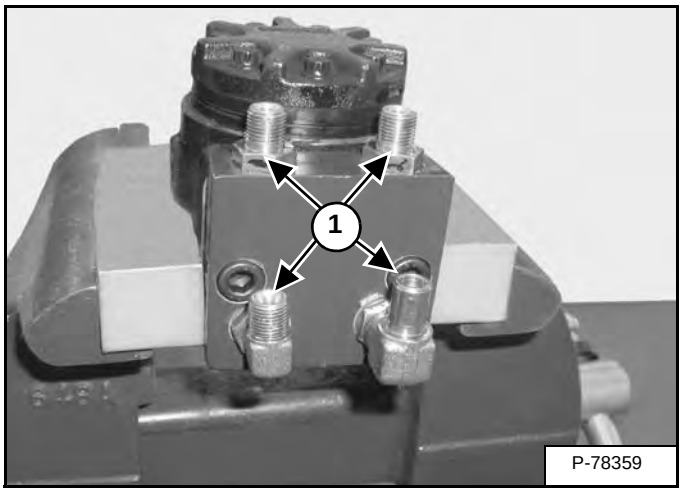
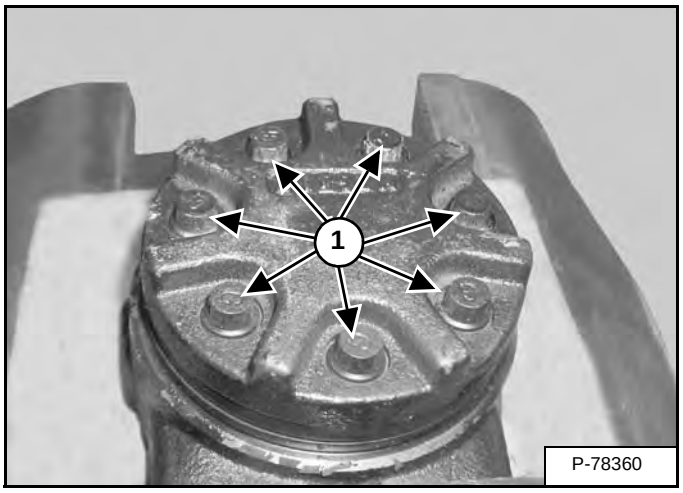
Disassembly

Figure 20-40-5



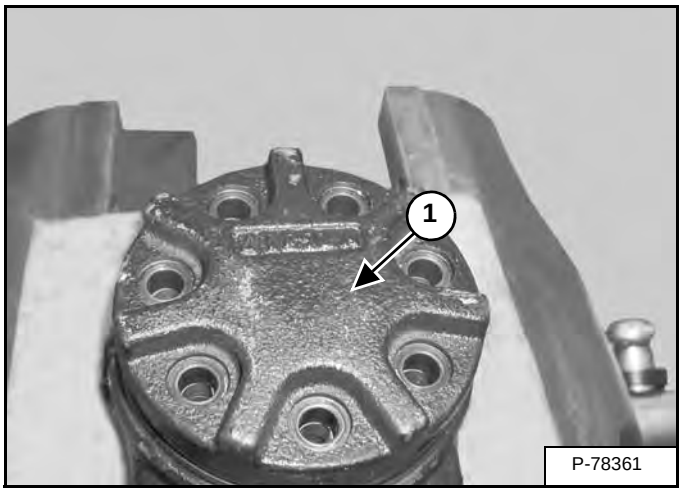
Remove the four fittings (Item 1) **[Figure 20-40-5]** from the steering valve.

Figure 20-40-6



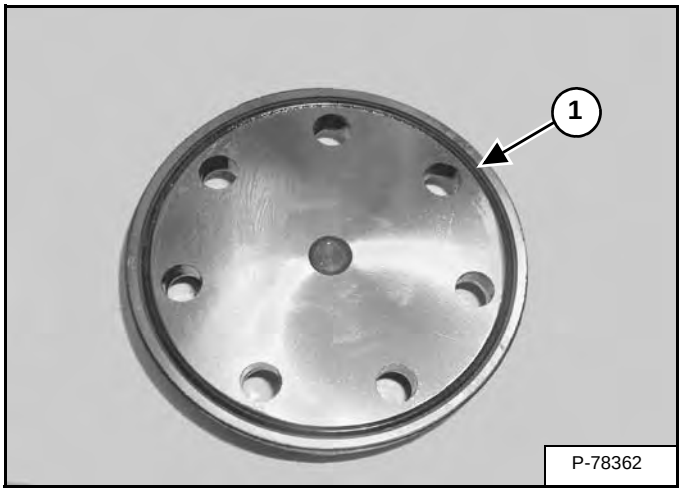
Remove the seven end cap bolts (Item 1) **[Figure 20-40-6]**.

Figure 20-40-7



Remove the end cap (Item 1) **[Figure 20-40-7]**.

Figure 20-40-8



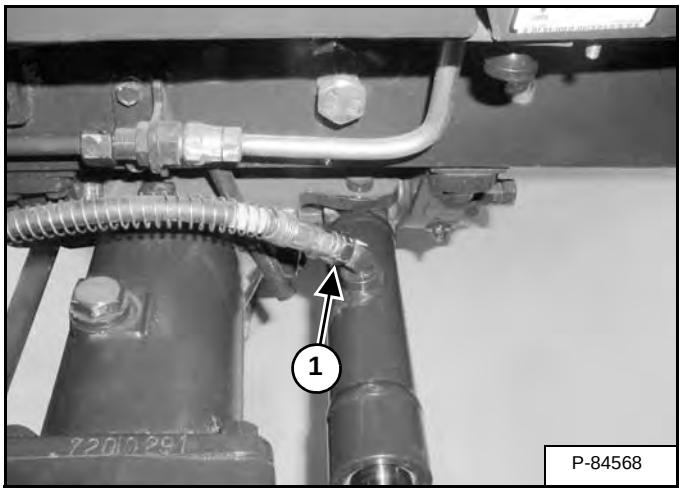
Remove the O-ring (Item 1) **[Figure 20-40-8]** from the end cap.

STEERING VALVE TESTING

Relief Pressure

NOTE: The following procedure is performed on a compact tractor equipped with HST. Although the photos may appear different the procedure is the same for a compact tractor equipped with SST.

Figure 20-41-1



Remove the hose (Item 1) **[Figure 20-41-1]** from the right side of the steering 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.

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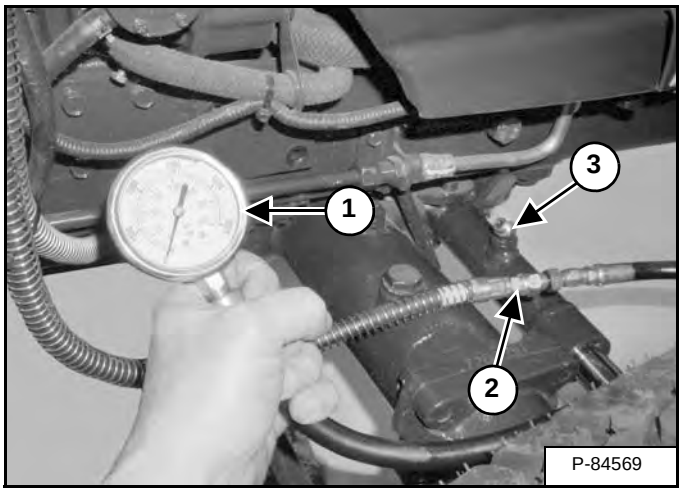
Figure 20-41-2



Install a 34474 kPa (344,8 bar) (5000 psi) gauge assembly (Item 1) to the steering cylinder hose (Item 2) **[Figure 20-41-2]**.

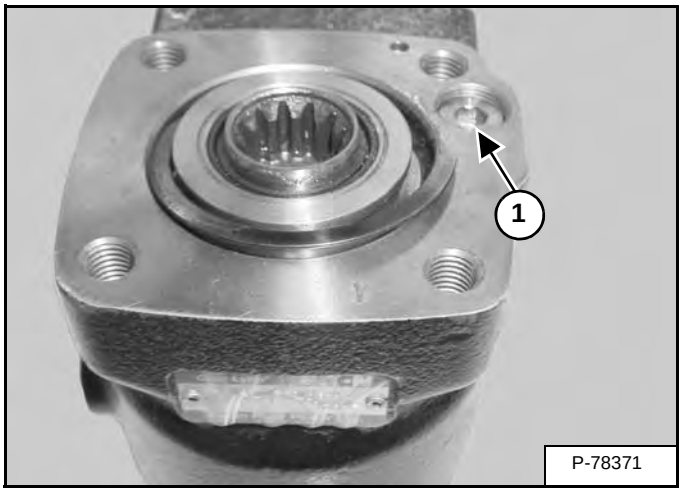
Install a cap (Item 3) **[Figure 20-41-2]** on the cylinder fitting. Engage the parking brake, start the engine and increase the engine speed to full rpm.

Turn the steering wheel in the direction of the removed hose and record the pressure shown on the gauge.

The relief pressure should be 13707 kPa (137,1 bar) (1988 psi).

Decrease engine speed to low rpm and stop the engine.

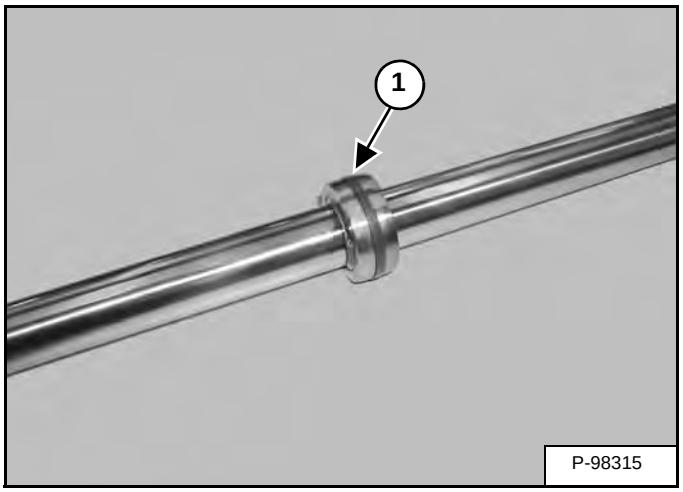
Figure 20-41-3



To increase pressure, turn the plug (Item 1) **[Figure 20-41-3]** clockwise, to reduce pressure turn the plug counter clockwise. Turn the plug in no more than 90° increments and retest.

Disassembly (Cont'd)

Figure 20-51-17



Remove the wear ring and the expander O-ring (Item 1) **[Figure 20-51-17]** from the piston.

Assembly

Use the following tools to assemble the cylinder.

MEL1396 - Seal Installation Tool
MEL 1033 - Rod Seal Installation Tool

Wash the cylinder ports in solvent and dry with compressed air.

Figure 20-51-18

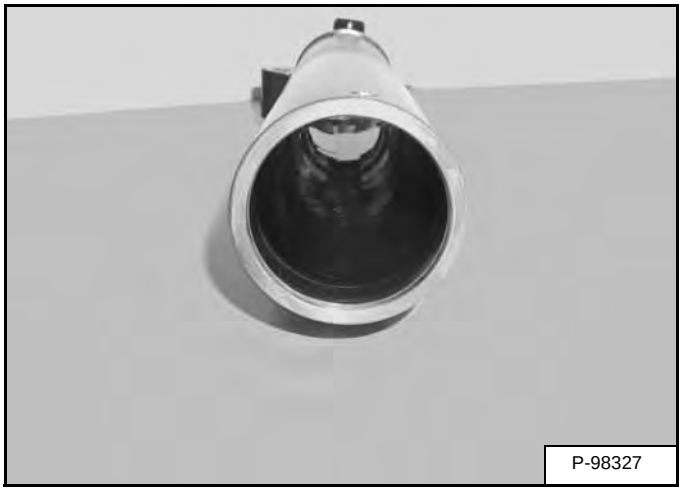
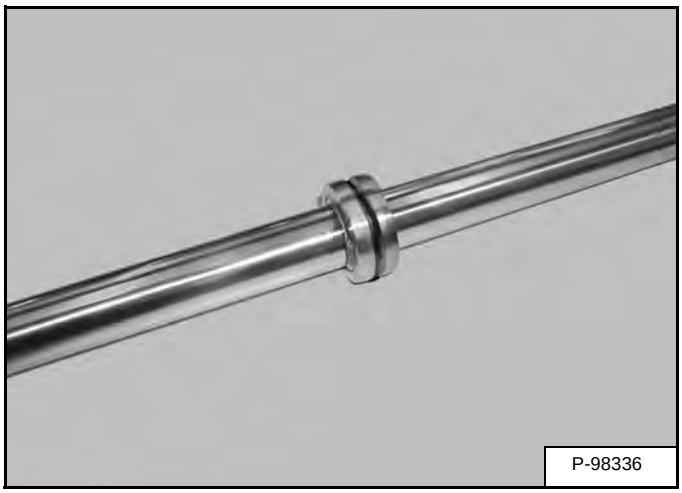


Figure 20-51-19



Inspect cylinder parts for nicks, scratches or other damage.

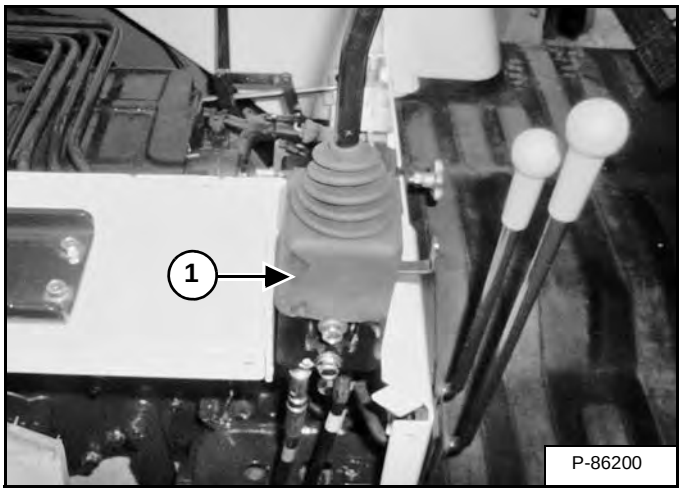
Replace any damaged parts **[Figure 20-51-18]** and **[Figure 20-51-19]**.

Lubricate all O-rings and seals with hydraulic oil during installation.

Always use new O-rings and seals.

Adjustment (Cont'd)

Figure 20-60-19

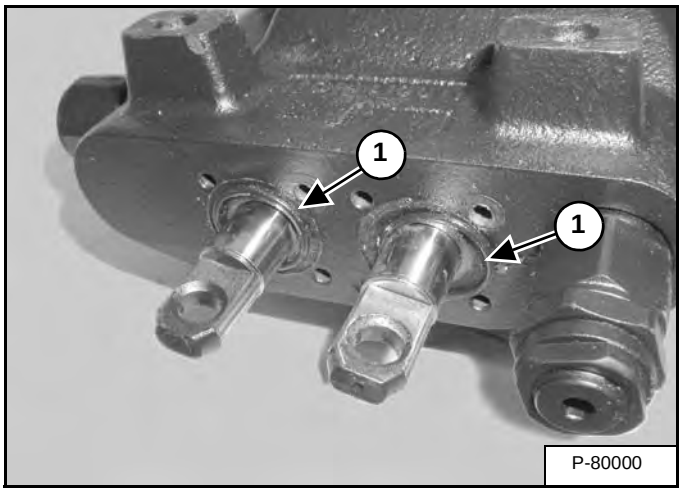


Install the dust boot (Item 1) **[Figure 20-60-19]**.

RIGHT JOYSTICK VALVE (IF EQUIPPED) (CONT'D)

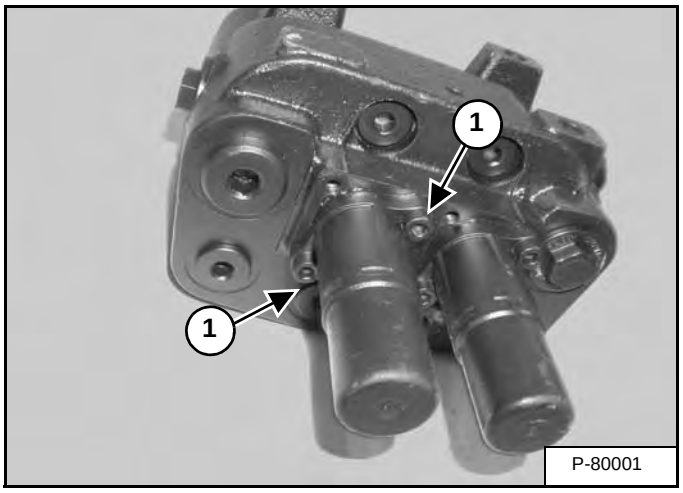
Disassembly

Figure 20-62-11



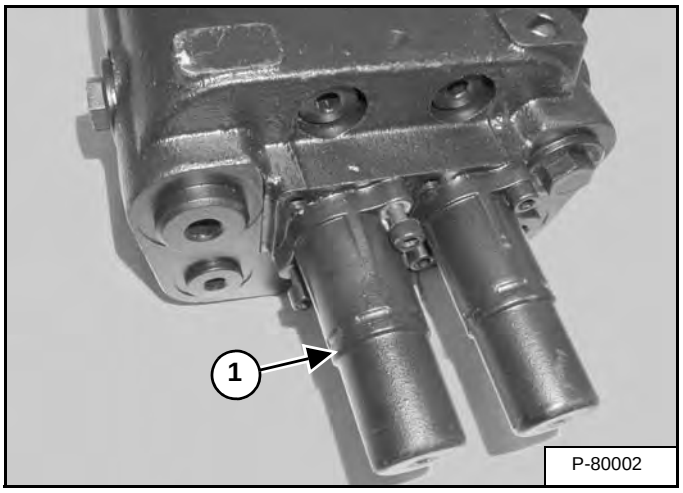
Remove and discard the two O-rings (Item 1) **[Figure 20-62-11]**.

Figure 20-62-12



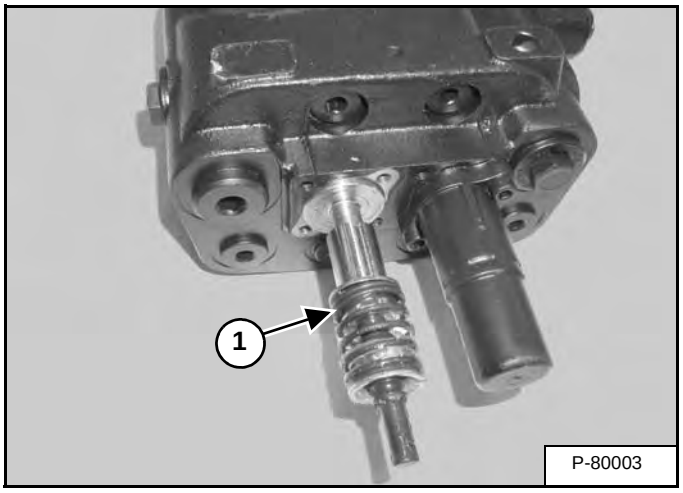
Remove the two screws (Item 1) **[Figure 20-62-12]**.

Figure 20-62-13



Remove the cap (Item 1) **[Figure 20-62-13]**.

Figure 20-62-14



Gently slide the spool (Item 1) **[Figure 20-62-14]** from the valve body.

NOTE: The two spools are not interchangeable and must be installed into the same bore they were removed from.

THREE POINT HITCH HOUSING

Removal And Installation

Drain the transmission oil. (See Checking And Adding Fluid on Page 10-120-1.)

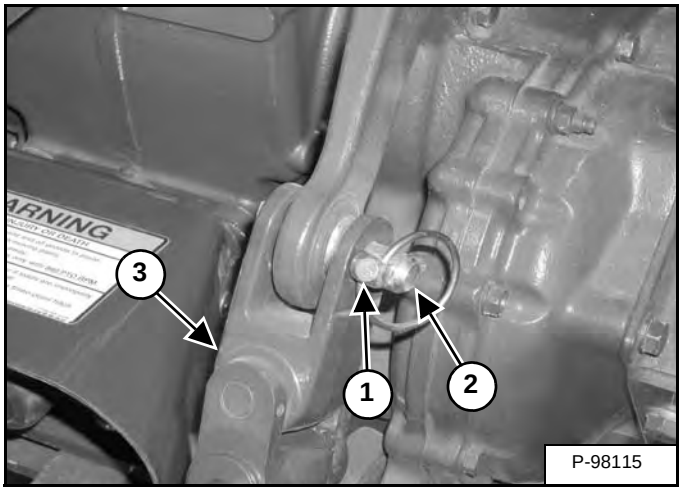
Remove the fender assembly. (See Removal And Installation on Page 50-110-1.)

Remove the ROPS. (See Removal And Installation on Page 50-140-1.)

Remove the top link assembly. (See Top Link Assembly Removal And Installation on Page 50-180-3.)

NOTE: The following procedure is done on a compact tractor equipped with rear auxiliary hydraulics.

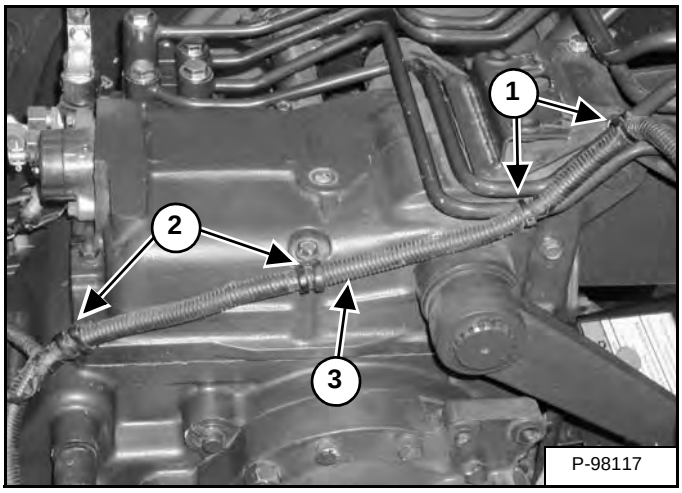
Figure 20-90-1



Remove the retaining clip (Item 1) and pin (Item 2) **[Figure 20-90-1]**.

Remove the lift rod (Item 3) **[Figure 20-90-1]** (both sides).

Figure 20-90-2



Remove the two cable ties (Item 1) open the clamps (Item 2) and reposition the wire harness (Item 3) **[Figure 20-90-2]**.

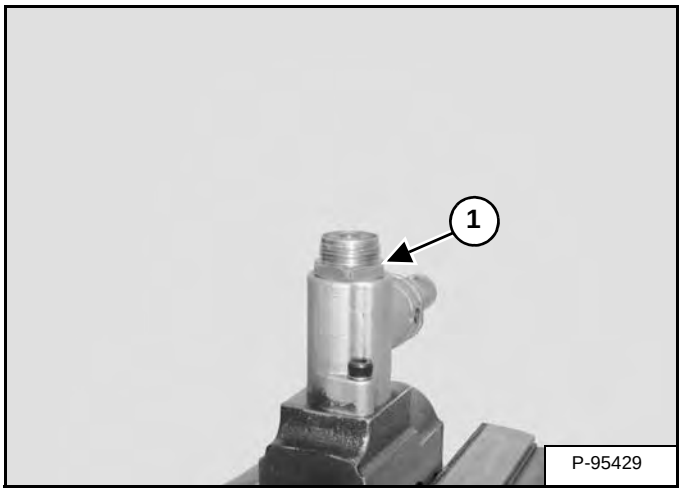
IMPORTANT

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

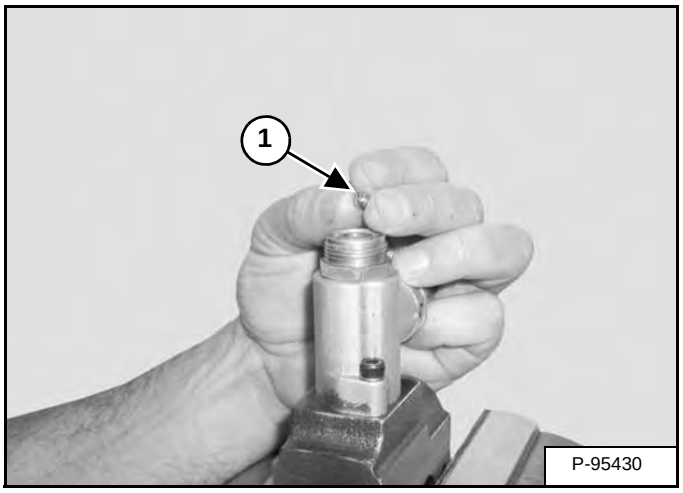
Detent Assembly (Cont'd)

Figure 20-100-24



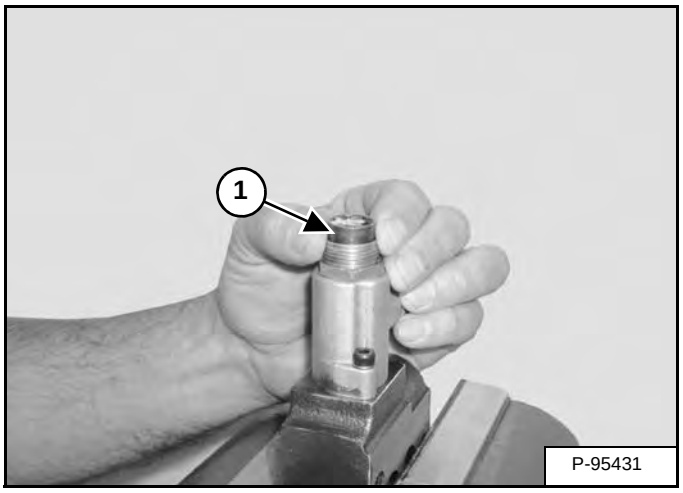
Install the fitting (Item 1) **[Figure 20-100-24]**.

Figure 20-100-25



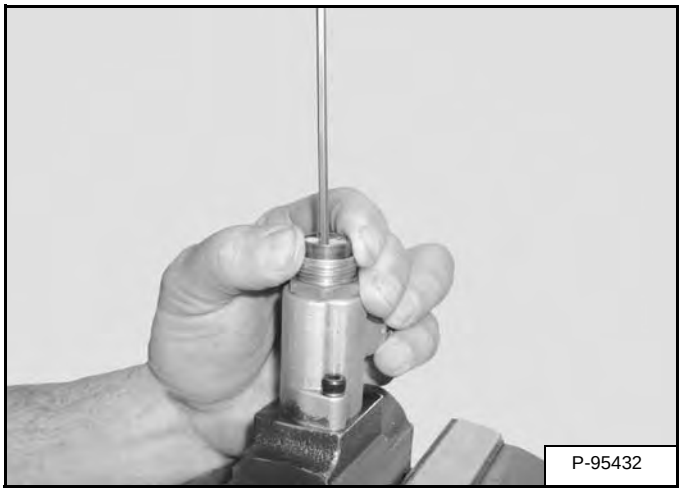
Apply grease on the large ball (Item 1) **[Figure 20-100-25]** and into the spool.

Figure 20-100-26



Install the sleeve (Item 1) **[Figure 20-100-26]**.

Figure 20-100-27

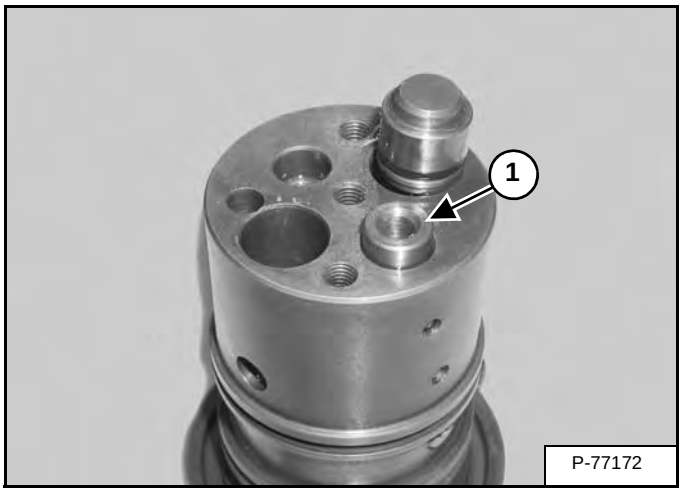


While holding the sleeve, push in on the large ball until the three smaller balls move into the spool while sliding the sleeve into the fitting **[Figure 20-100-27]**.

NOTE: The diameter of the tool used must be small enough to push the large ball (Item 1) [Figure 20-100-25] down below the three smaller balls (Item 1) [Figure 20-100-23] and allow the three balls to move inward.

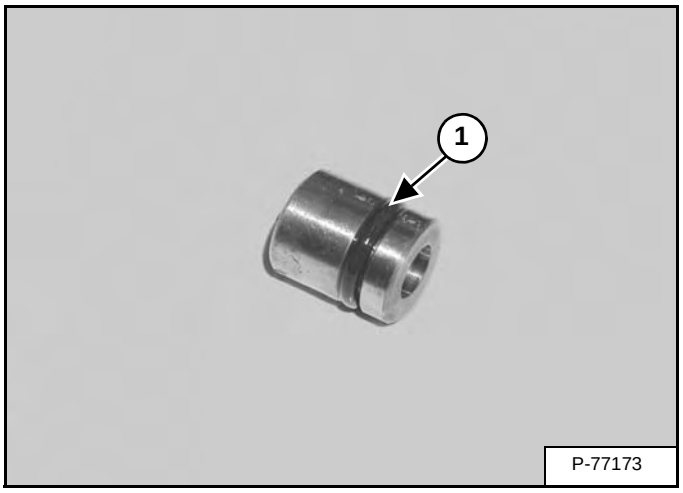
Disassembly And Assembly (Cont'd)

Figure 20-120-27



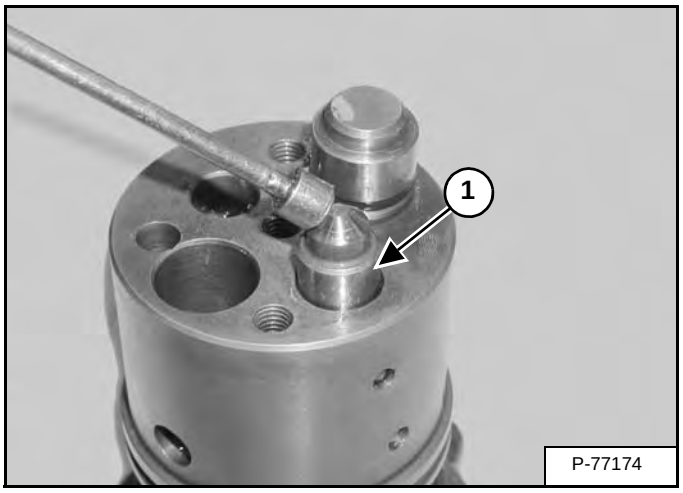
Remove the valve seat (Item 1) **[Figure 20-120-27]**.

Figure 20-120-28



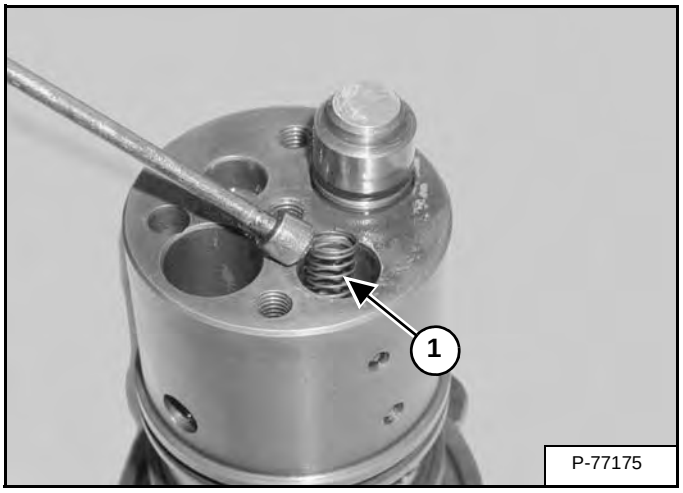
Remove the O-ring (Item 1) **[Figure 20-120-28]** and replace.

Figure 20-120-29



Remove the pilot valve (Item 1) **[Figure 20-120-29]**.

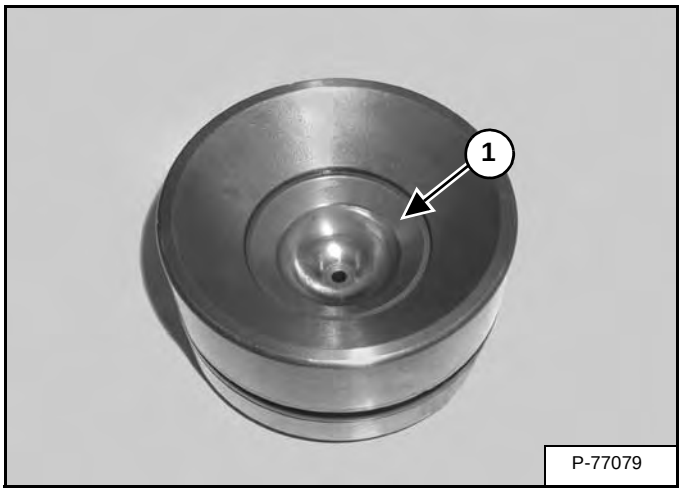
Figure 20-120-30



Remove the spring (Item 1) **[Figure 20-120-30]**.

Inspection (Cont'd)

Figure 20-130-14



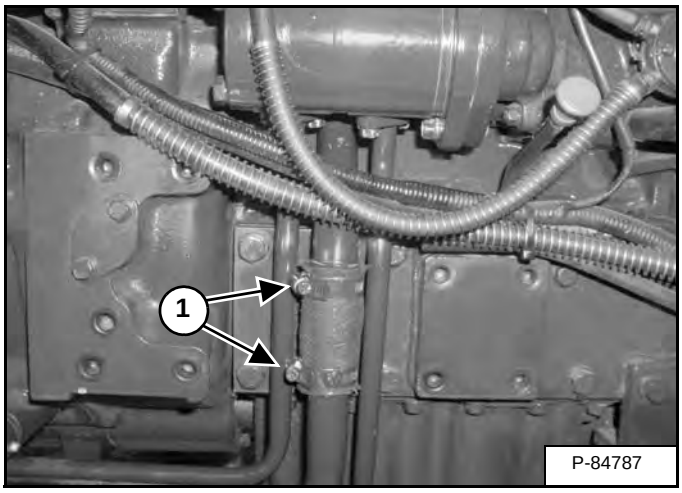
Inspect the piston running surface (Item 1) **[Figure 20-130-14]** for wear or damage.

MODULATOR VALVE

Removal And Installation

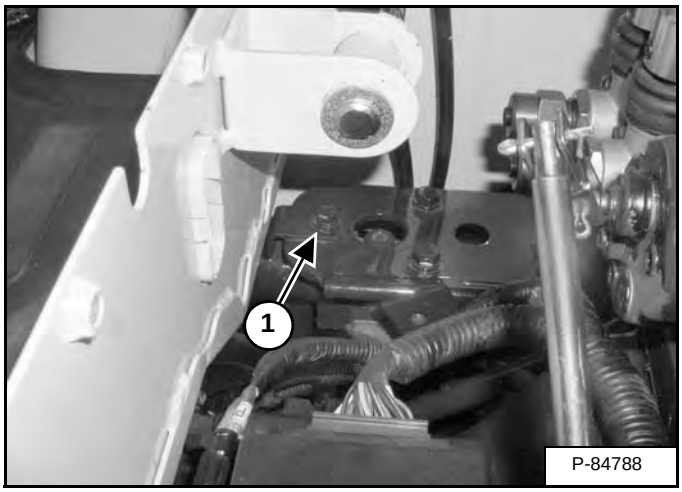
NOTE: The following procedure is performed on a compact tractor equipped with HST. Although the photos may appear different the procedure is the same for a compact tractor equipped with SST.

Figure 20-150-1



Loosen the hose clamps (Item 1) **[Figure 20-150-1]** on the supply line.

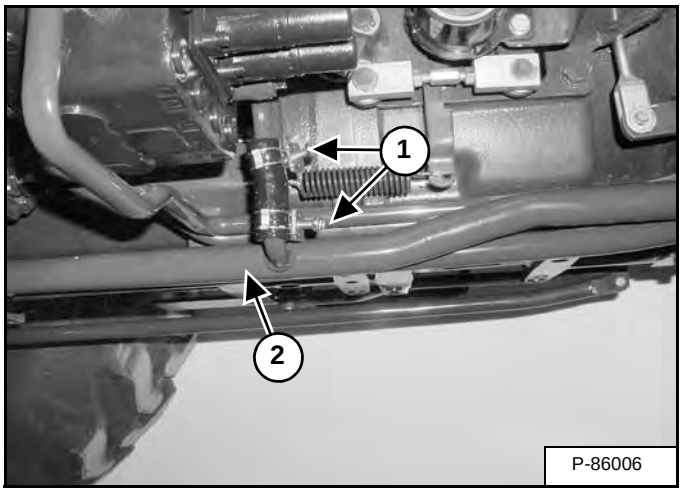
Figure 20-150-2



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

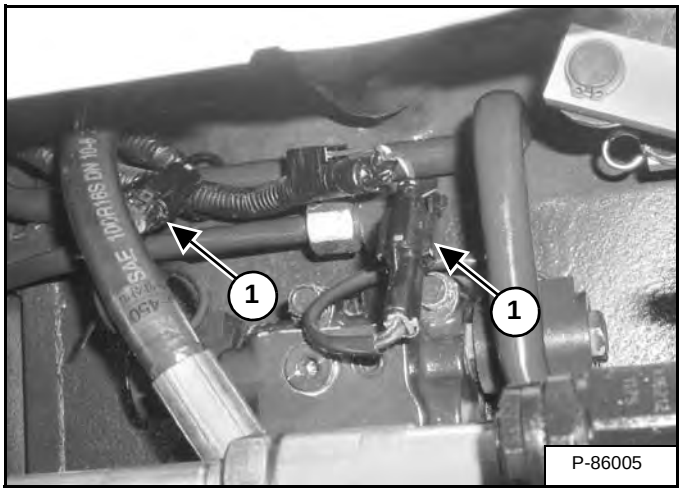
Installation: Tighten the bolt to 24,5 N•m (18 ft-lb) torque.

Figure 20-150-3



Loosen the hose clamps (Item 1) and remove the supply line (Item 2) **[Figure 20-150-3]**.

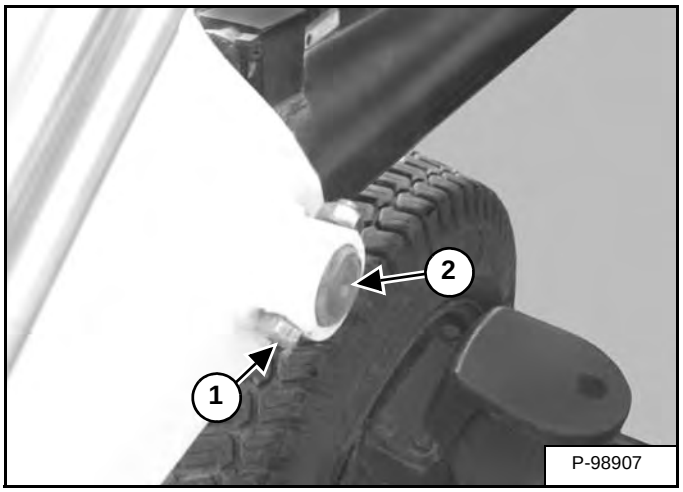
Figure 20-150-4



Disconnect the wire harness (Item 1) **[Figure 20-150-4]**.

Removal And Installation (Cont'd)

Figure 20-170-7



Remove the bolt and nut (Item 1). Remove the base end pin (Item 2) **[Figure 20-170-7]** and remove the cylinder.

Disassembly

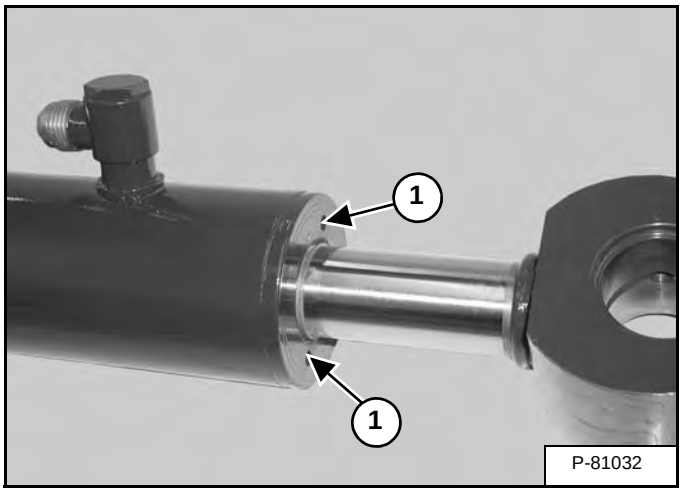
Clean the outside of the bucket cylinder before disassembly.

Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-2 - Special Offset Pins

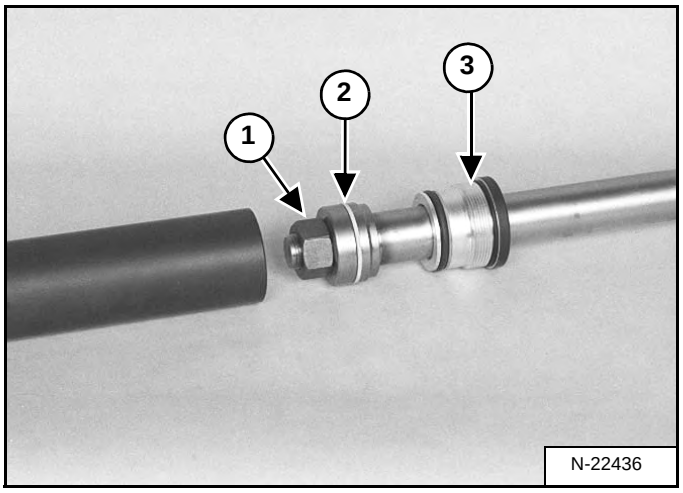
Hold the hydraulic cylinder over a drain pan and move the rod in and out slowly to remove the fluid from the cylinder.

Figure 20-171-8



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-171-8]** to loosen the head.

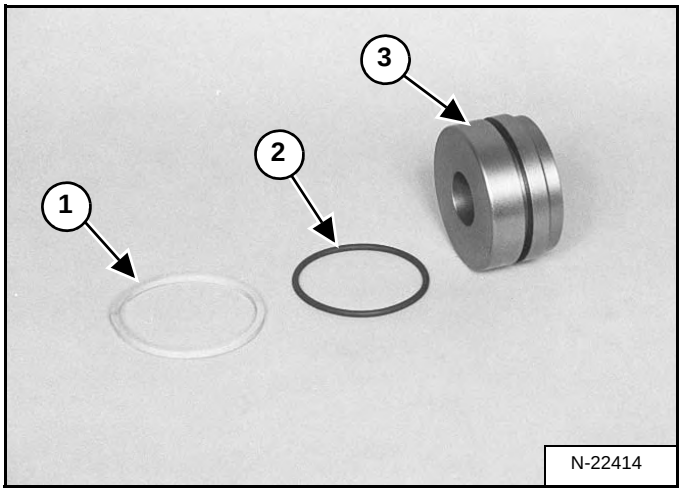
Figure 20-171-9



Remove the head and the rod assembly from the cylinder **[Figure 20-171-9]**. Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-171-9]**.

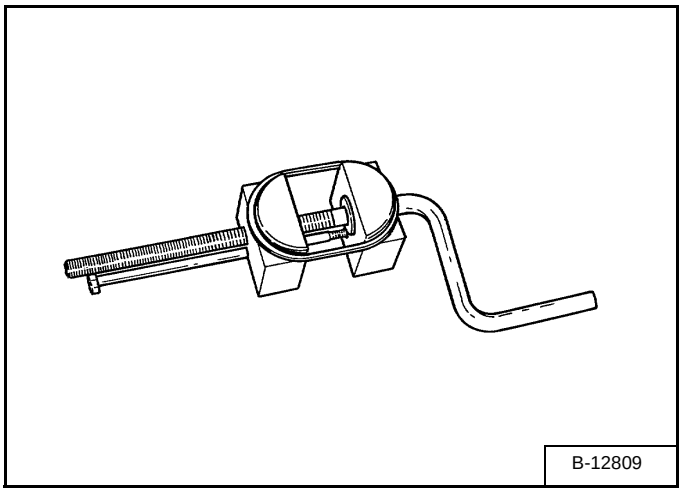
Figure 20-171-10



Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-171-10]**.

Assembly (Cont'd)

Figure 20-180-16

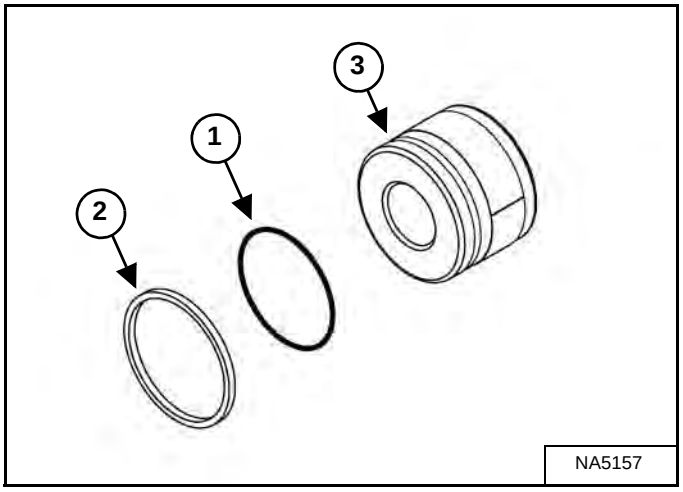


NOTE: Do not overstretch the seal.

Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-180-16]**.

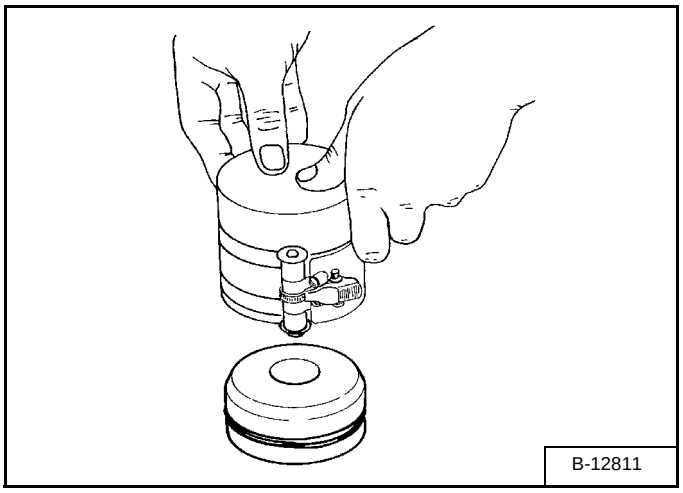
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-180-17



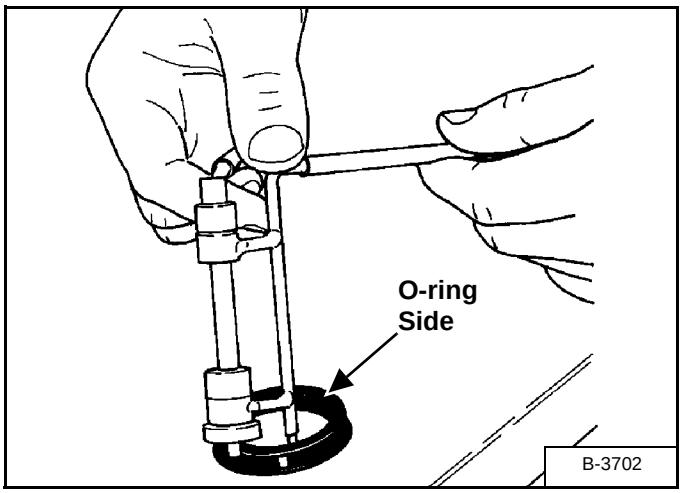
Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-180-17]**.

Figure 20-180-18



Use a ring compressor to compress the seal to the correct size **[Figure 20-180-18]**. Leave the piston in the ring compressor for three minutes.

Figure 20-180-19



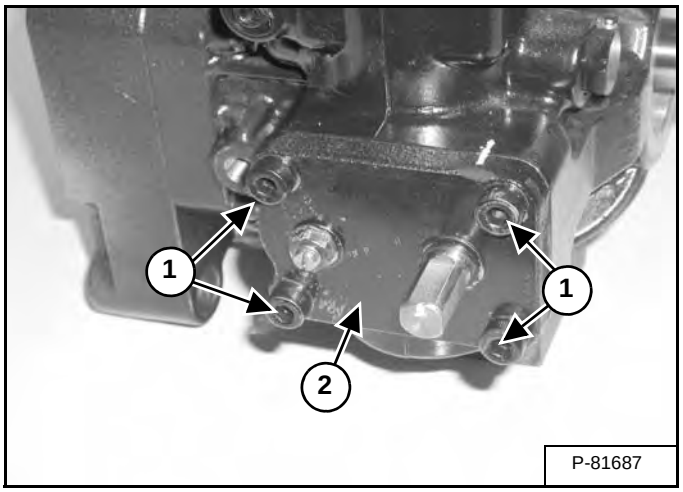
Install the oil seal on the rod seal tool **[Figure 20-180-19]**.

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

HYDROSTATIC SYSTEM

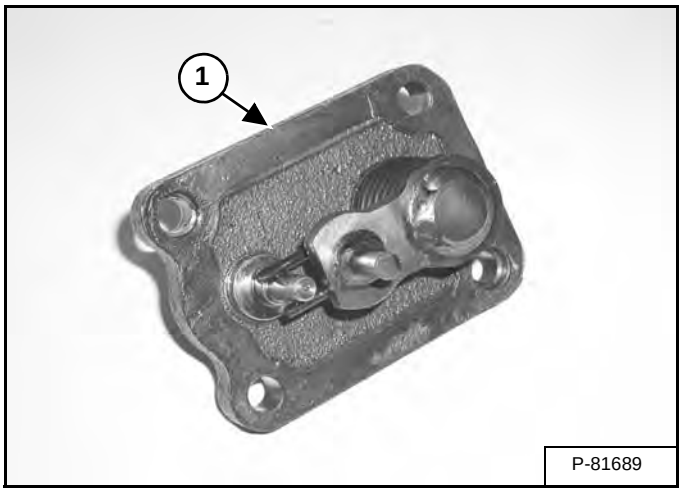
Disassembly

Figure 30-20-24



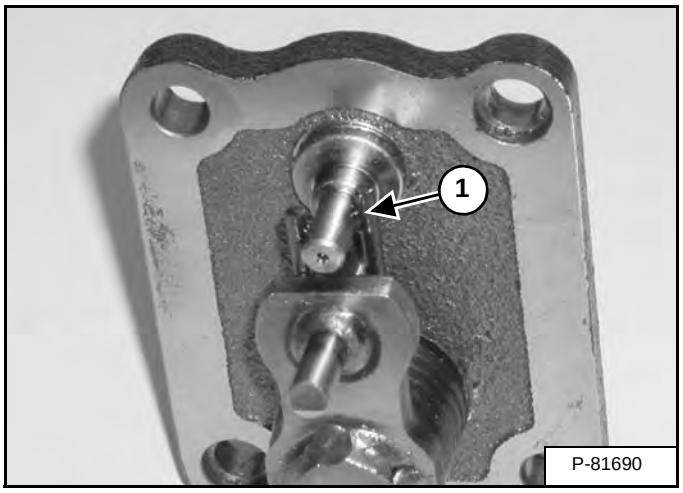
Remove the four bolts (Item 1) and cover (Item 2) **[Figure 30-20-24]**.

Figure 30-20-25



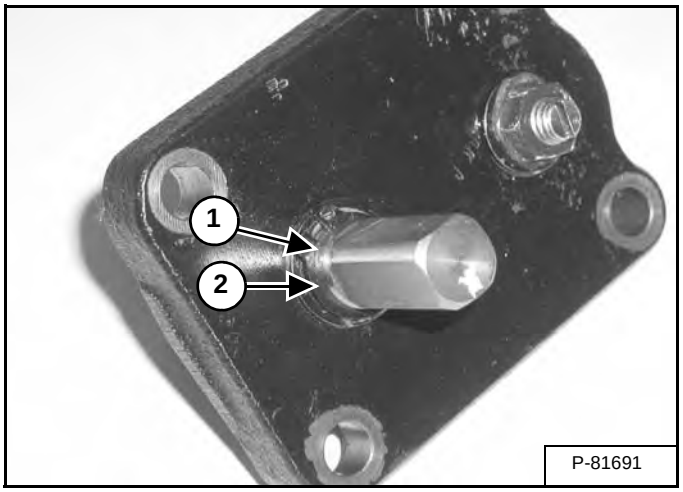
Remove the gasket (Item 1) **[Figure 30-20-25]** from the cover.

Figure 30-20-26



Record the position of the spring (Item 1) **[Figure 30-20-26]** before removing.

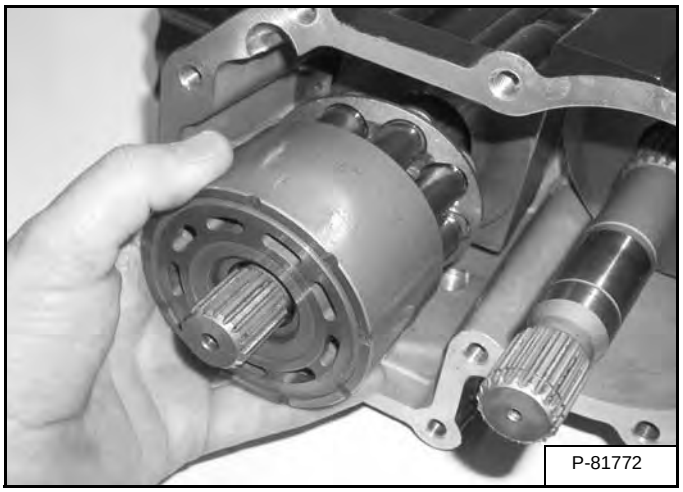
Figure 30-20-27



Remove the snap ring (Item 1) and washer (Item 2) **[Figure 30-20-27]** from the shaft.

Disassembly (Cont'd)

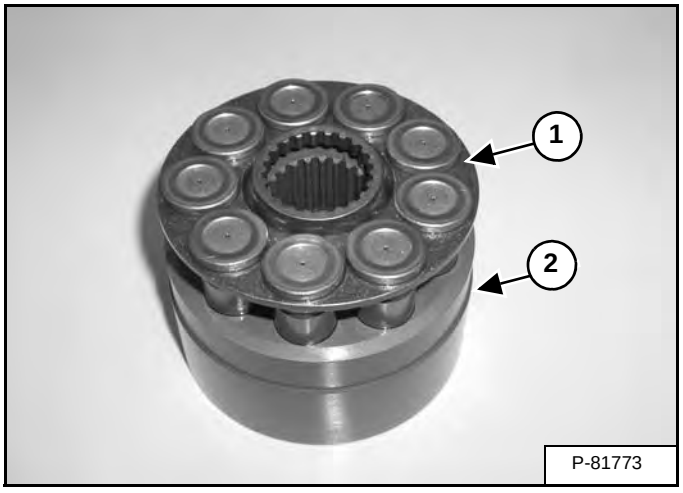
Figure 30-20-72



Remove the cylinder block / piston assembly from the pump shaft.

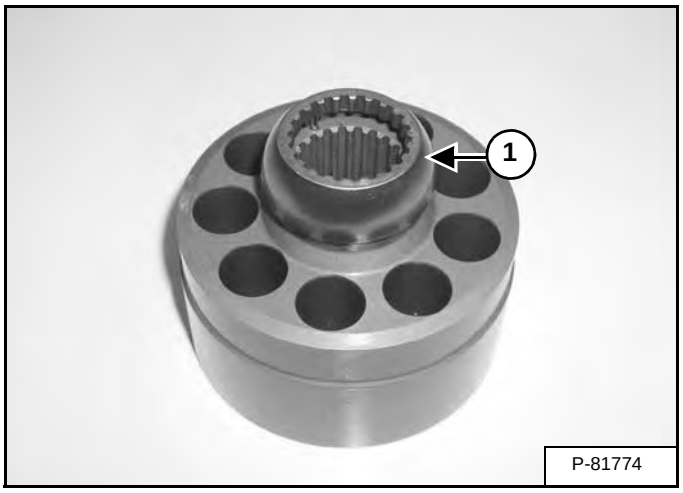
NOTE: Do not mix rotating group ports from the pump shaft with the motor shaft.

Figure 30-20-73



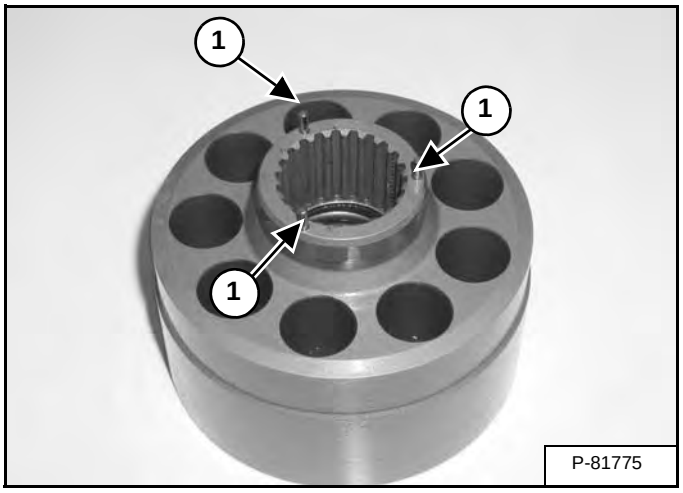
Remove the pistons and retainer plate assembly (Item 1) from the cylinder block (Item 2) **[Figure 30-20-73]**.

Figure 30-20-74



Remove the retainer washer (Item 1) **[Figure 30-20-74]**.

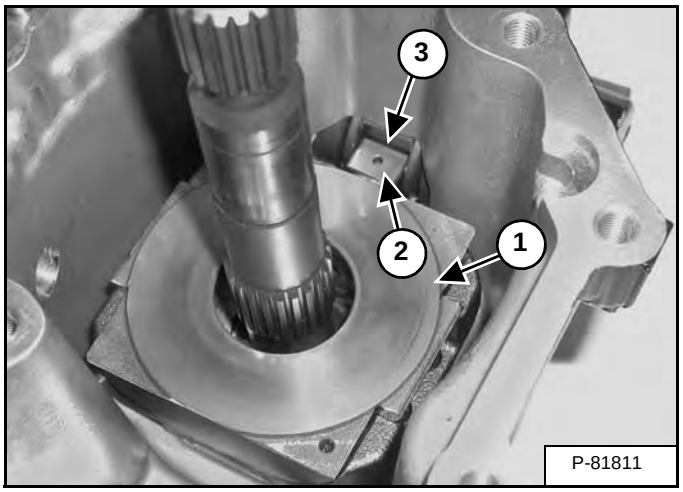
Figure 30-20-75



Remove the three pins (Item 1) **[Figure 30-20-75]** from the cylinder block.

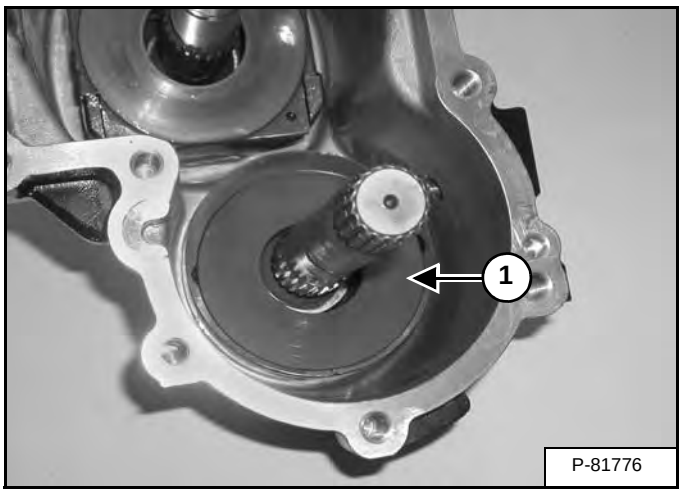
Assembly (Cont'd)

Figure 30-20-119



Lightly lubricate the cradle and install the swash plate assembly (Item 1). Make sure the hole (Item 2) is pointing up when installed into the power piston groove (Item 3) **[Figure 30-20-119]**.

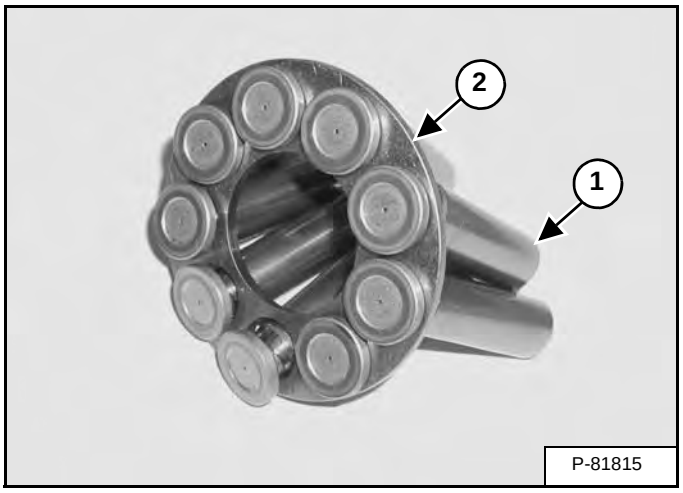
Figure 30-20-120



Install the thrust plate (Item 1) **[Figure 30-20-120]**.

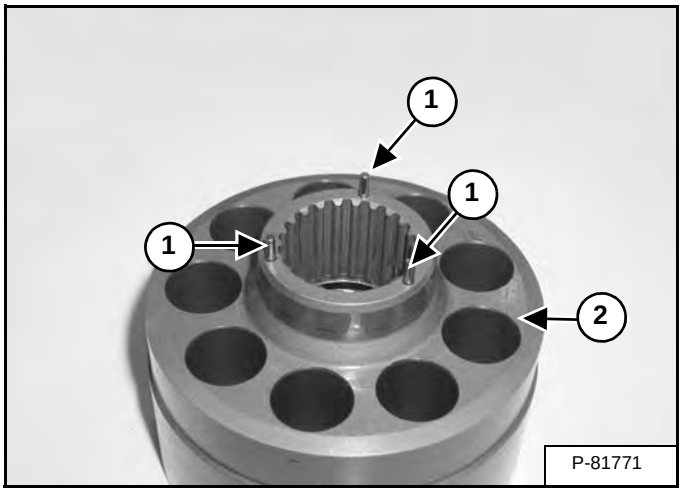
NOTE: The beveled edge must face the plate.

Figure 30-20-121



Lightly lubricate the pistons (Item 1) and install into the retainer ring (Item 2) **[Figure 30-20-121]**,

Figure 30-20-122

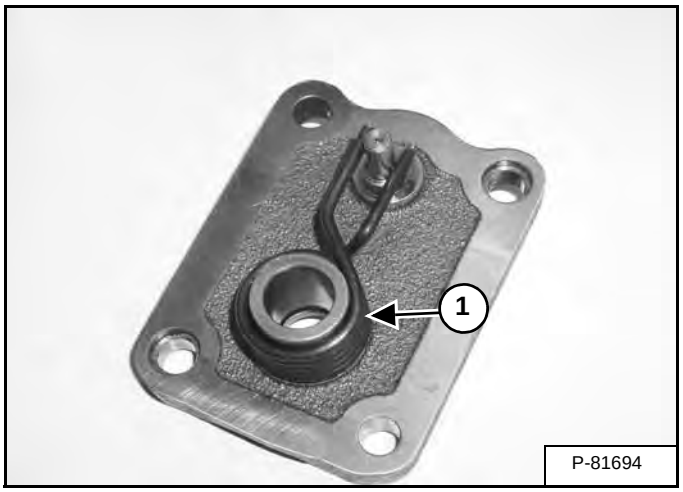


Install the three pins (Item 1) into the block (Item 2) **[Figure 30-20-122]**.

NOTE: Apply light grease to the pins to retain them.

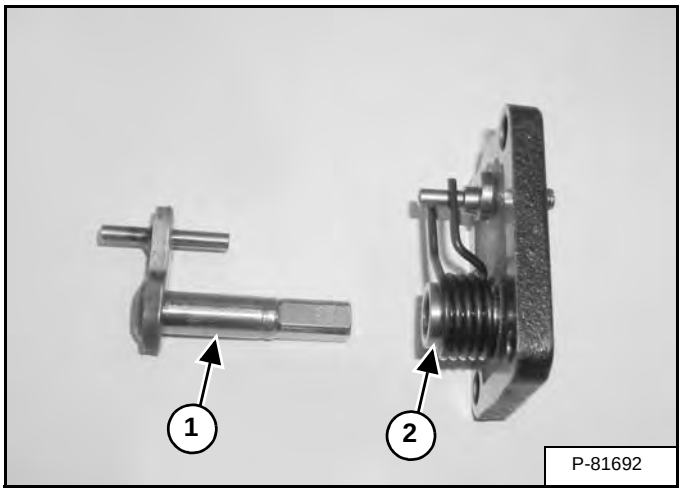
Assembly (Cont'd)

Figure 30-20-167



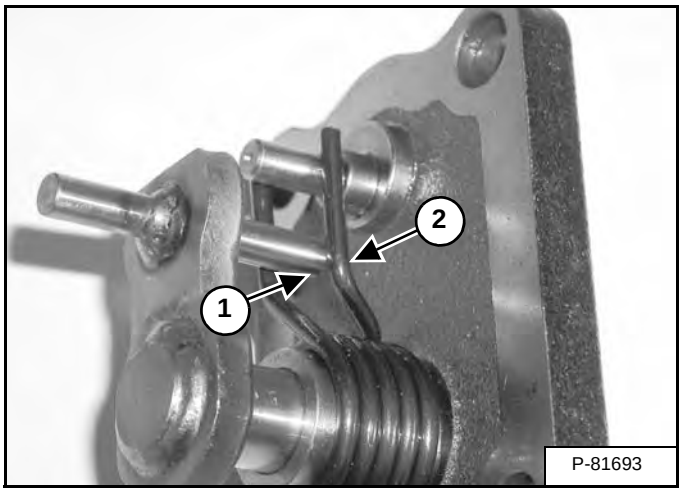
Install the spring (Item 1) **[Figure 30-20-167]** onto the cover as shown.

Figure 30-20-168



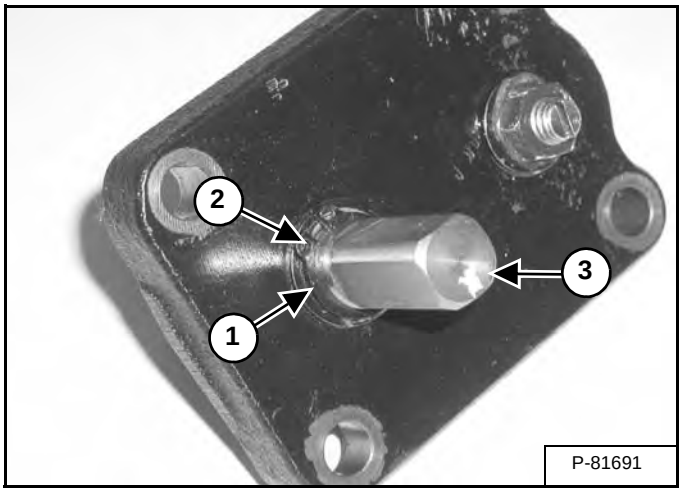
Install the adjustment arm (Item 1) into the cover (Item 2) **[Figure 30-20-168]**.

Figure 30-20-169



The pin (Item 1) must enter the spring (Item 2) **[Figure 30-20-169]** (as shown).

Figure 30-20-170



Install the washer (Item 1) and snap ring (Item 2) onto the shaft (Item 3) **[Figure 30-20-170]**.

TRAVEL CONTROL PEDAL PIVOT ARMS (HST MODELS)

Removal And Installation

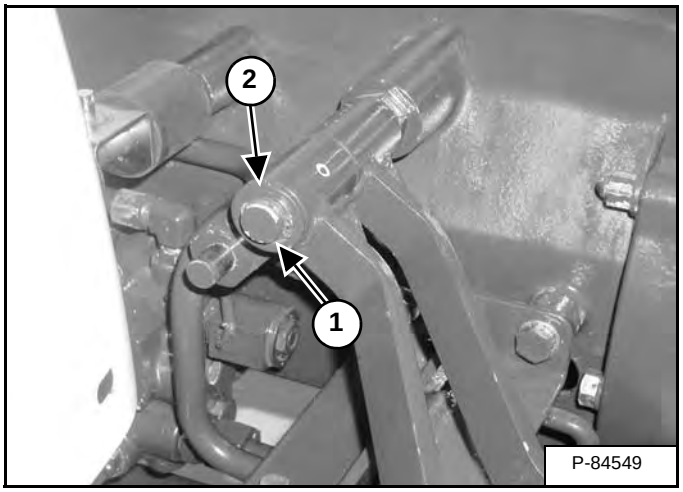
NOTE: The floor plate is removed for photo clarity.

Remove the travel control pedals. (See Removal And Installation on Page 30-40-1.)

Remove the travel control pedal linkage. (See Removal And Installation on Page 30-50-1.)

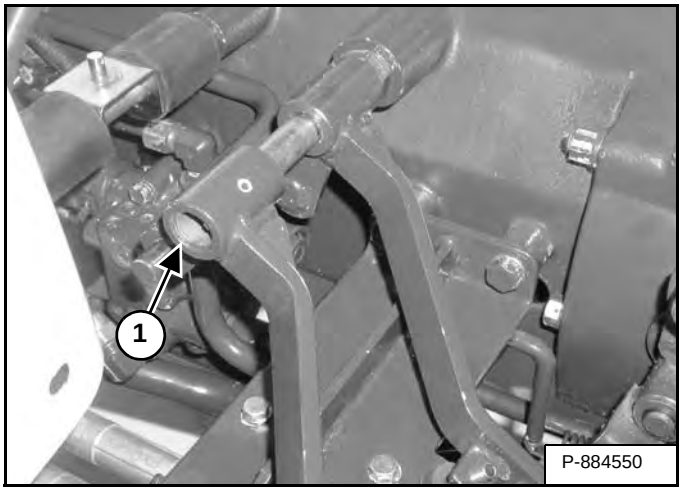
NOTE: The floor plate is removed for photo clarity.

Figure 30-60-1



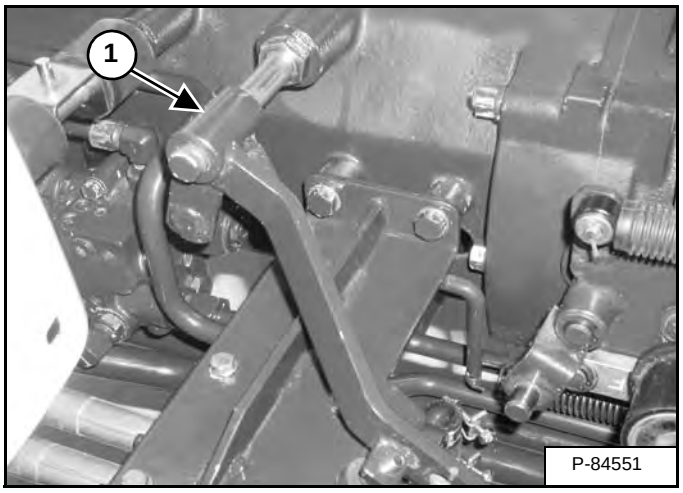
Remove the snap ring (Item 1) and washer (Item 2) **[Figure 30-60-1]**.

Figure 30-60-2



Remove the reverse pivot arm (Item 1) **[Figure 30-60-2]** from the pivot shaft.

Figure 30-60-3



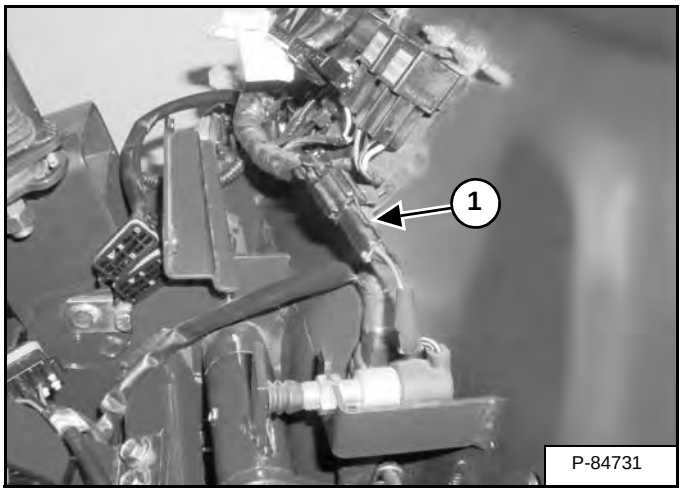
Remove forward pivot arm (Item 1) **[Figure 30-60-3]** from the pivot shaft.

Stop Switch Adjustment (HST Models)

Right Switch Adjustment

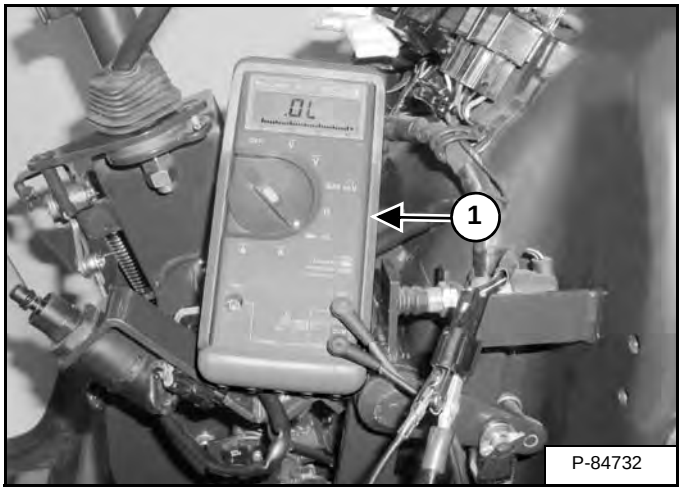
Remove the instrument panel. (See Removal And Installation on Page 60-80-1.)

Figure 40-10-5



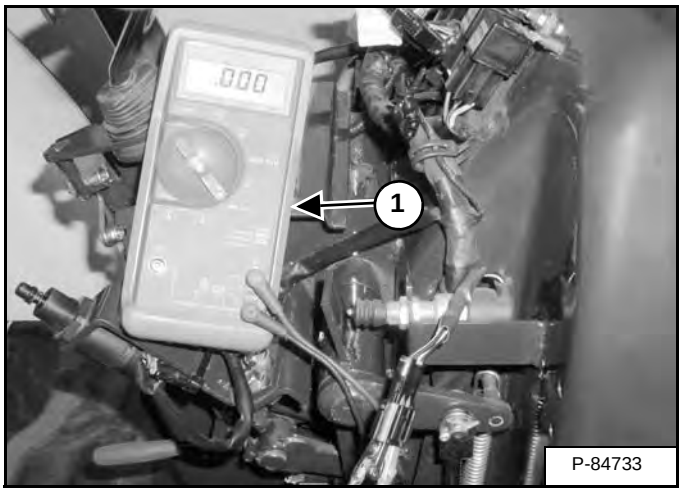
Disconnect the wire harness (Item 1) **[Figure 40-10-5]**.

Figure 40-10-6



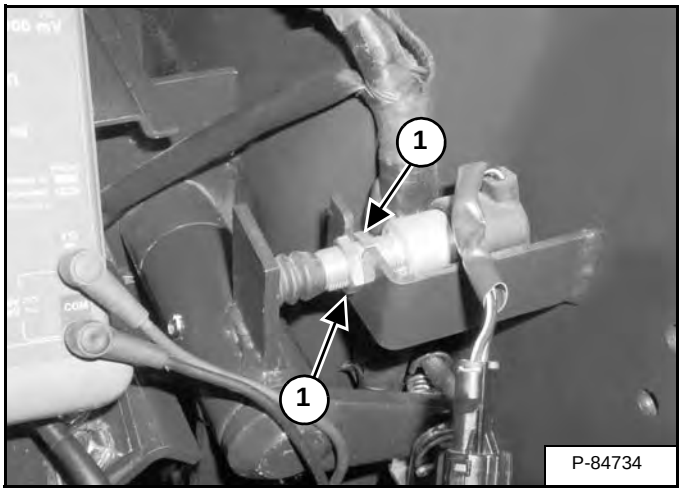
Connect a multimeter to the switch wire connector. There must be no continuity shown on the multimeter (Item 1) **[Figure 40-10-6]**.

Figure 40-10-7



Depress the brake pedal. There must be continuity shown on the multimeter (Item 1) **[Figure 40-10-7]**.

Figure 40-10-8



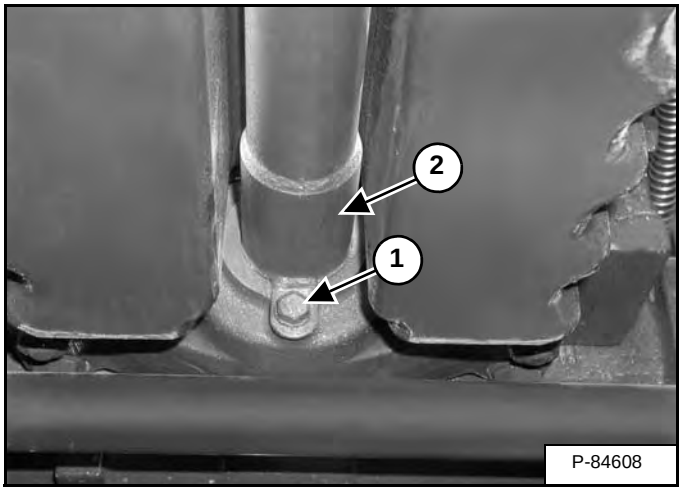
Loosen the nuts (Item 1) **[Figure 40-10-8]** and adjust the switch until there is continuity when the brake pedal is depressed and no continuity when the brake pedal is released.

DRIVESHAFT (EARLY MODELS)

Removal And Installation

Put blocks in front and behind the rear wheels to keep machine from rolling.

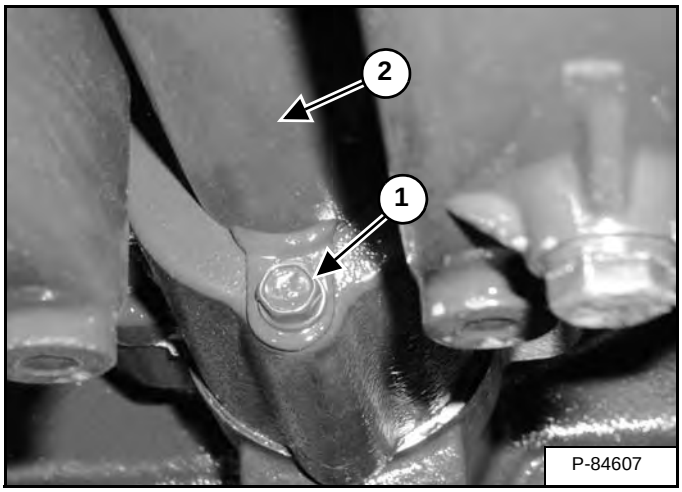
Figure 40-30-1



Remove the bolt (Item 1) from the front of the driveshaft cover and slide the cover (Item 2) **[Figure 40-30-1]** back.

Installation: Tighten the bolt to 24 - 27 N•m (17 - 20 ft-lb) torque.

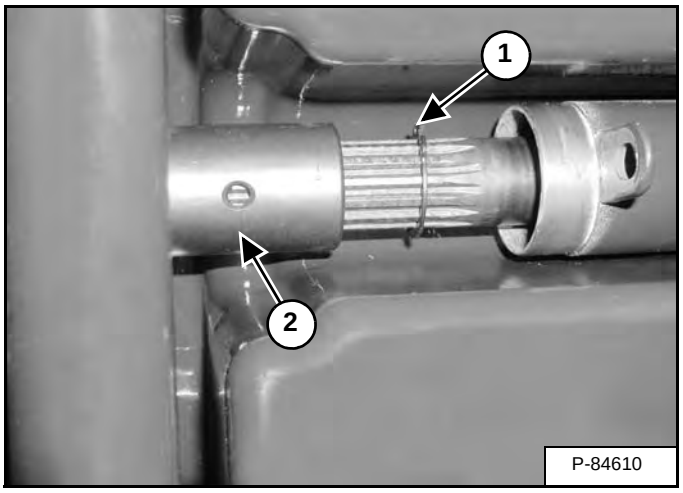
Figure 40-30-2



Remove the bolt (Item 1) from the rear of the driveshaft cover and slide the cover (Item 2) **[Figure 40-30-2]** forward.

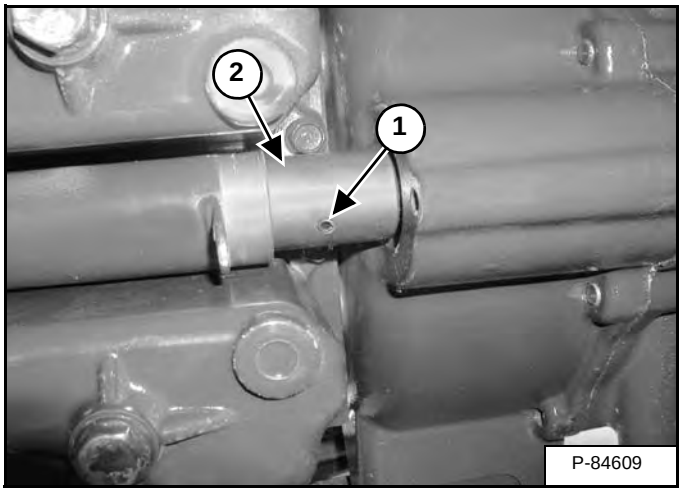
Installation: Tighten the bolt to 24 - 27 N•m (17 - 20 ft-lb) torque.

Figure 40-30-3



Move the snap ring (Item 1) back and slide the coupler (Item 2) **[Figure 40-30-3]** onto the driveshaft.

Figure 40-30-4



Remove the roll pin (Item 1) and slide the coupler (Item 2) forward **[Figure 40-30-4]** onto the driveshaft.

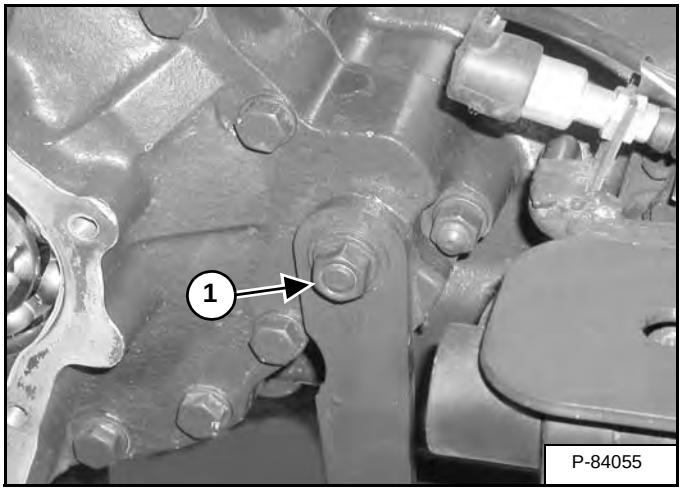
Remove the driveshaft.

BRAKE CASE

Removal And Installation

Remove the axle case. (See Removal And Installation on Page 40-40-1.)

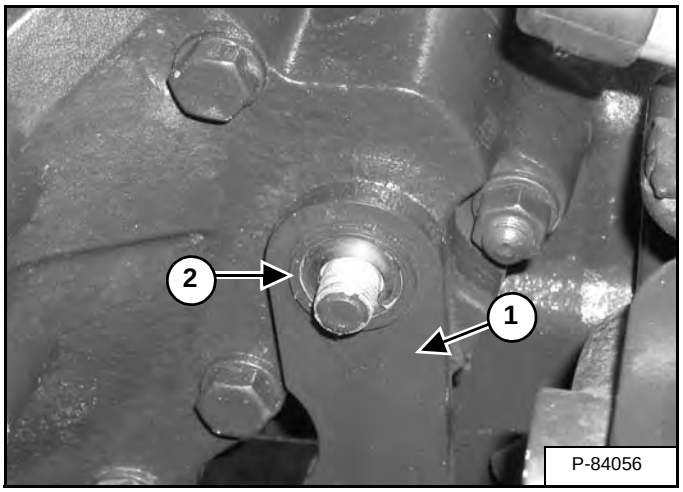
Figure 40-50-1



Remove the nut and lock washer (Item 1) **[Figure 40-50-1]**.

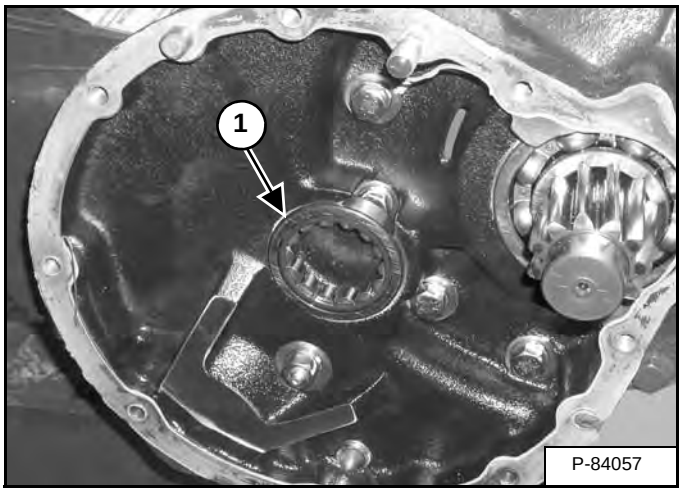
Installation: Tighten the nut to 24 - 27 N•m (17 - 20 ft-lb) torque.

Figure 40-50-2



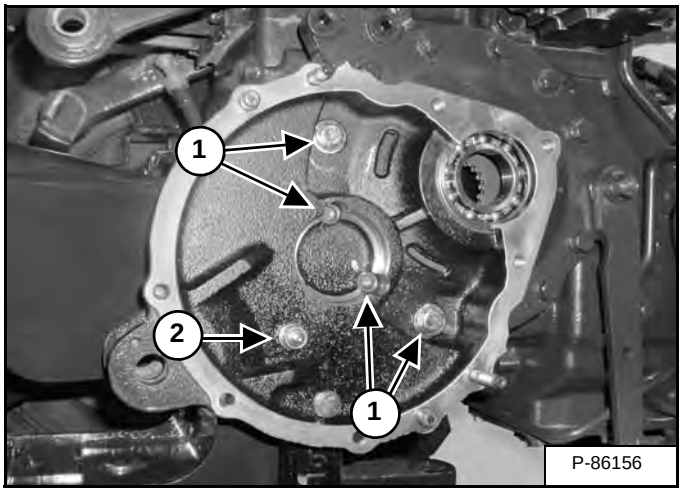
Remove the brake linkage (Item 1) and spacers (Item 2) **[Figure 40-50-2]**.

Figure 40-50-3



Remove the bearing (Item 1) **[Figure 40-50-3]**.

Figure 40-50-4

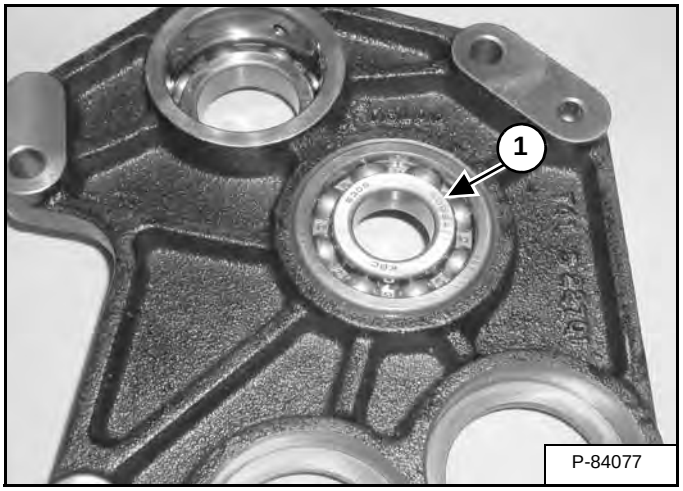


Remove the four bolts (Item 1) and nut (Item 2) **[Figure 40-50-4]**.

Installation: Tighten the bolts and nut to 74 - 93 N•m (54 - 69 ft-lb) torque.

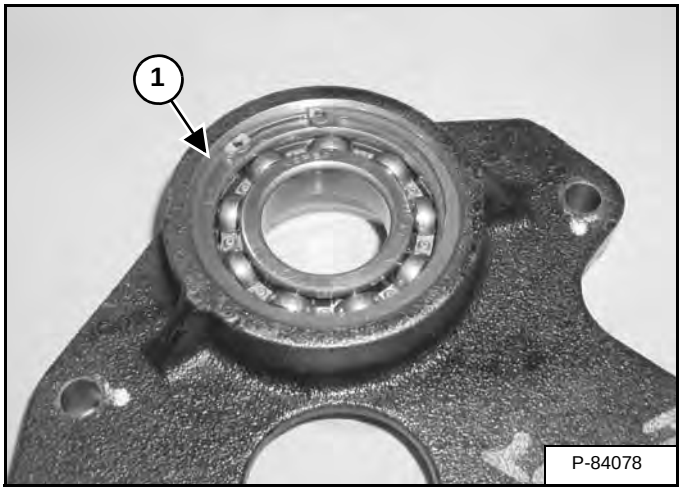
Middle Case / PTO Clutch Group Disassembly (Cont'd)

Figure 40-60-9



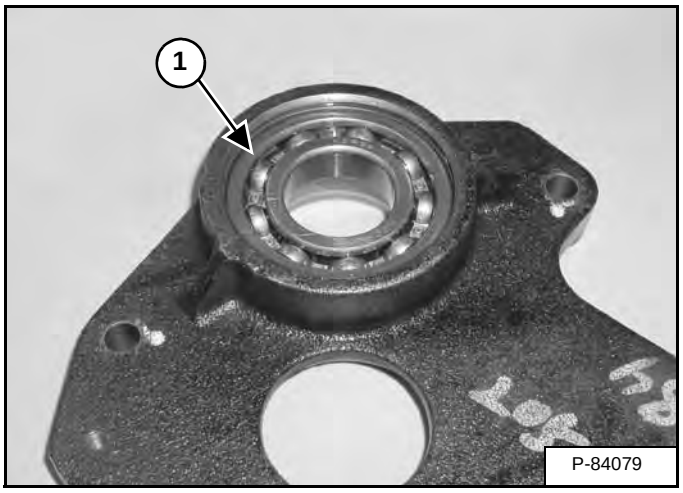
Remove the bearing (Item 1) **[Figure 40-60-9]**.

Figure 40-60-10



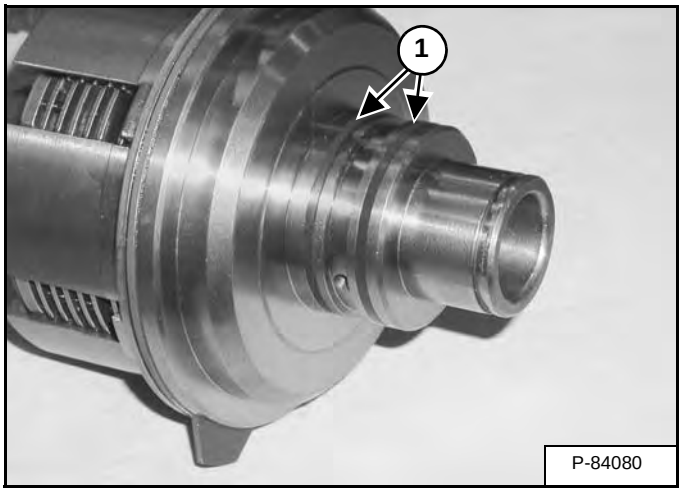
Remove the snap ring (Item 1) **[Figure 40-60-10]**.

Figure 40-60-11



Remove the bearing (Item 1) **[Figure 40-60-11]** from the cover.

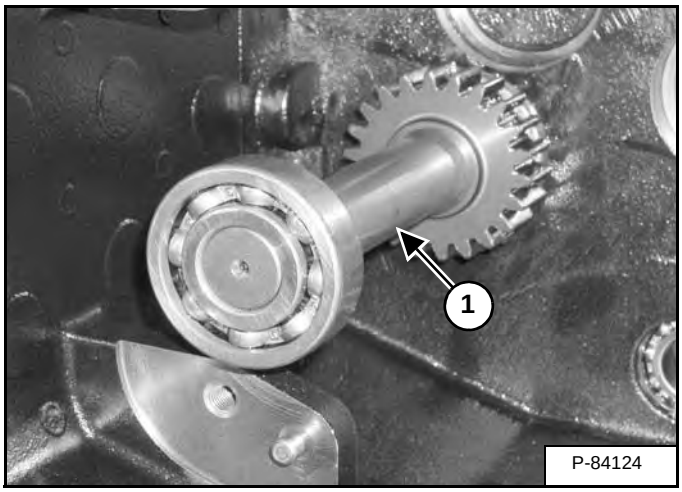
Figure 40-60-12



Remove the two seals (Item 1) **[Figure 40-60-12]** from the clutch assembly.

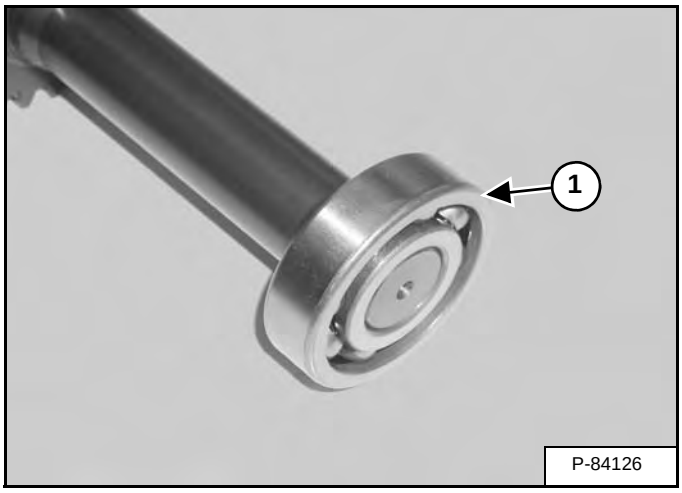
Middle Case / Countershaft Group Disassembly

Figure 40-60-43



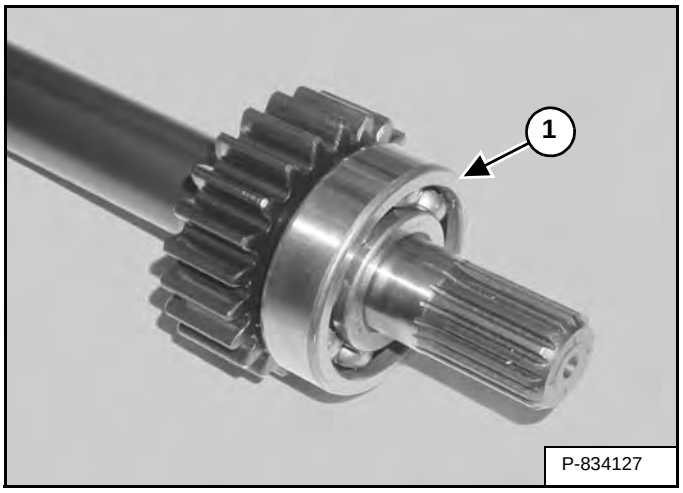
Remove the countershaft assembly (Item 1) **[Figure 40-60-43]** from the housing.

Figure 40-60-44



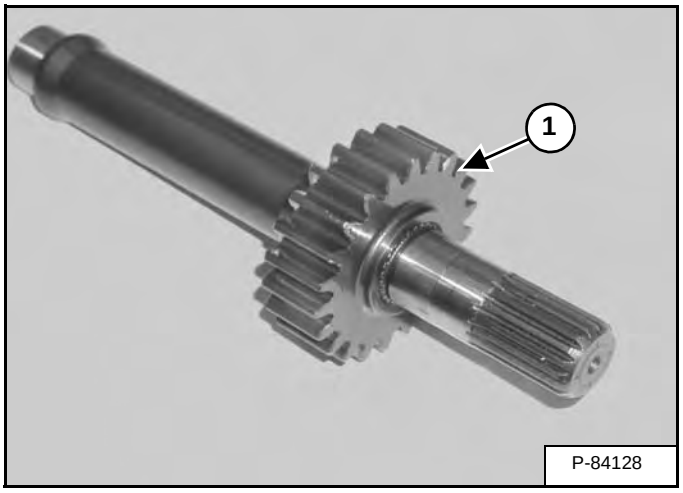
Remove the bearing (Item 1) **[Figure 40-60-44]** from the shaft.

Figure 40-60-45



Remove the bearing (Item 1) **[Figure 40-60-45]**.

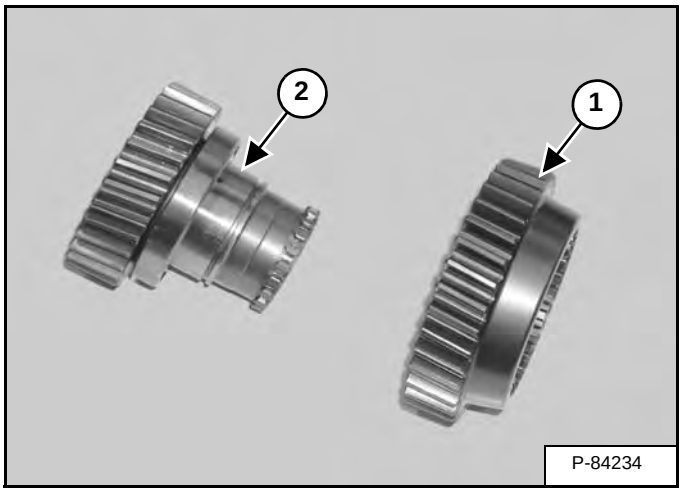
Figure 40-60-46



Remove the 22 gear (Item 1) **[Figure 40-60-46]**.

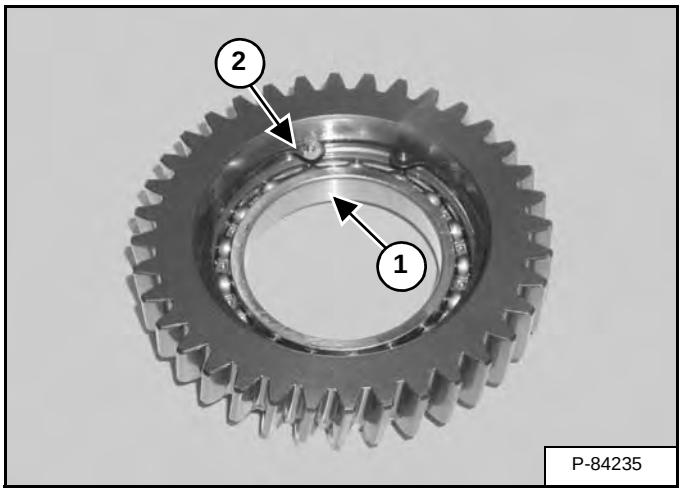
Pinion Shaft Group Disassembly (Cont'd)

Figure 40-60-82



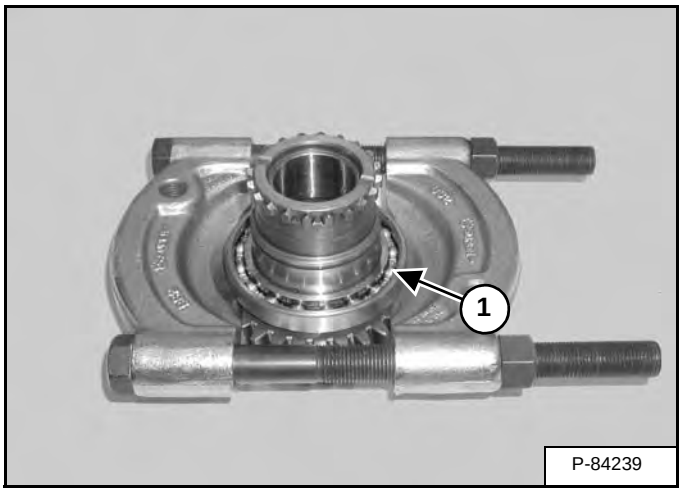
Remove the 36 gear (Item 1) from the 30 gear (Item 2) **[Figure 40-60-82]**.

Figure 40-60-83



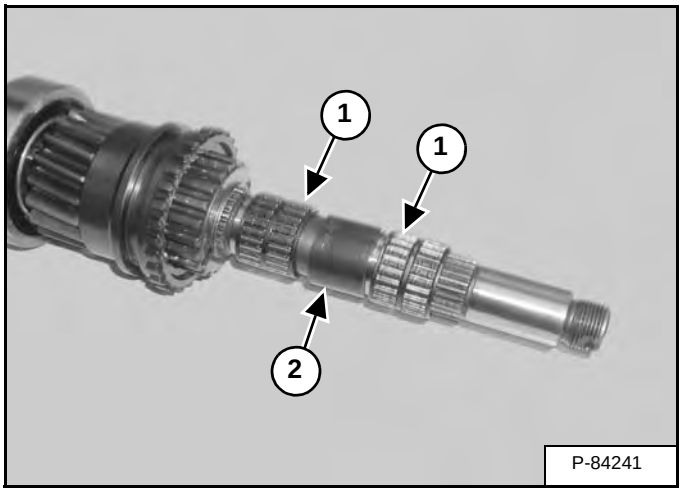
Remove the snap ring (Item 1) and bearing (Item 2) **[Figure 40-60-83]**.

Figure 40-60-84



Remove the bearing (Item 1) **[Figure 40-60-84]** from the 30 gear shaft.

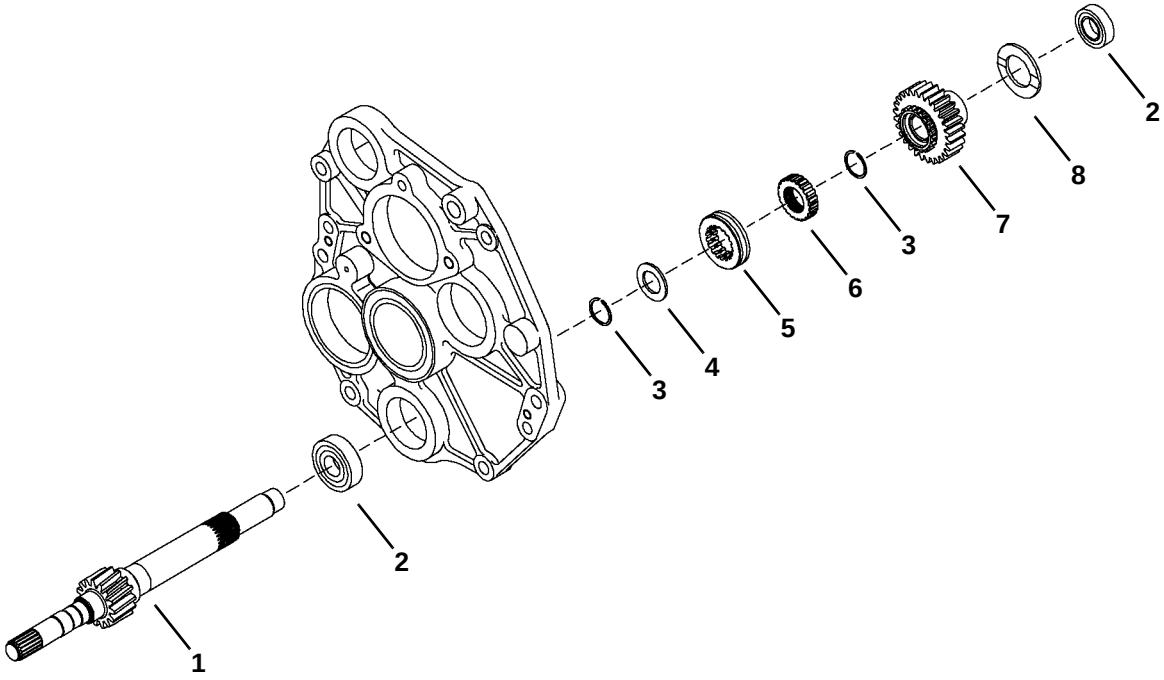
Figure 40-60-85



Remove the two needle bearings (Item 1) and spacer (Item 2) **[Figure 40-60-85]** from the shaft.

PTO 15 Gear Shaft Group Parts Identification

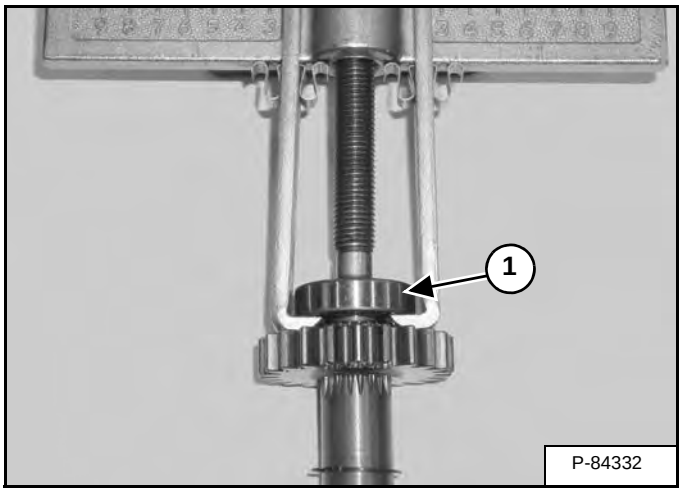
1. PTO 15 Gear Shaft
2. Bearing
3. Snap Ring
4. Spacer
5. Shift Assembly
6. Spline Boss
7. 28 Gear
8. Thrust Collar



MS-2717S

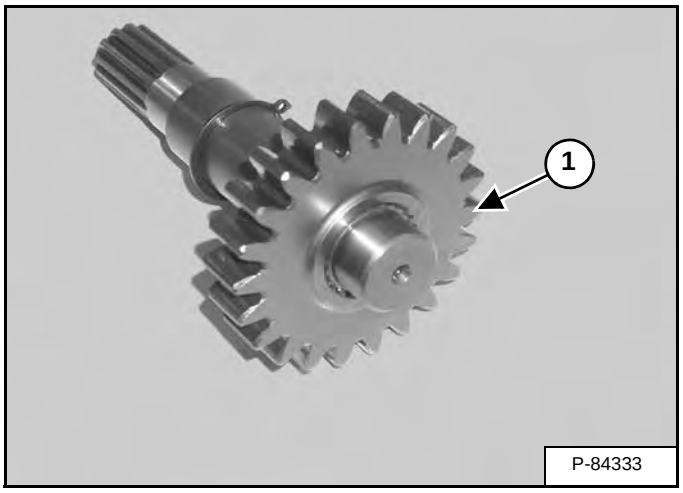
Front Wheel Drive Shaft Group Disassembly (Cont'd)

Figure 40-60-149



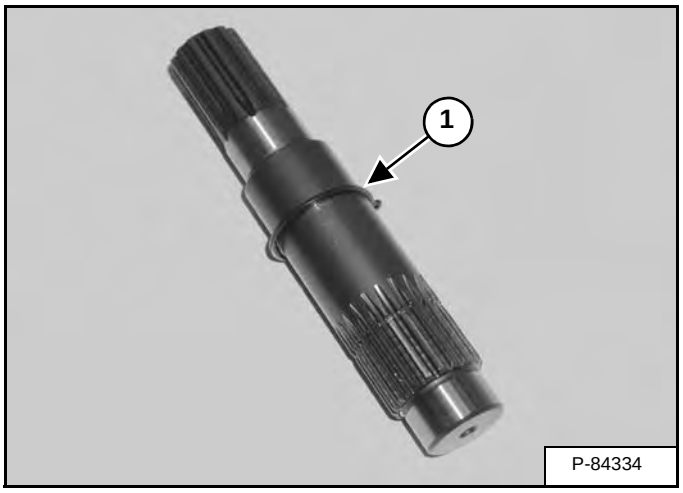
Remove the bearing (Item 1) **[Figure 40-60-149]**.

Figure 40-60-150



Remove the gear (Item 1) **[Figure 40-60-150]**.

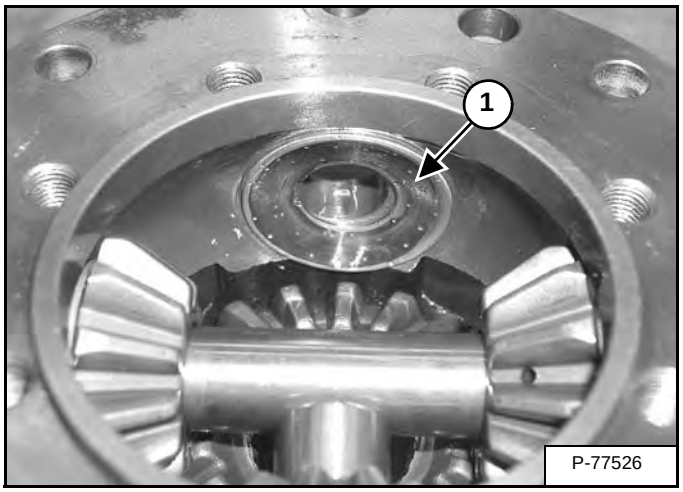
Figure 40-60-151



Remove the snap ring (Item 1) **[Figure 40-60-151]** from the shaft.

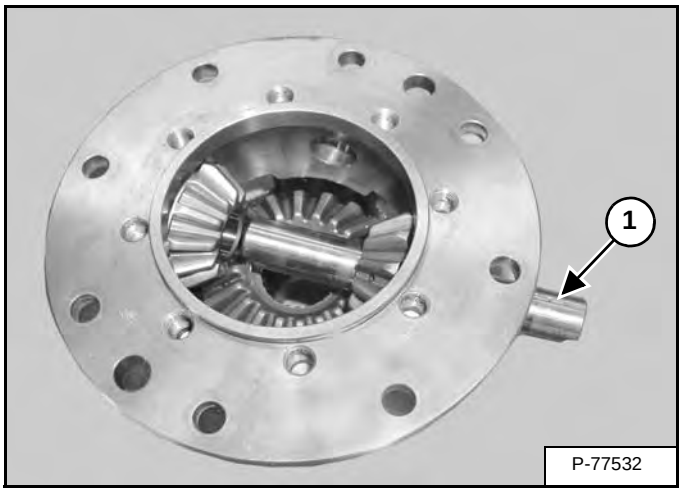
Differential Disassembly (Cont'd)

Figure 40-60-184



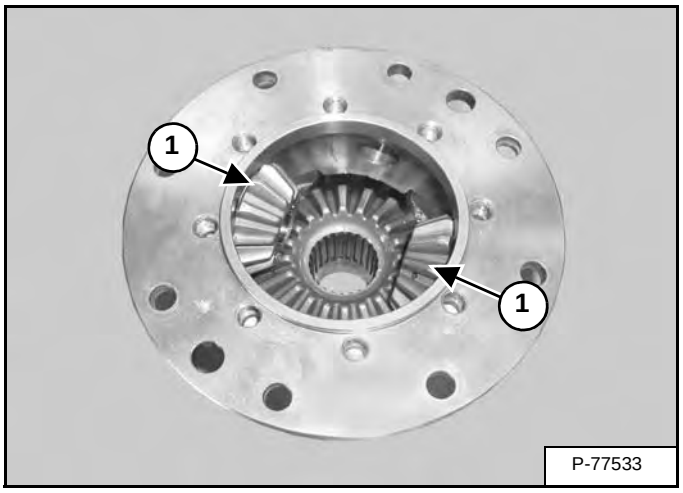
Remove the cup washer (Item 1) **[Figure 40-60-184]**.

Figure 40-60-185



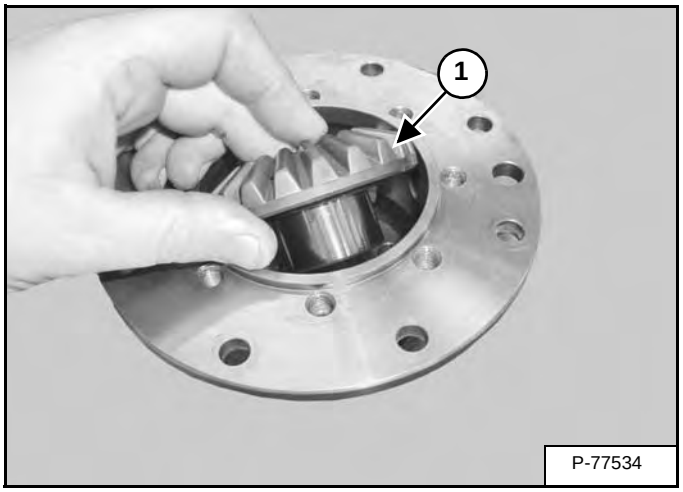
Remove the long pinion shaft assembly (Item 1) **[Figure 40-60-185]**.

Figure 40-60-186



Remove the two pinion gears / cup washers (Item 1) **[Figure 40-60-186]**.

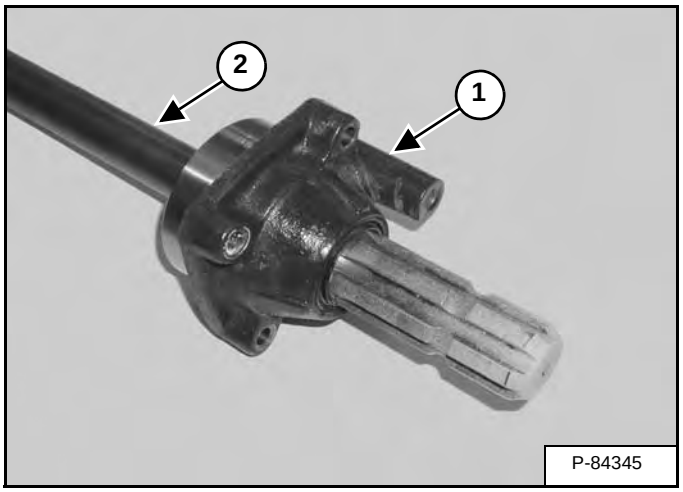
Figure 40-60-187



Remove the side gear (Item 1) **[Figure 40-60-187]**.

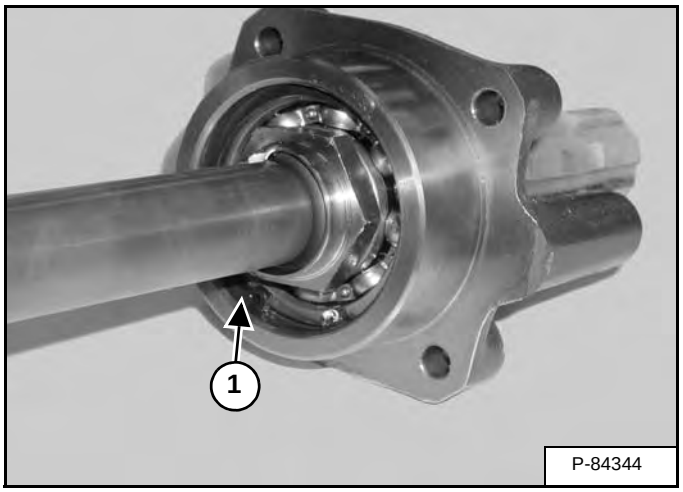
Rear PTO Shaft Group Assembly (Cont'd)

Figure 40-60-226



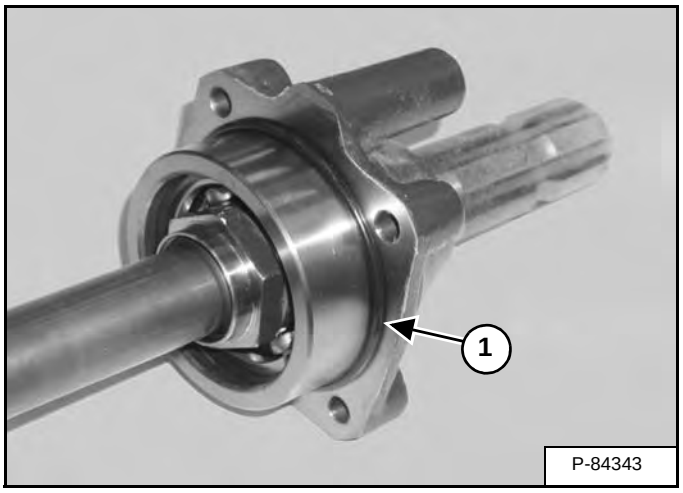
Lubricate the oil seals (Item 1) **[Figure 40-60-225 on Page 40-60-76]** and install the cover (Item 1) onto the shaft (Item 2) **[Figure 40-60-226]**.

Figure 40-60-227



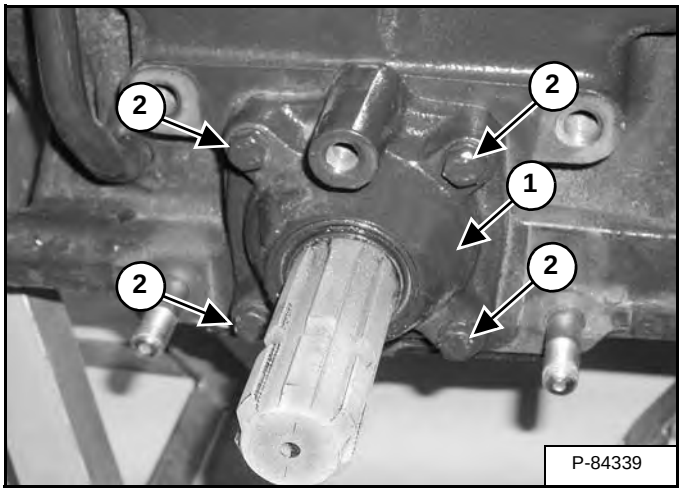
Install the snap ring (Item 1) **[Figure 40-60-227]**.

Figure 40-60-228



Install the O-ring (Item 1) **[Figure 40-60-228]** onto the cover.

Figure 40-60-229

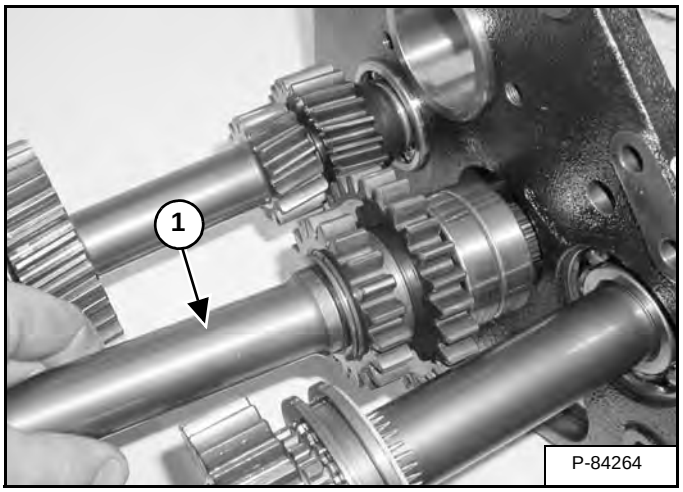


Clean and apply gasket eliminator to the mounting surface and install the PTO assembly (Item 1) into the housing. Install the four bolts (Item 2) **[Figure 40-60-229]**.

NOTE: Use any aftermarket gasket eliminator except regular RTV silicone.

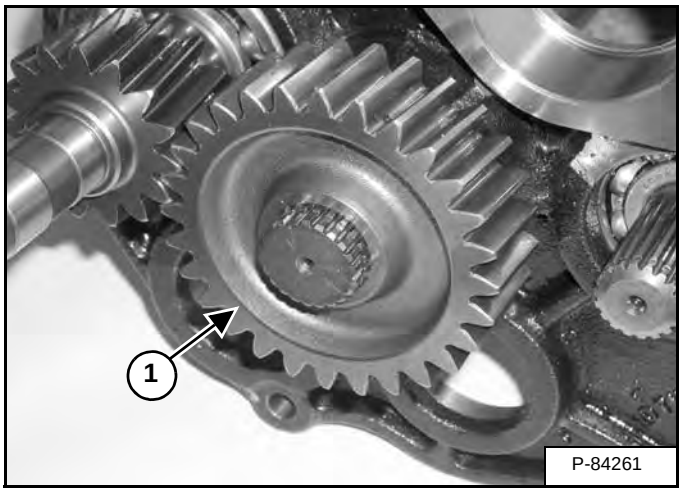
PTO Shaft Group Assembly (Cont'd)

Figure 40-60-268



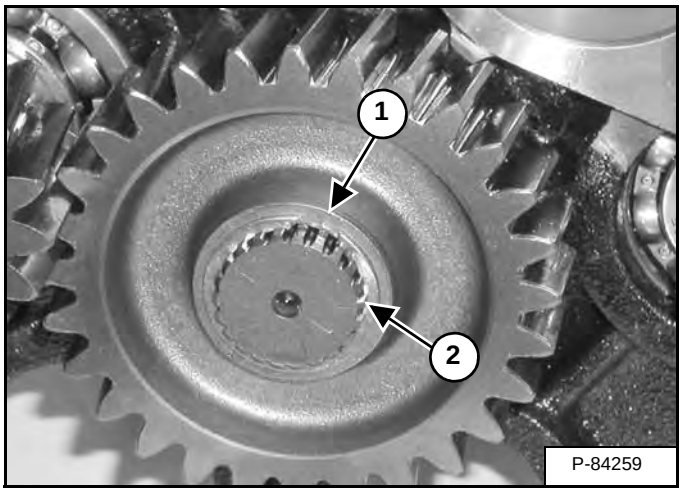
Install the PTO shaft assembly (Item 1) **[Figure 40-60-268]** into the backside of the bearing cover.

Figure 40-60-269



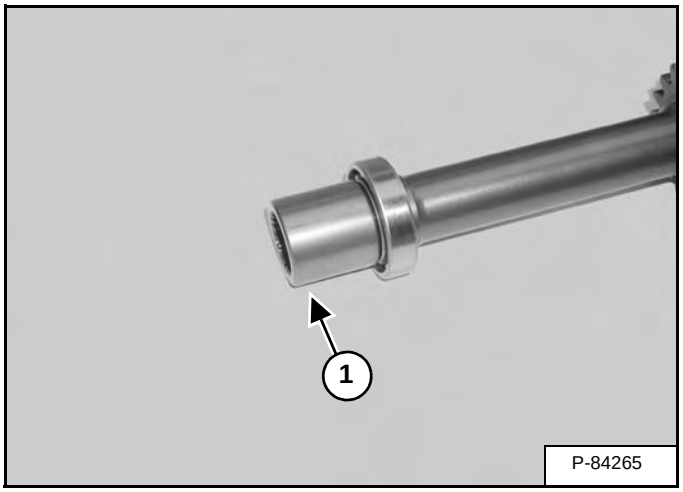
Install the 28 gear (Item 1) **[Figure 40-60-269]** onto the shaft.

Figure 40-60-270



Install the washer (Item 1) and snap ring (Item 2) **[Figure 40-60-270]** onto the shaft.

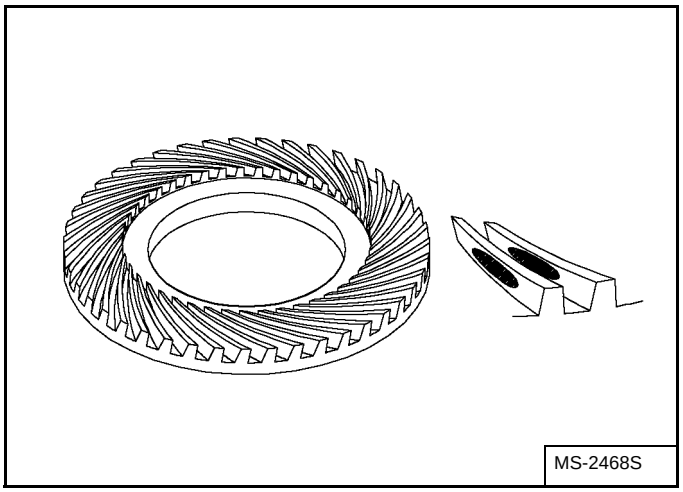
Figure 40-60-271



Install the coupler (Item 1) **[Figure 40-60-271]**.

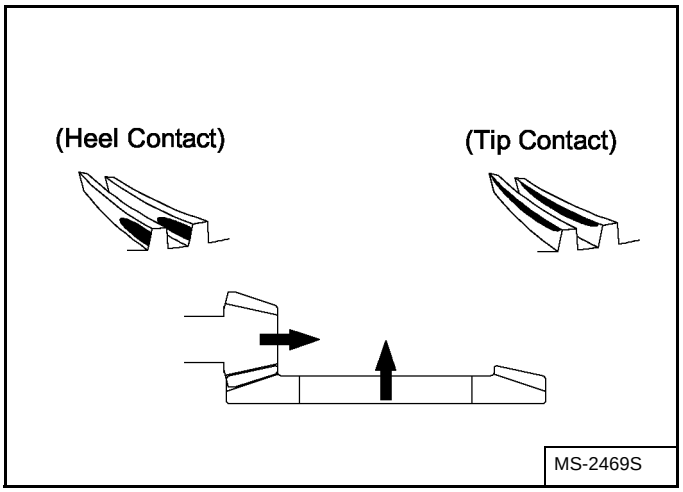
Bearing Cover / Shift Links Assembly (Cont'd)

Figure 40-60-313



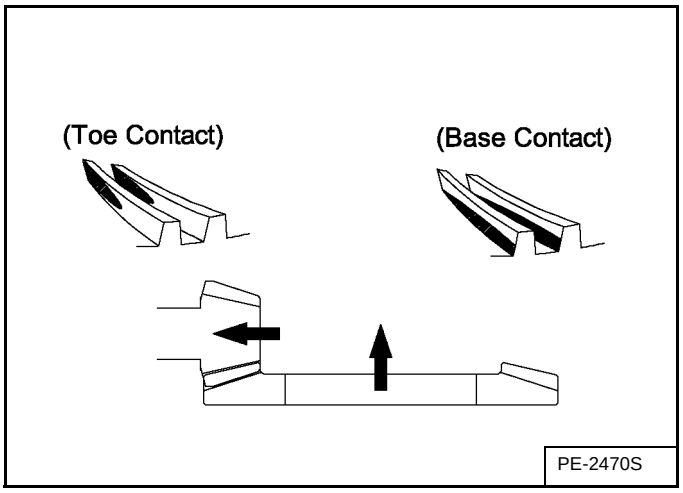
Correct Pattern: If the pinion / ring gear has been properly adjusted, wear pattern (contact) should be as shown **[Figure 40-60-313]**.

Figure 40-60-314



If excessive contact on tooth heal and tip **[Figure 40-60-314]**, replace the shim (Item 5) with a thicker shim to move the pinion shaft backward, to move the pinion gear left, reduce the side shim (Item 1) and add shim of the same thickness to the right side (Item 2) **[Figure 40-60-312 on Page 40-60-100]**.

Figure 40-60-315



If excessive contact on tooth toe and base **[Figure 40-60-315]**, replace the shim (Item 5) with a thinner shim to move the pinion shaft forward, to move the pinion gear right, reduce the side shim (Item 2) and add shim of the same thickness to the left side (Item 1) **[Figure 40-60-312 on Page 40-60-100]**.

TRANSMISSION (SST MODELS)

Troubleshooting Chart

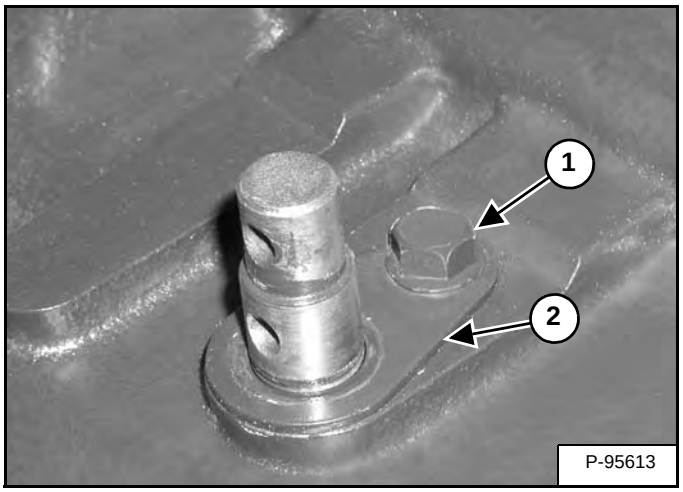
The following Troubleshooting Chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

PROBLEM	CAUSE
Excessive or unusual noise at all times	1, 2, 3, 4
Noise while turning	3, 5, 6
Differential lock can not be engaged	7, 8
Differential lock pedal does not return	9
Pinion or ring gear tooth broken	4, 10, 11, 12, 13
Pinion teeth pitted	4, 14
Worn or pitted bearings	4, 10, 11, 12, 13, 14
Oil leakage	4, 15, 16, 17, 18
Pinion teeth fatigue	4, 19
Side gear spline worn	4, 19
Thrust washer surface worn	4
Range shifting lever does not shift into gear	3, 4, 20

KEY TO CORRECT THE CAUSE
1. Improper backlash between pinion shaft and pinion gear
2. Improper backlash between pinion shaft and differential side gear
3. Worn bearings
4. Insufficient, improper, or contaminated transmission oil
5. Differential pinions or side gears worn or damaged
6. Differential lock does not disengage
7. Differential lock shift fork damaged
8. Differential lock arm damaged
9. Differential lock pedal return spring weakened or damaged.
10. Excessive gear load
11. Incorrect gear adjustment (excessive play)
12. Pinion nut loose
13. Incorrect gear adjustment (insufficient play)
14. Excessive use
15. Operation at high temperature
16. Low oil level
17. Normal wear
18. Lip seal damaged
19. Overloaded continuously
20. Start tractor move range shifting lever to “N”, press the travel pedal to forward or reverse and release pedal to neutral, move range shifting lever to desired range.

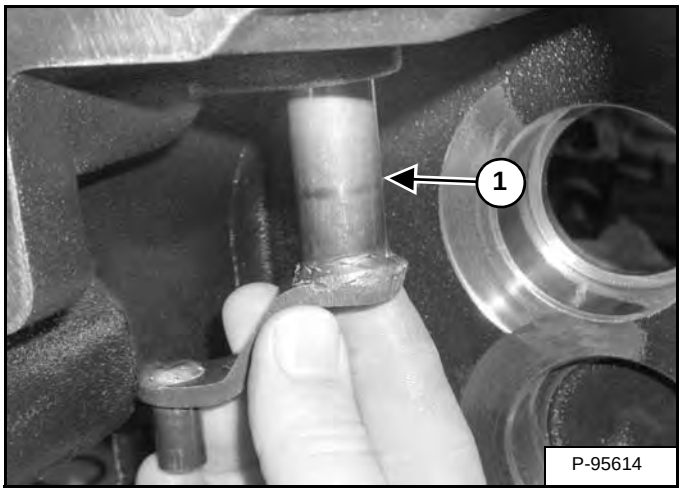
Transmission Case Disassembly (Cont'd)

Figure 40-61-39



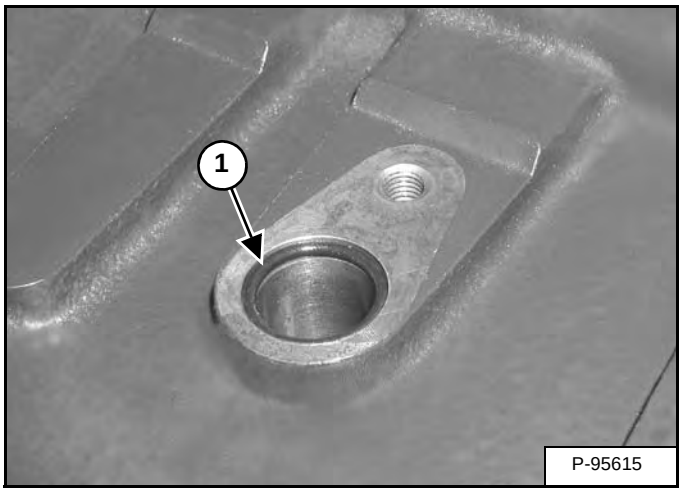
Remove the bolt (Item 1) and retainer plate (Item 2) **[Figure 40-61-39]**.

Figure 40-61-40



Remove the shuttle shift arm (Item 1) **[Figure 40-61-40]** from the housing.

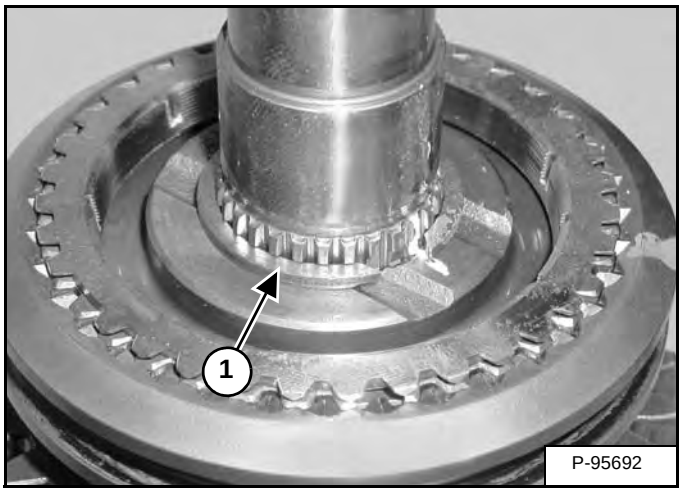
Figure 40-61-41



Remove the O-ring (Item 1) **[Figure 40-61-41]** from the housing.

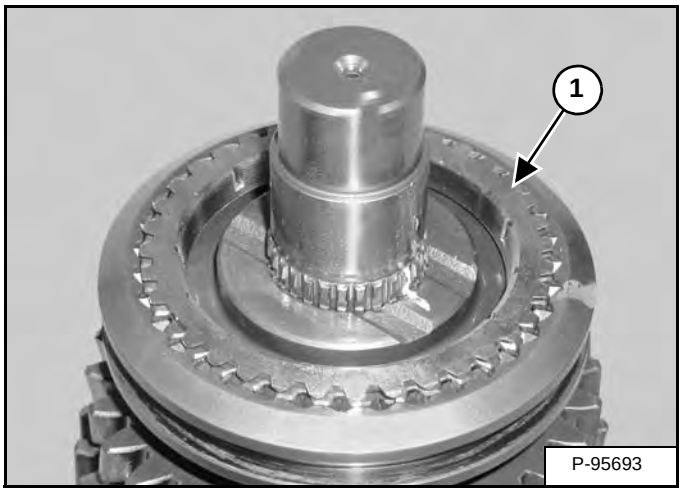
Bearing Cover / Countershaft Disassembly (Cont'd)

Figure 40-61-68



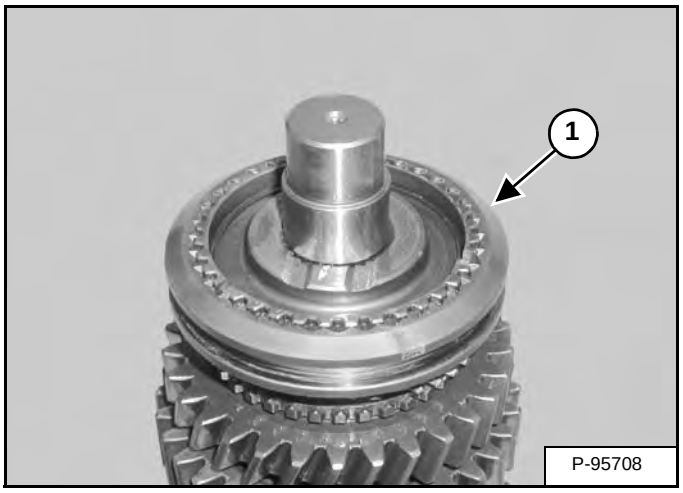
Remove the snap ring (Item 1) **[Figure 40-61-68]**.

Figure 40-61-69



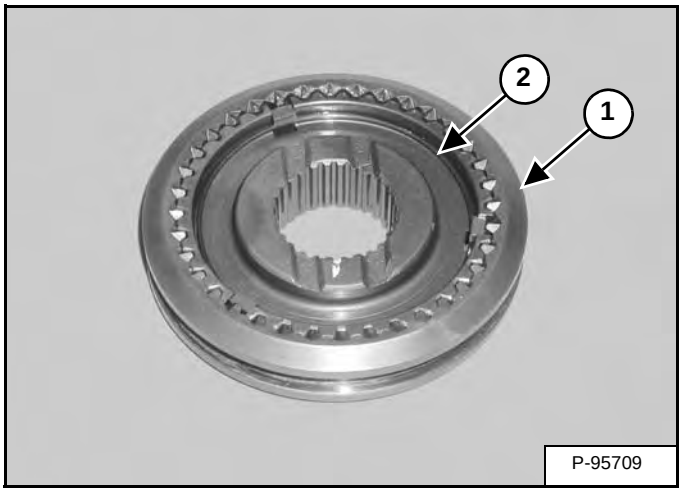
Remove the synchronizer ring (Item 1) **[Figure 40-61-69]**.

Figure 40-61-70



Remove the shifter / synchronizer hub (Item 1) **[Figure 40-61-70]** from the shaft.

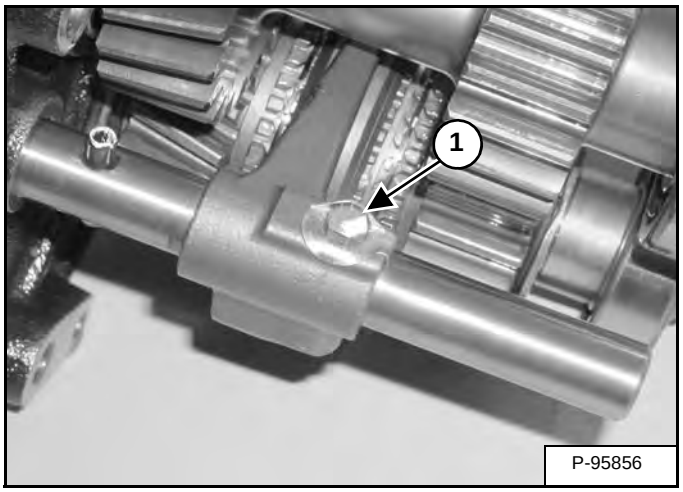
Figure 40-61-71



Slide the shifter (Item 1) off the synchronizer hub (Item 2) **[Figure 40-61-71]**.

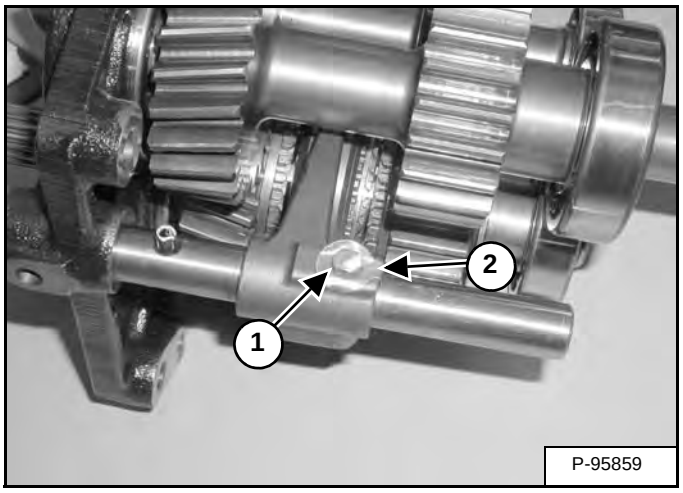
Middle Case / Shift Link Disassembly

Figure 40-61-103



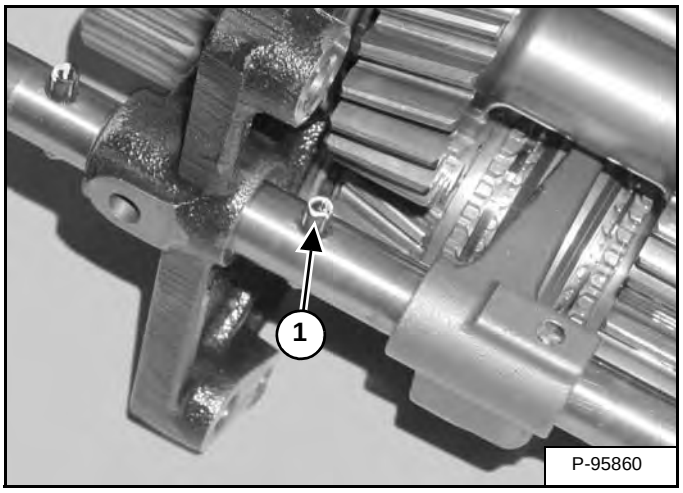
Bend the retainer plate (Item 1) **[Figure 40-61-103]** over.

Figure 40-61-104



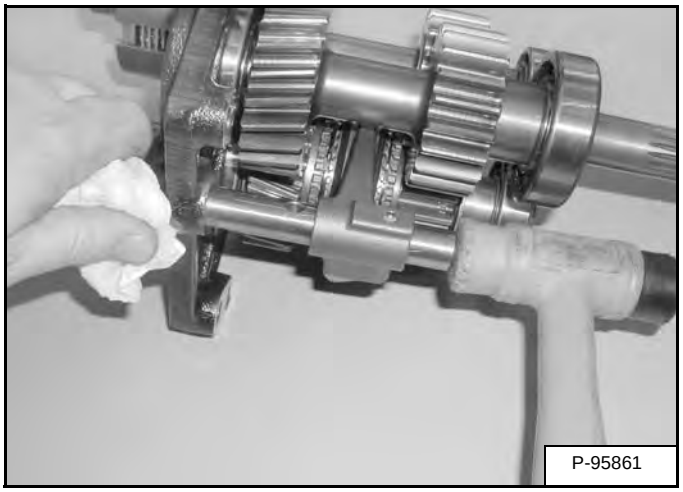
Remove the bolt (Item 1) and retainer plate (Item 2) **[Figure 40-61-104]** from the shifting fork.

Figure 40-61-105



Remove the roll pin (Item 1) **[Figure 40-61-105]** from the shifting rod.

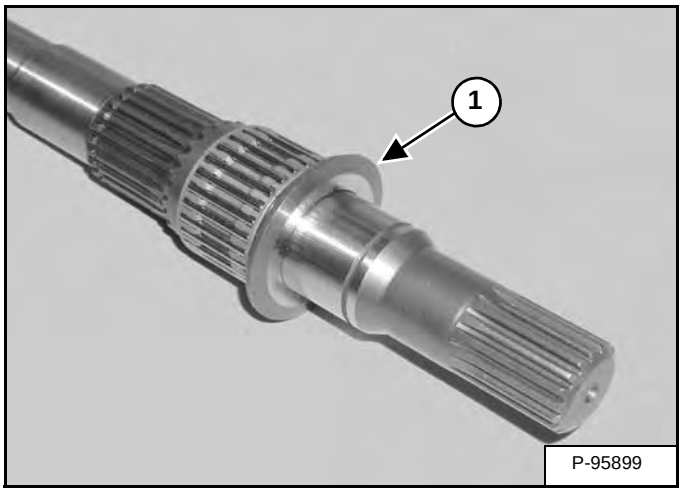
Figure 40-61-106



Cover the bearing cover holes with a rag to avoid losing the detent ball while taping on the end of the shifting rod with a soft faced hammer **[Figure 40-61-106]**.

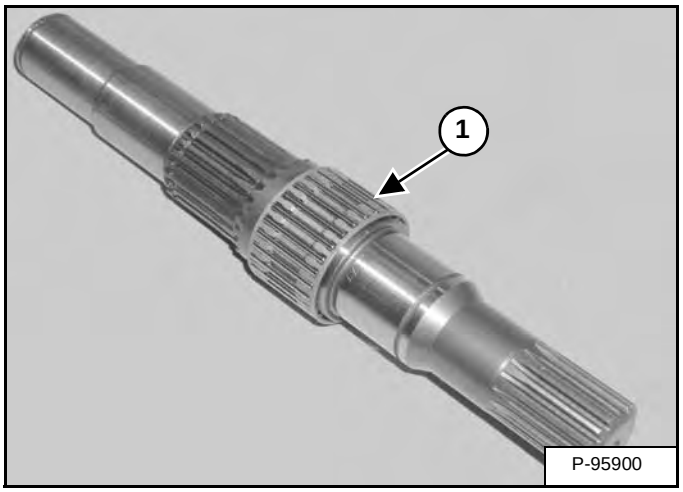
Middle Case / Shuttle Shaft Disassembly (Cont'd)

Figure 40-61-140



Remove the thrust collar (Item 1) **[Figure 40-61-140]** from the shaft.

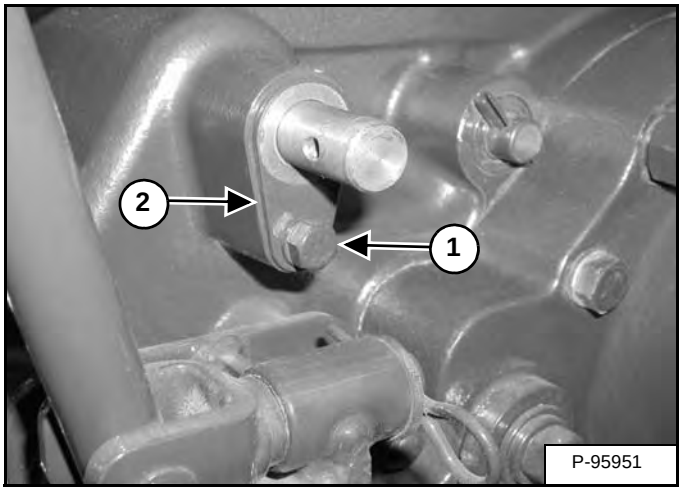
Figure 40-61-141



Remove the needle bearing (Item 1) **[Figure 40-61-141]**.

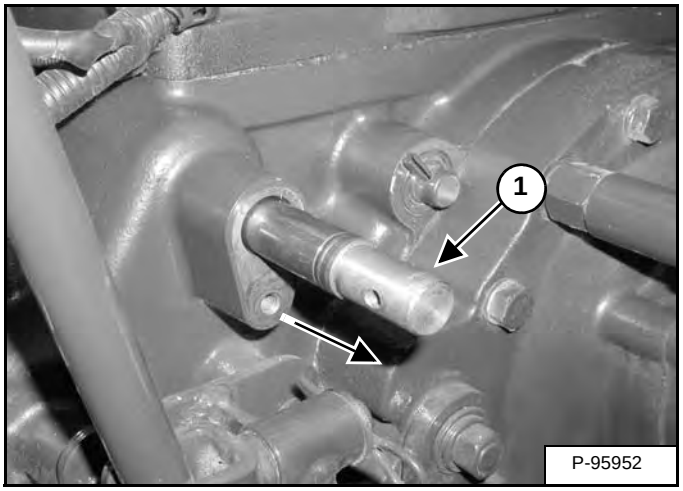
Middle Case Bearing Cover / Shift Links Disassembly (Cont'd)

Figure 40-61-171



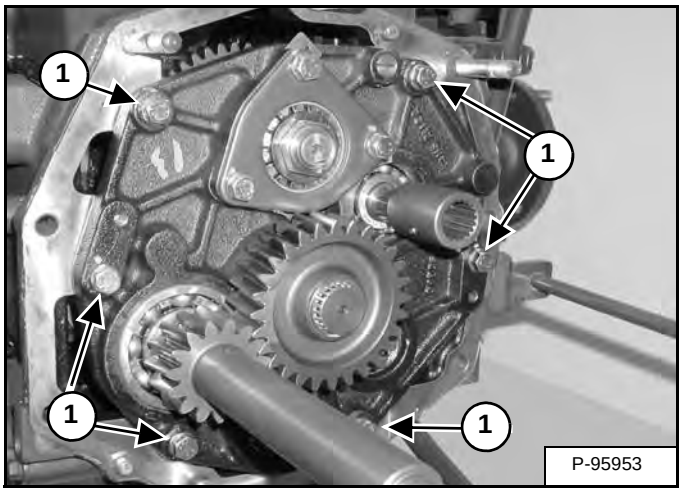
Remove the bolt (Item 1) and retainer plate (Item 2) **[Figure 40-61-171]**.

Figure 40-61-172



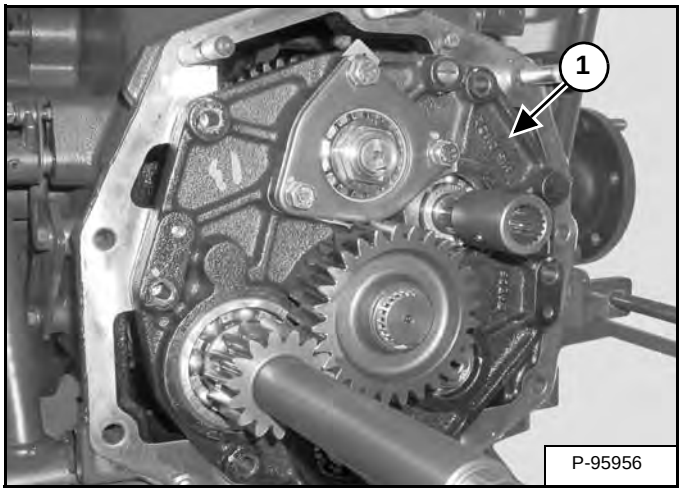
Move the range shift arm (Item 1) **[Figure 40-61-172]** outward.

Figure 40-61-173



Remove the six bolts (Item 1) **[Figure 40-61-172]**.

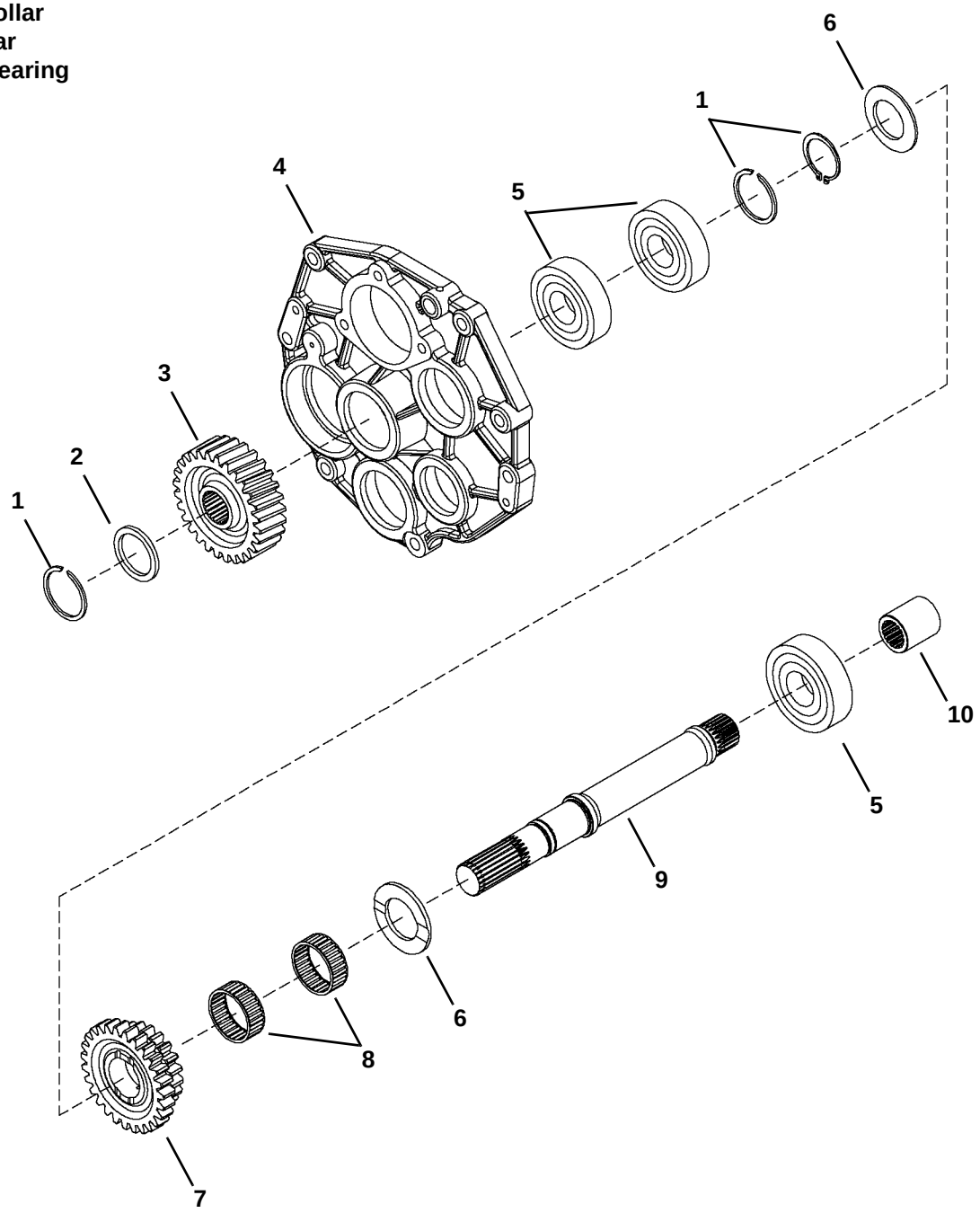
Figure 40-61-174



Remove the bearing cover assembly (Item 1) **[Figure 40-61-174]** from the housing.

PTO Shaft Parts Identification

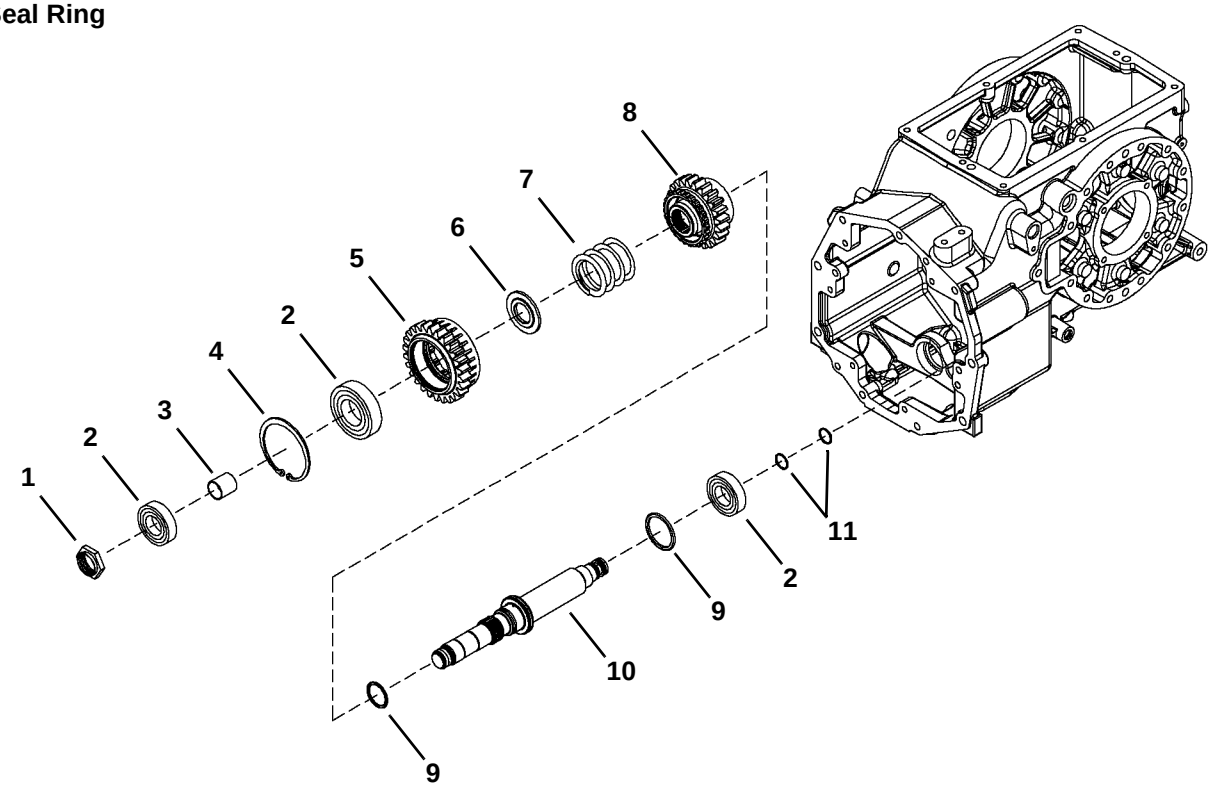
1. Snap Ring
2. Washer
3. 28 Gear
4. Bearing Cover
5. Bearing
6. Thrust Collar
7. 20/27 Gear
8. Needle Bearing
9. Shaft
10. Coupler



MS-2712S

Idle Shaft Parts Identification

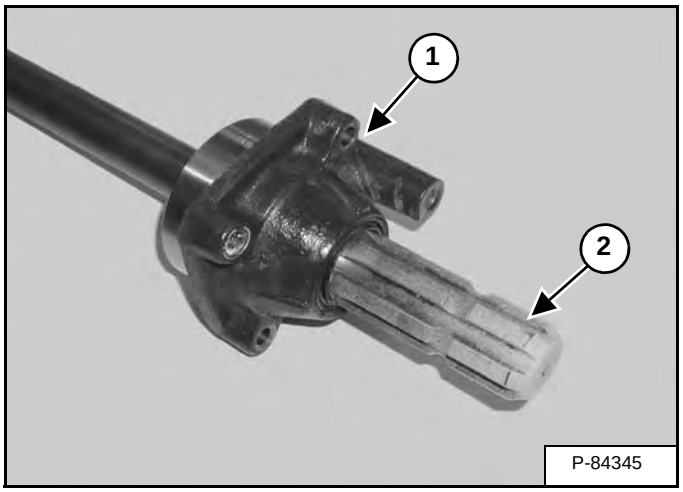
1. Nut
2. Bearing
3. Spacer
4. Snap Ring
5. 26 Gear
6. Spacer Washer
7. Spring
8. 23 Shift Gear
9. O-ring
10. Shaft
11. Seal Ring



MS-2710S

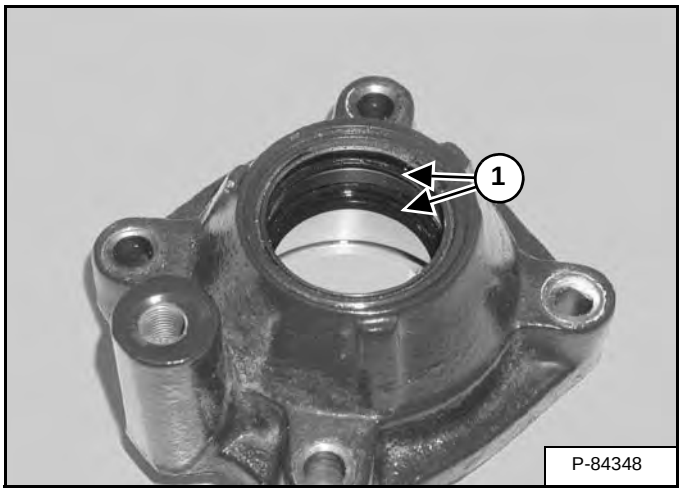
Rear PTO Shaft Disassembly (Cont'd)

Figure 40-61-274



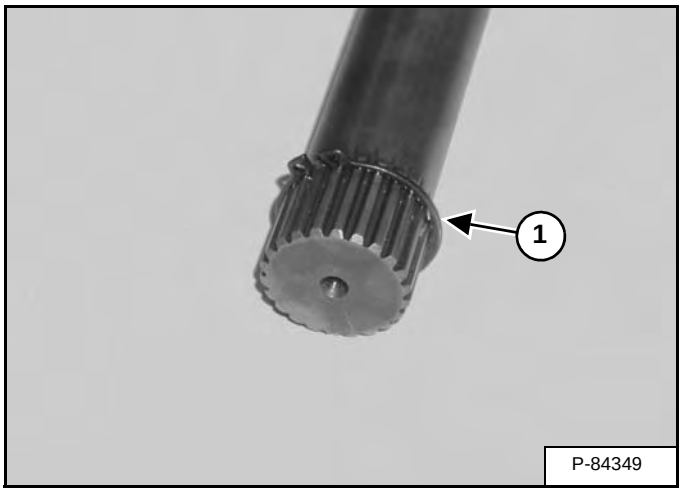
Remove the cover (Item 1) from the shaft (Item 2) **[Figure 40-61-274]**.

Figure 40-61-275



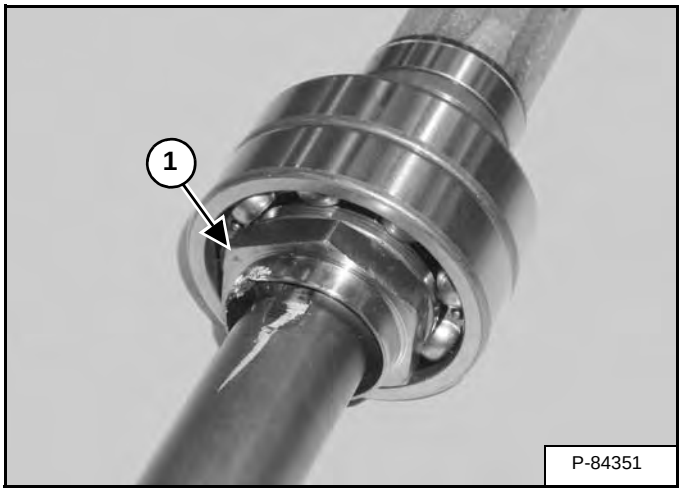
Remove the two oil seals (Item 1) **[Figure 40-61-275]** from the cover.

Figure 40-61-276



Remove the snap ring (Item 1) **[Figure 40-61-276]** from the shaft.

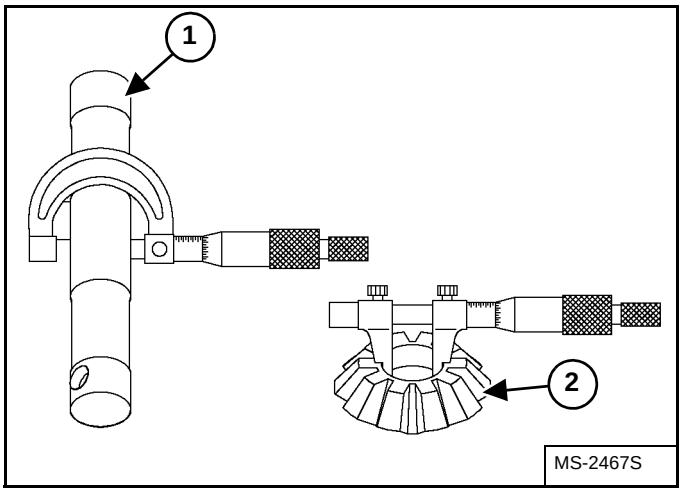
Figure 40-61-277



Unstake and remove the nut (Item 1) **[Figure 40-61-277]**.

Differential Assembly (Cont'd)

Figure 40-61-311



Measure and record the outside diameter of the differential pinion shaft (Item 1) **[Figure 40-61-311]**.

Measure and record the inside diameter of the differential pinion gear (Item 2) **[Figure 40-61-311]**.

Figure 40-61-312

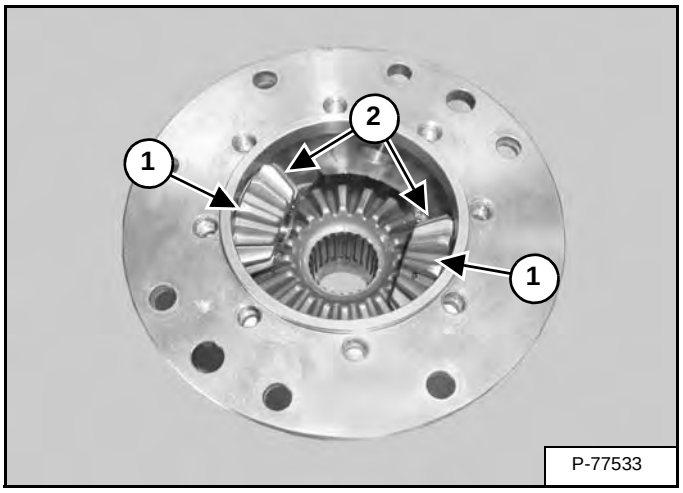
Clearance between differential pinion shaft and differential pinion	Factory spec.	0,081 - 0,102 mm (0.0032 - 0.0040 in)
	Allowable limit	0,25 mm (0.0098 in)

Differential pinion shaft O.D.	Factory spec.	19,959 - 19,980 mm (0.78579 - 0.78661 in)
Differential pinion I.D.	Allowable limit	20,040 - 20,061 mm (0.78898 - 0.78980 in)

If the clearance exceeds the allowable limit, see chart **[Figure 40-61-312]**.

Replace as a set.

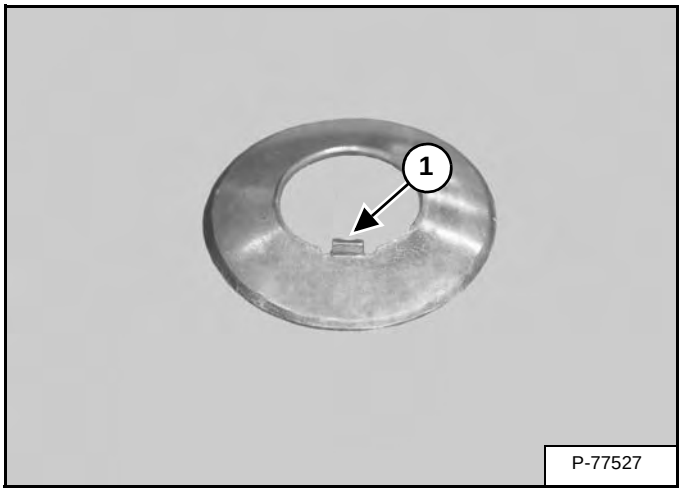
Figure 40-61-313



Install the two cup washers (Item 1) and pinion gears (Item 2) **[Figure 40-61-313]** into the housing.

NOTE: Apply a small amount of assembly lube on the cup washers to help hold them in position.

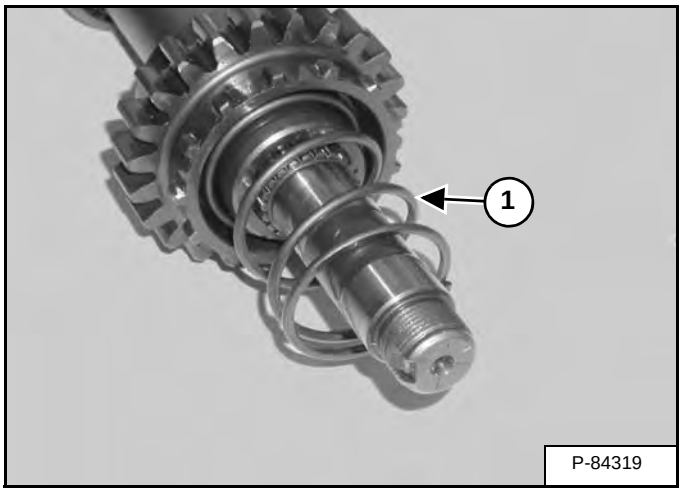
Figure 40-61-314



NOTE: The tang (Item 1) must fit in the notch in the housing [Figure 40-61-314].

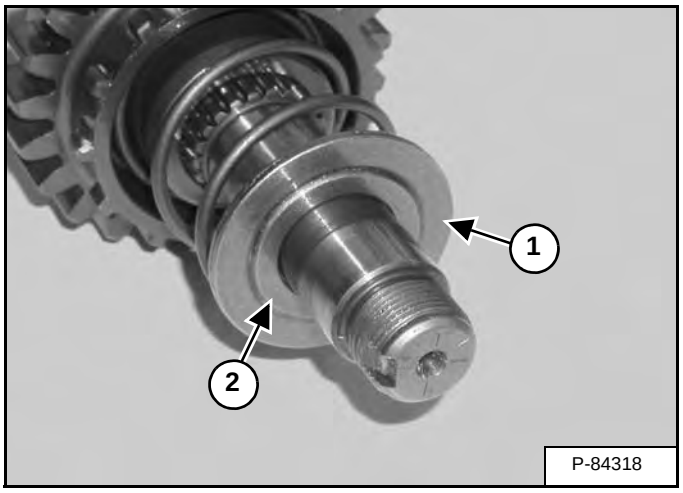
Idle Shaft Assembly (Cont'd)

Figure 40-61-356



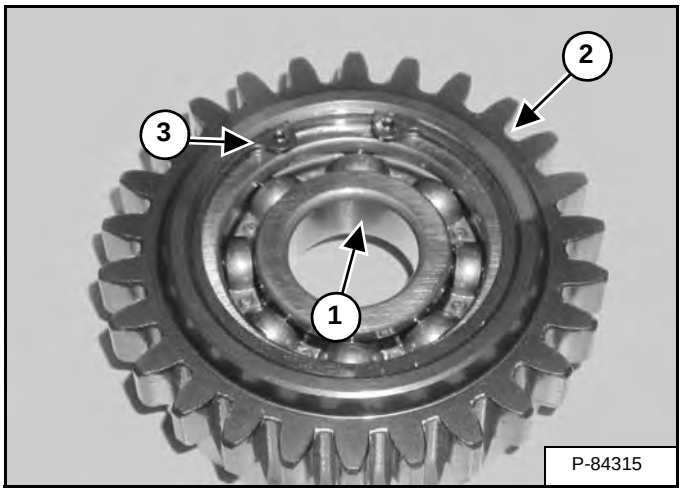
Install the spring (Item 1) **[Figure 40-61-356]**.

Figure 40-61-357



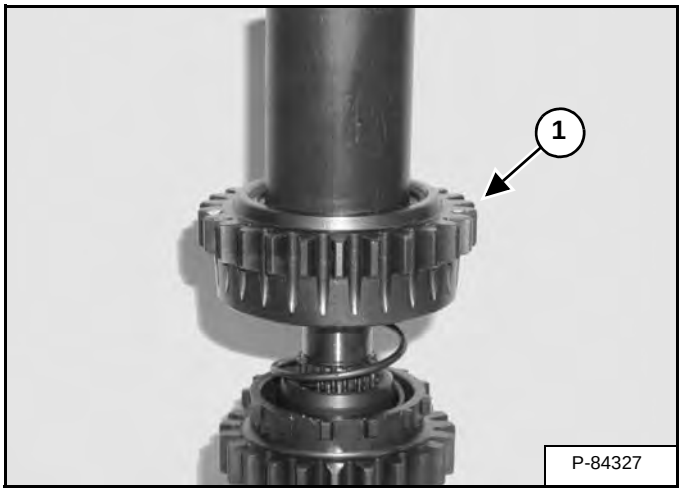
Install the spacer plate (Item 1) onto the shaft with the protrusion (Item 2) **[Figure 40-61-357]** positioned as shown.

Figure 40-61-358



Install the bearing (Item 1) into the 26 gear (Item 2) and retain with the snap ring (Item 3) **[Figure 40-61-358]**.

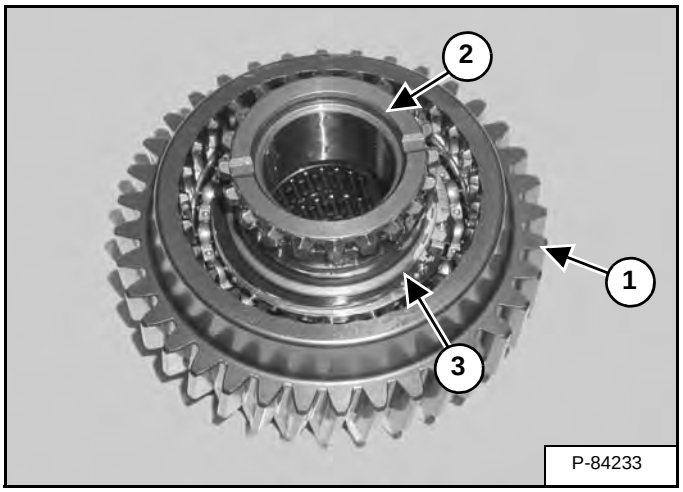
Figure 40-61-359



Press the 26 gear (Item 1) **[Figure 40-61-359]** onto the shaft and align with the 23 gear.

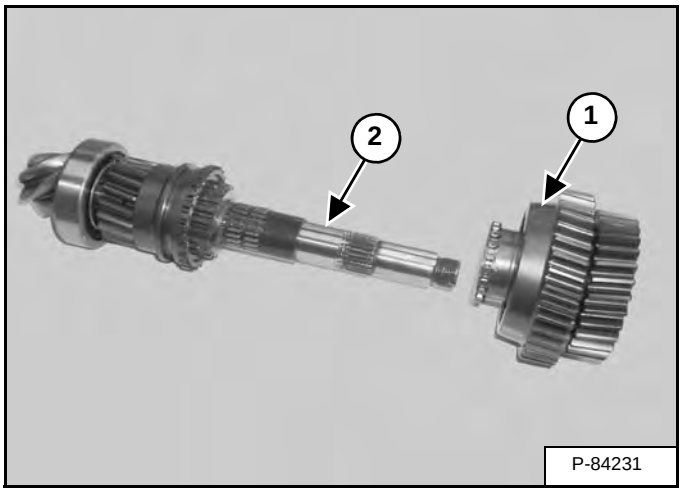
Pinion Shaft Assembly (Cont'd)

Figure 40-61-400



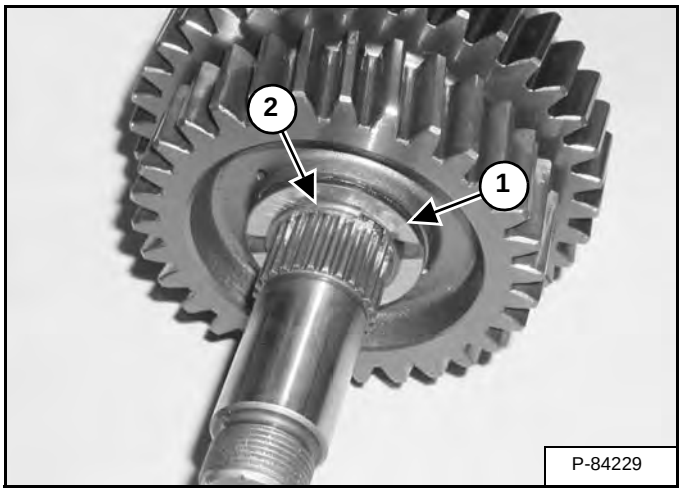
Install the 36 gear (Item 1) onto the 30 gear (Item 2) and install the snap ring (Item 3) **[Figure 40-61-400]**.

Figure 40-61-401



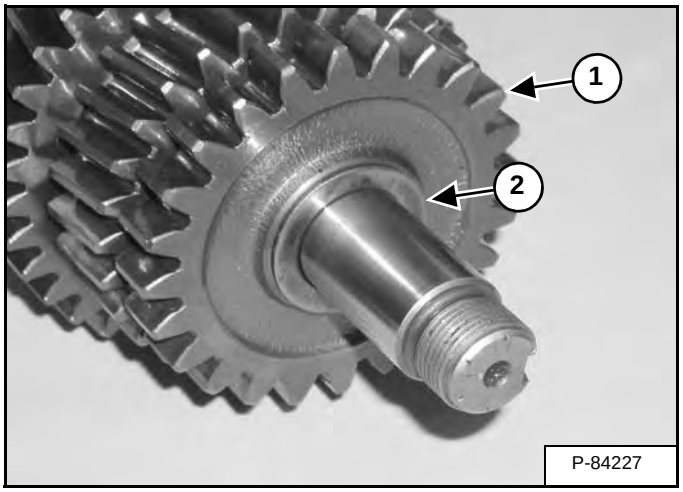
Install the 36 / 30 gear assembly (Item 1) onto the shaft (Item 2) **[Figure 40-61-401]**.

Figure 40-61-402



Install the thrust collar (Item 1) and snap ring (Item 2) **[Figure 40-61-402]**.

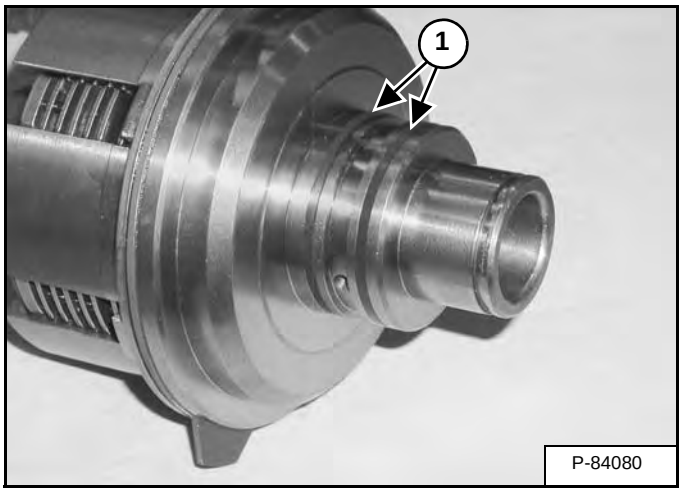
Figure 40-61-403



install the 24 gear (Item 1) and spacer (Item 2) **[Figure 40-61-403]**.

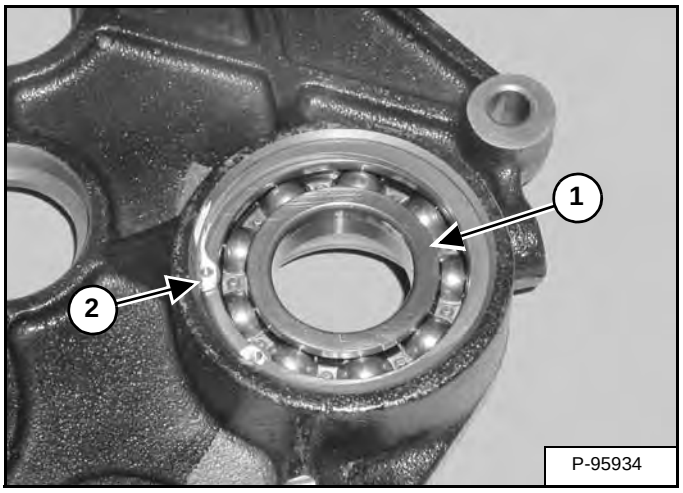
Middle Case / PTO Clutch Assembly (Cont'd)

Figure 40-61-444



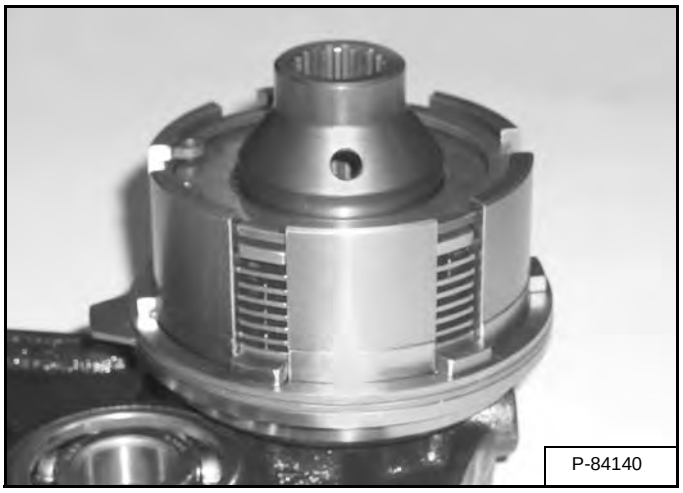
Lightly lubricate and install the two seals (Item 1) **[Figure 40-61-444]** on the clutch shaft.

Figure 40-61-445



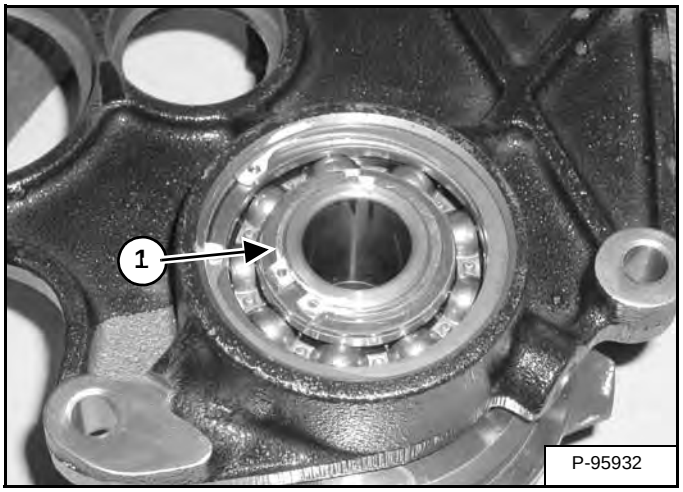
Install the bearing (Item 1) and snap ring (Item 2) **[Figure 40-61-445]**.

Figure 40-61-446



Install the PTO clutch assembly into the bearing cover until fully seated **[Figure 40-61-446]**.

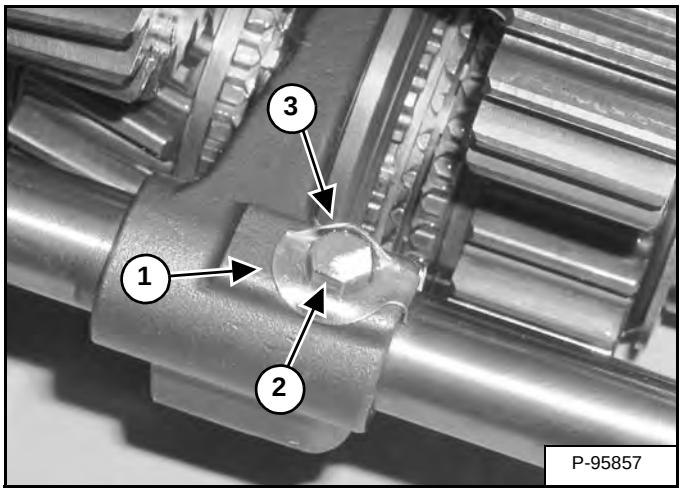
Figure 40-61-447



Install the washer and snap ring (Item 1) **[Figure 40-61-447]** onto the PTO clutch shaft.

Middle Case / Shift Link Assembly (Cont'd)

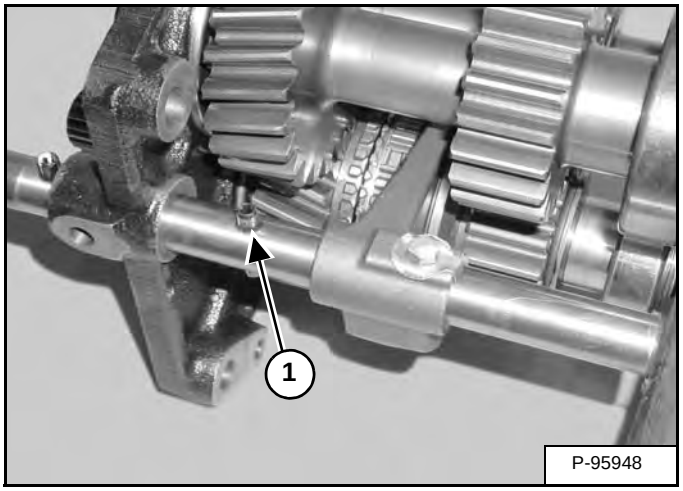
Figure 40-61-488



Install the retainer plate (Item 1) and bolt (Item 2) **[Figure 40-61-488]**.

Bend the retainer plate (Item 3) **[Figure 40-61-488]** up and around the bolt head.

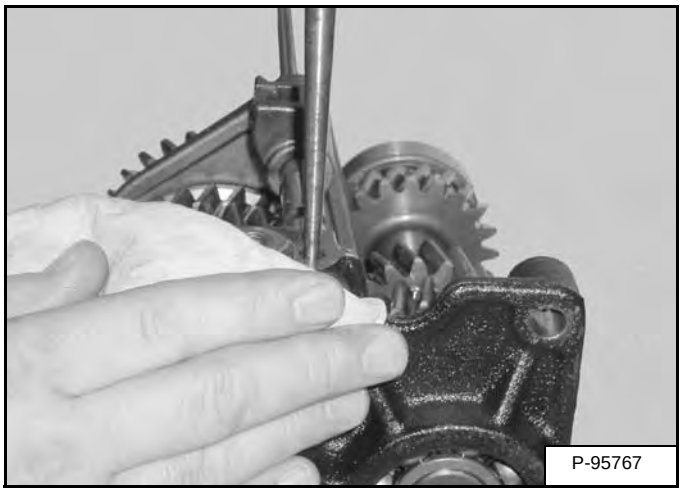
Figure 40-61-489



Install the roll pin (Item 1) **[Figure 40-61-489]** into the shifter rod.

Bearing Cover / Shift Links Assembly (Cont'd)

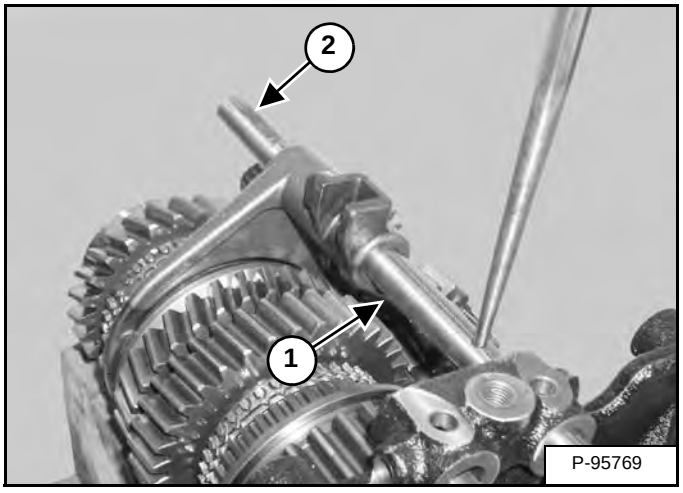
Figure 40-61-531



Use a rag and cover the openings in the bearing cover **[Figure 40-61-531]**.

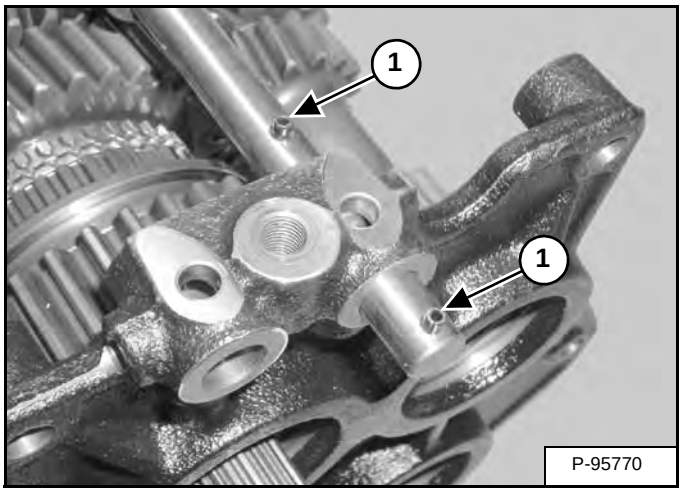
Using a punch, press down on the detent ball while moving the shifting rod into the bearing cover until it stops in the detent groove **[Figure 40-61-531]**.

Figure 40-61-532



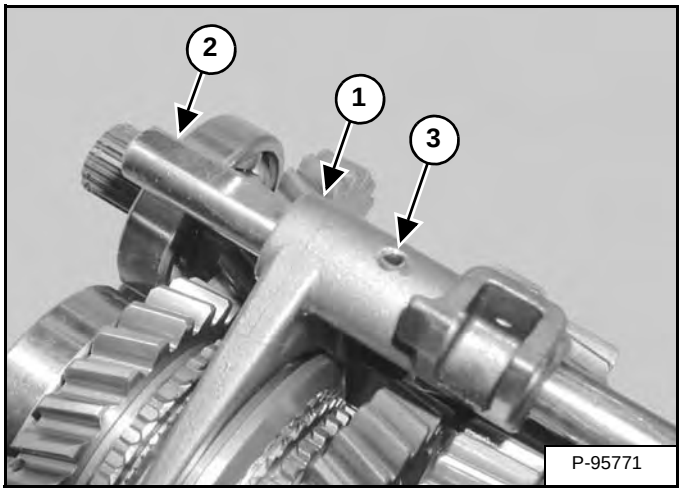
Using a punch as shown rotate the shifting rod (Item 1) until the flat surface (Item 2) **[Figure 40-61-532]** is pointed upward.

Figure 40-61-533



Install the two roll pins (Item 1) **[Figure 40-61-533]** into the shifting rod.

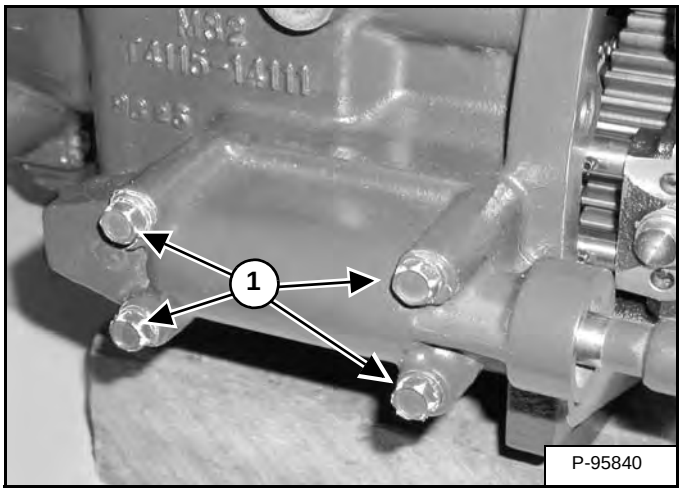
Figure 40-61-534



Align the shifter fork (Item 1) with the shifting rod (Item 2) and install the roll pin (Item 3) **[Figure 40-61-534]**.

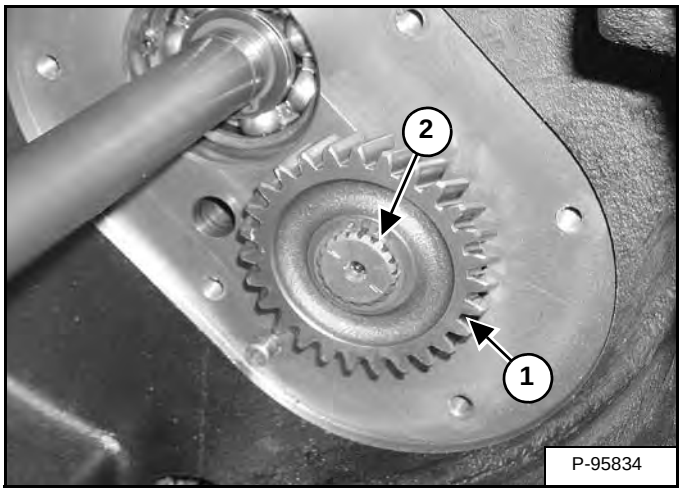
Transmission Case Assembly (Cont'd)

Figure 40-61-574



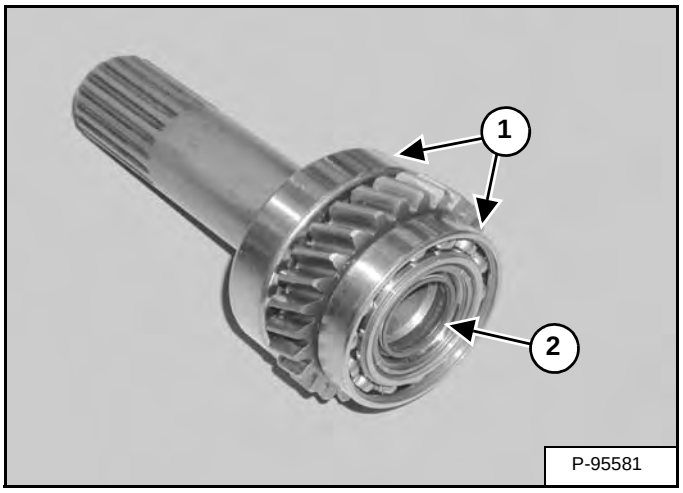
Install the four bolts (Item 1) **[Figure 40-61-574]** and tighten.

Figure 40-61-575



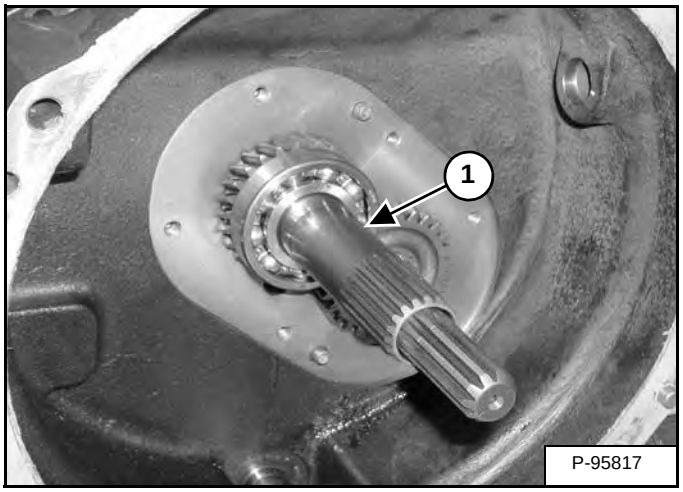
Install the gear (Item 1) and snap ring (Item 2) **[Figure 40-61-575]** onto the main shaft.

Figure 40-61-576



Install the two bearings (Item 1) and seal (Item 2) **[Figure 40-61-576]**.

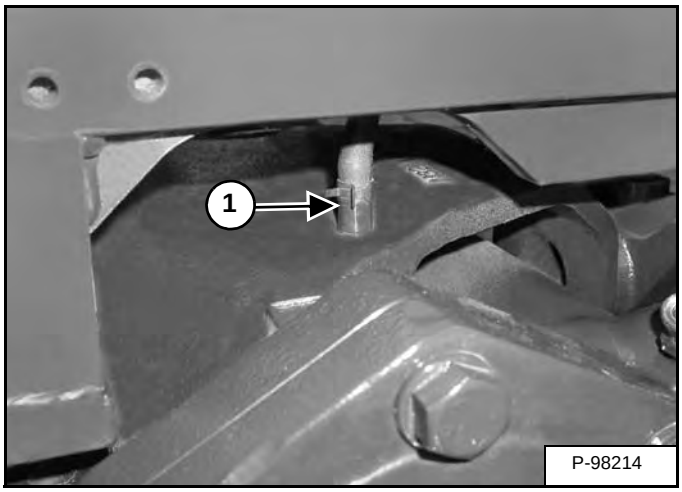
Figure 40-61-577



Install the shaft / bearing assembly (Item 1) **[Figure 40-61-577]** into the housing.

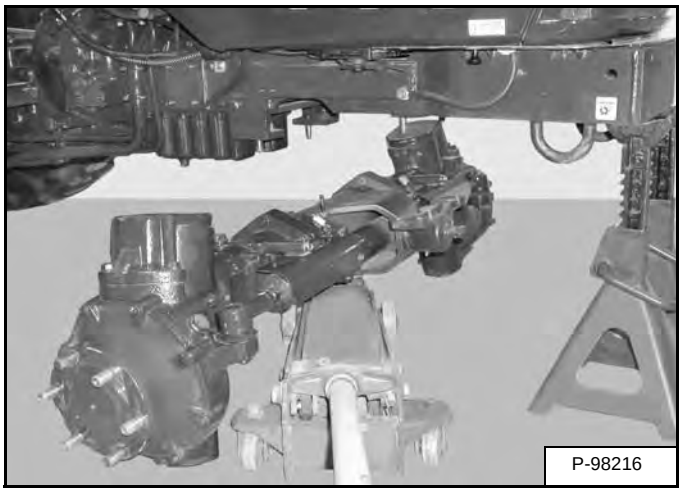
Removal And Installation (Cont'd)

Figure 40-71-8



Remove the hose (Item 1) **[Figure 40-71-8]** from the top of the axle. Remove the wheels.

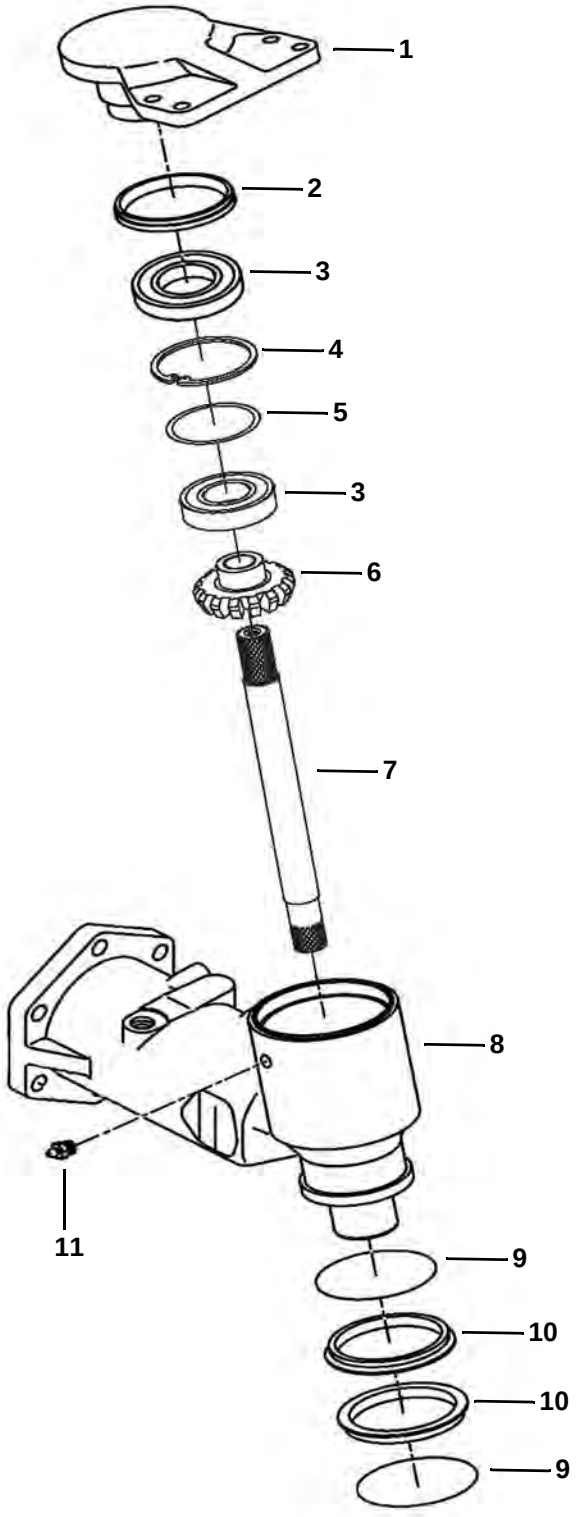
Figure 40-71-9



Lower the front axle and roll out from under the machine **[Figure 40-71-9]**.

Bevel Gear Case Group Parts Identification

1. Support
2. Seal
3. Bearing
4. Snap Ring
5. Shim
6. 17 Gear
7. Shaft
8. Case
9. O-ring
10. Seal Ring
11. Plug



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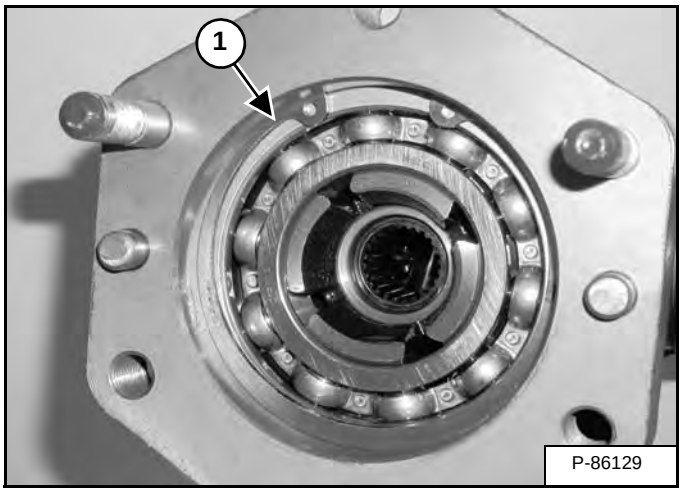
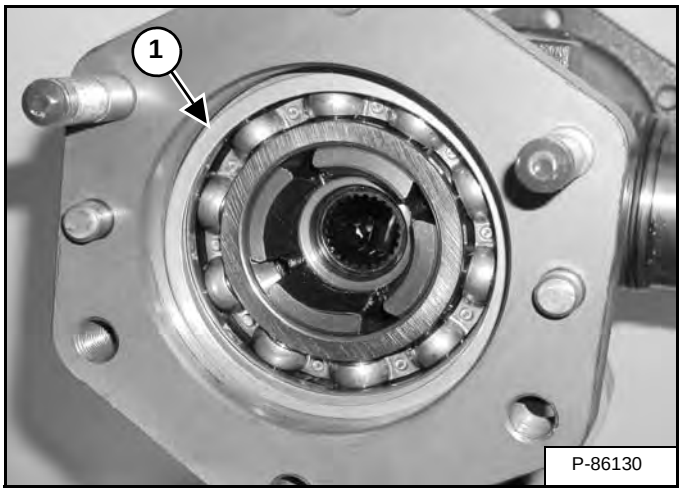
Differential Removal

Figure 40-80-56



Remove the snap ring (Item 1) **[Figure 40-80-56]** from the left side of the housing.

Figure 40-80-57



Remove the shims (Item 1) **[Figure 40-80-57]**. Record the number of shims for correct assembly.

Figure 40-80-58

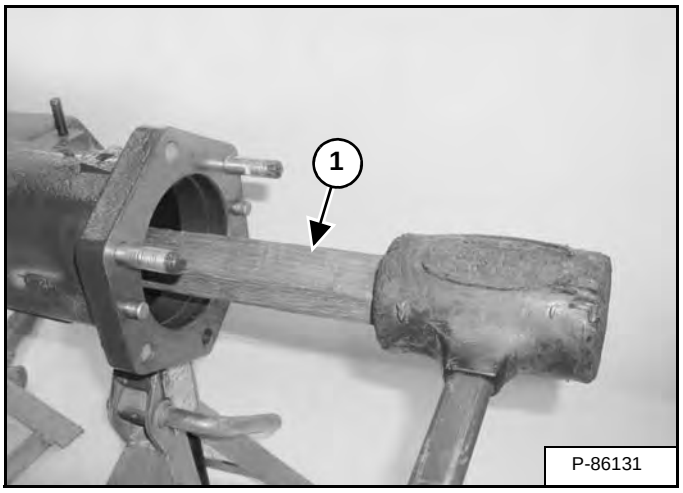
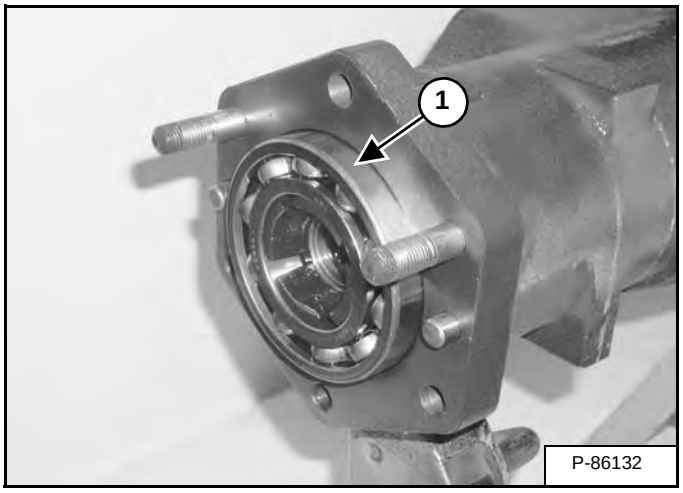


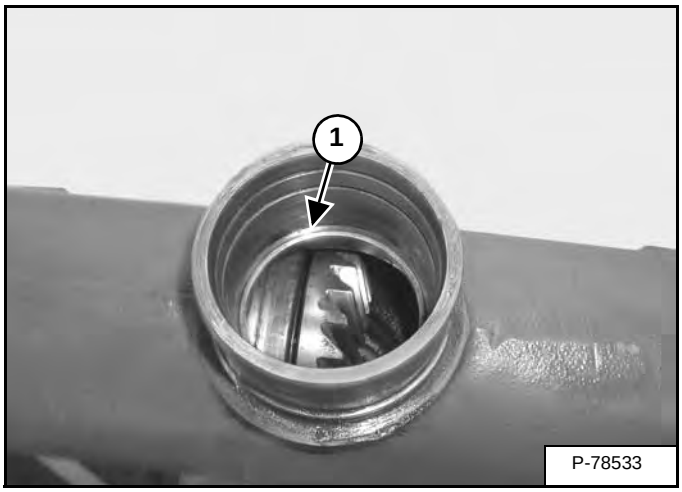
Figure 40-80-59



Using a block of wood (Item 1) **[Figure 40-80-58]**. Remove the differential assembly (Item 1) **[Figure 40-80-59]** from the left side of the housing.

Pinion Shaft Installation

Figure 40-80-94

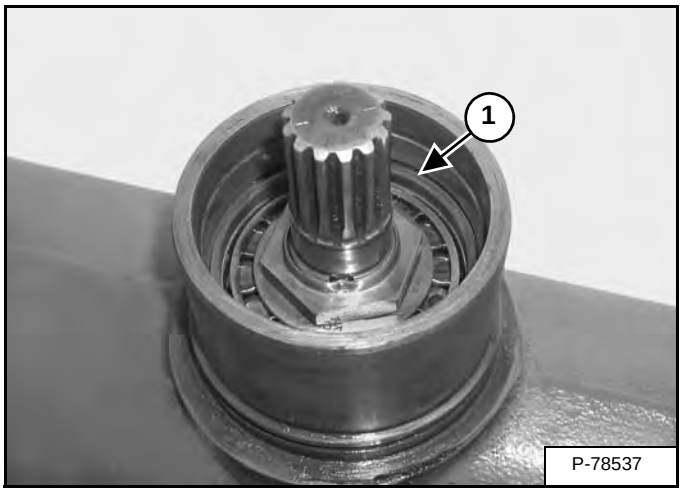


Install the adjusting collar (Item 1) **[Figure 40-80-94]** marked and removed earlier, into the axle housing.

Figure 40-80-95

Install the pinion shaft assembly into the axle housing **[Figure 40-80-95]**.

Figure 40-80-96



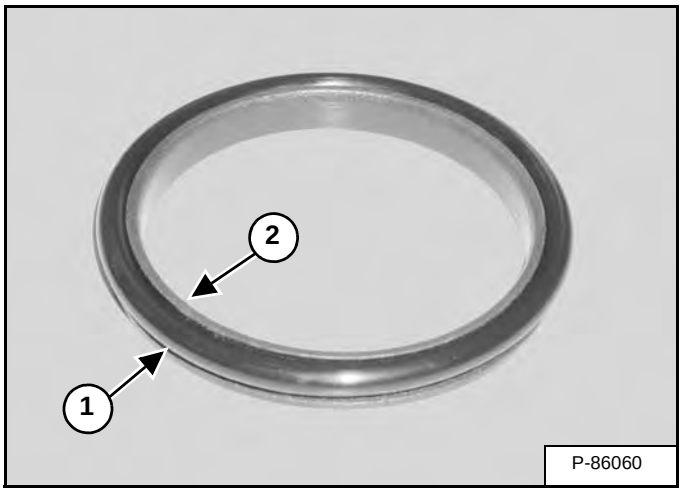
Install the adjusting collar (Item 1) **[Figure 40-80-96]** marked and removed earlier, into the axle housing.

Figure 40-80-97

Install the snap ring (Item 1) **[Figure 40-80-97]**.

Front Axle Cover Assembly

Figure 40-80-137



Install the O-ring (Item 1) on the seal ring (Item 2) **[Figure 40-80-137]**.

NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the seal ring making sure it is not twisted. To remove any twists, gently pull a section of the O-ring and let it snap back.

The O-ring, seal ring and gearcase assembly must be clean and free of any dust, oil film or foreign matter.

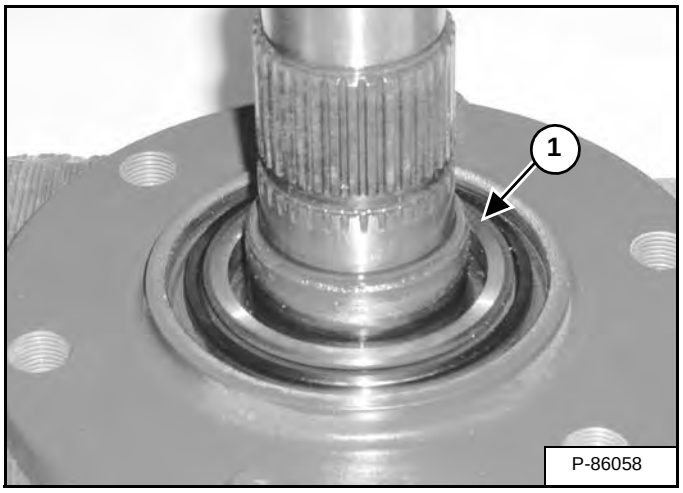
The seal ring assembly must be lubricated with alcohol, so the O-ring will slip past the housing retaining ring and seal uniform on the gear case radius.

Dip the O-ring will slip past the housing retaining ring and seal uniform on the gear case radius.

Dip the O-ring and seal ring assembly in a pan of alcohol.

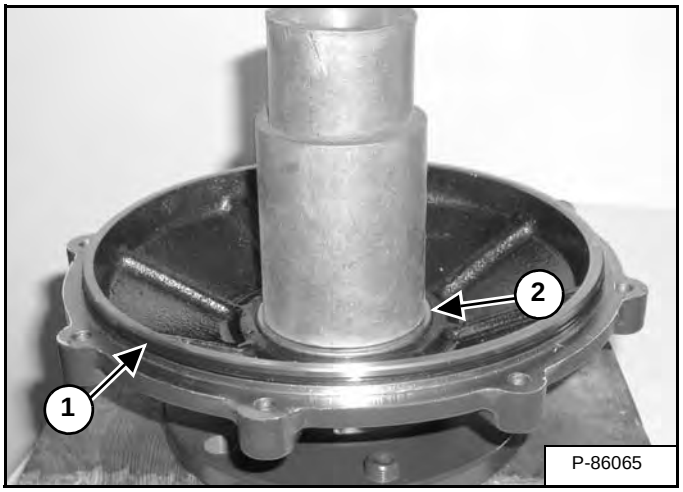
Shake off the excess alcohol.

Figure 40-80-138



Use film, even pressure to pop the O-ring / seal ring assembly (Item 1) **[Figure 40-80-138]** onto the hub.

Figure 40-80-139

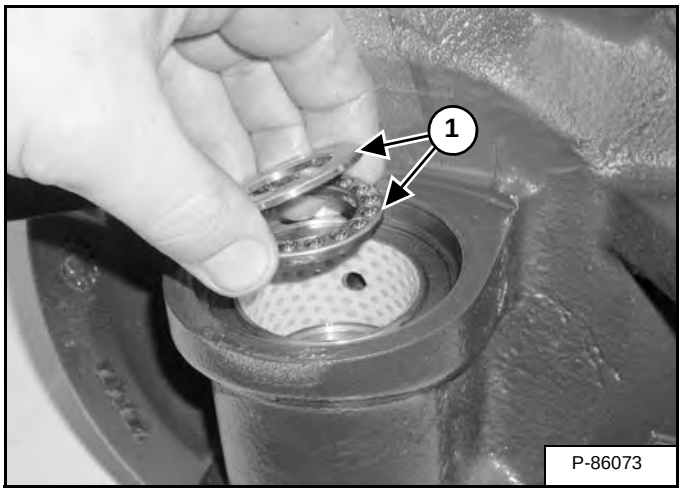


Install the O-ring (Item 1) **[Figure 40-80-139]**.

Install the bearing (Item 2) **[Figure 40-80-139]** into the cover.

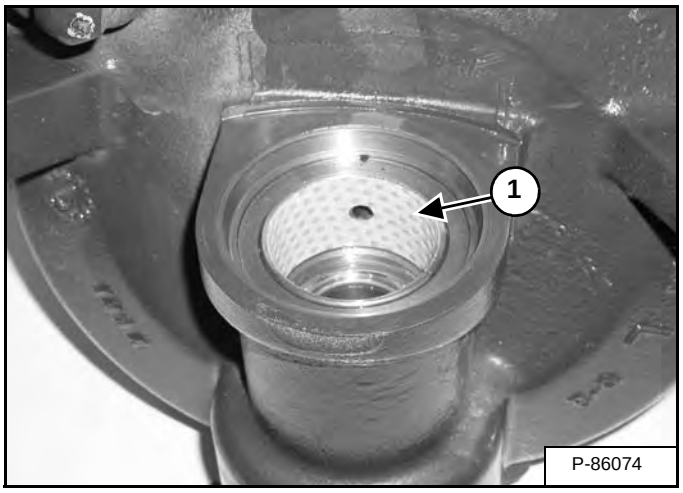
Front Axle Case Group Disassembly (Cont'd)

Figure 40-81-19



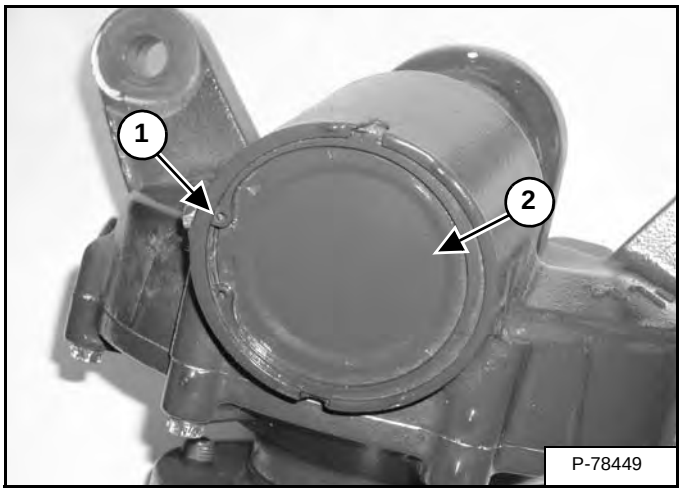
Remove the two piece bearing (Item 1) **[Figure 40-81-19]**.

Figure 40-81-20



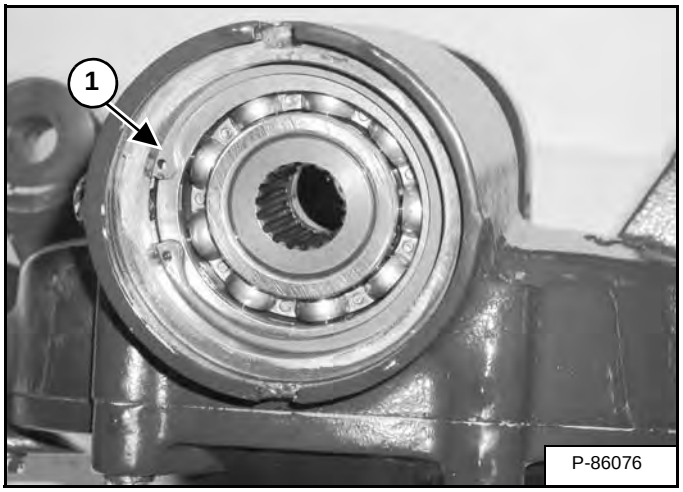
Remove the bushing (Item 1) **[Figure 40-81-20]**.

Figure 40-81-21



Remove the snap ring (Item 1) and end cap (Item 2) **[Figure 40-81-21]** from the axle case.

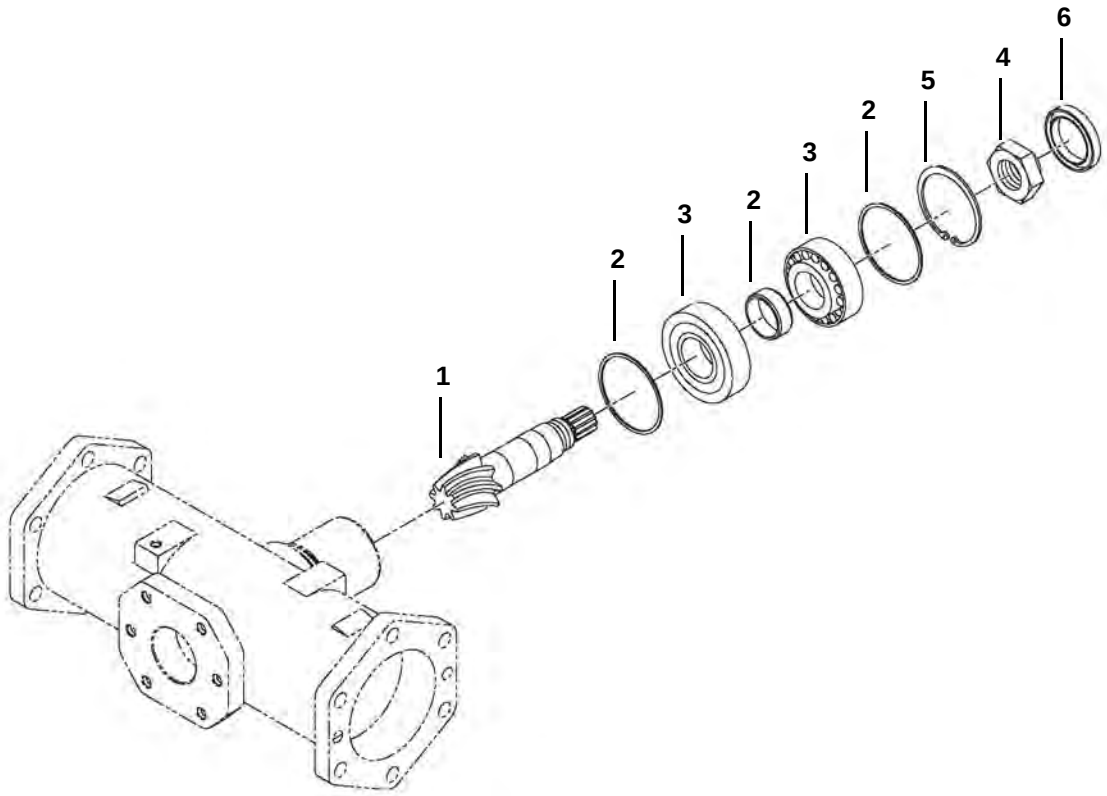
Figure 40-81-22



Remove the snap ring (Item 1) **[Figure 40-81-22]**.

Pinion Shaft Parts Identification

1. Pinion Shaft
2. Collar (Adjusting)
3. Bearing
4. Nut
5. Snap Ring
6. Seal



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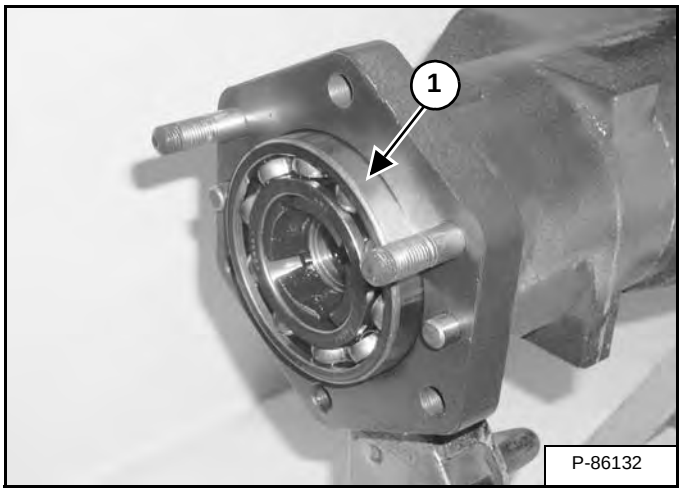
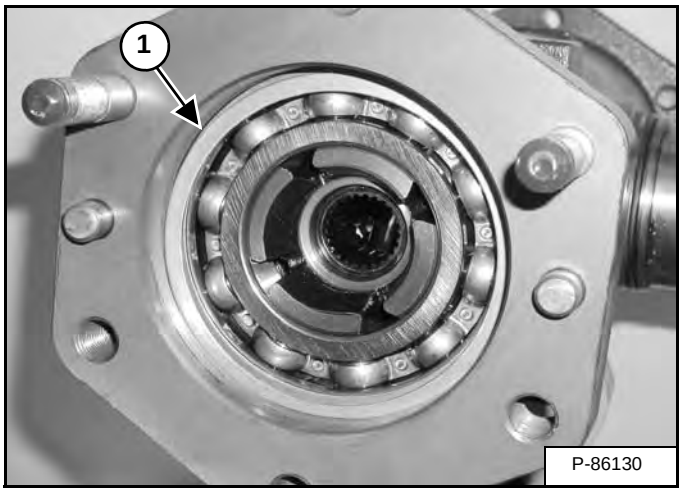
Differential Installation

Figure 40-81-87



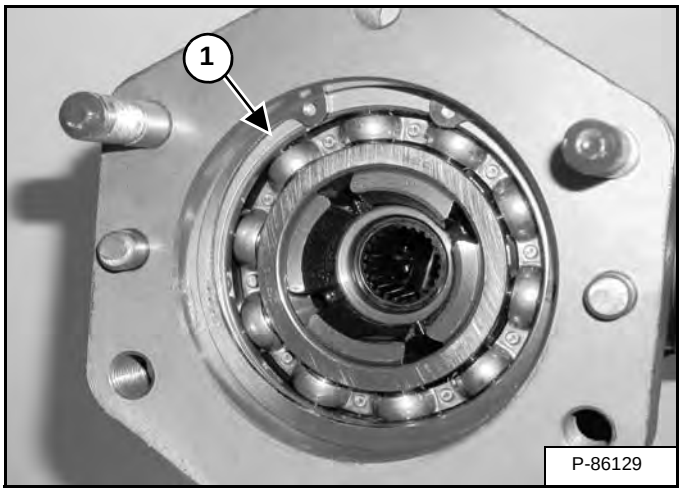
Install the differential / bearing assembly (Item 1) **[Figure 40-81-87]** into the axle housing until it is fully seated next to the pinion shaft.

Figure 40-81-88



Install the shims (Item 1) **[Figure 40-81-88]** (removed earlier).

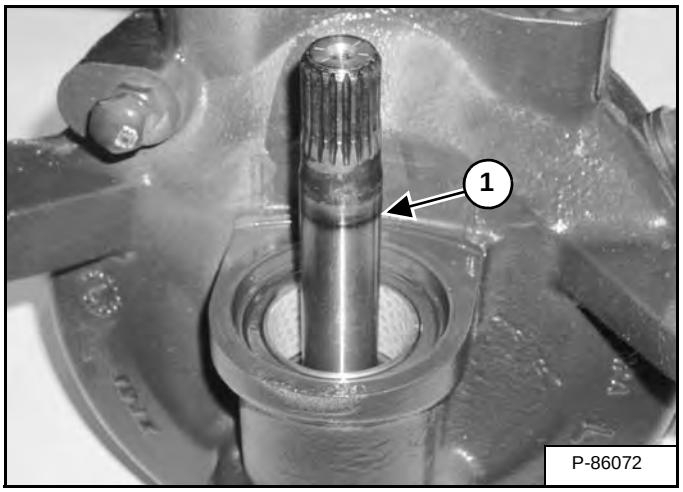
Figure 40-81-89



Install the snap ring (Item 1) **[Figure 40-81-89]**.

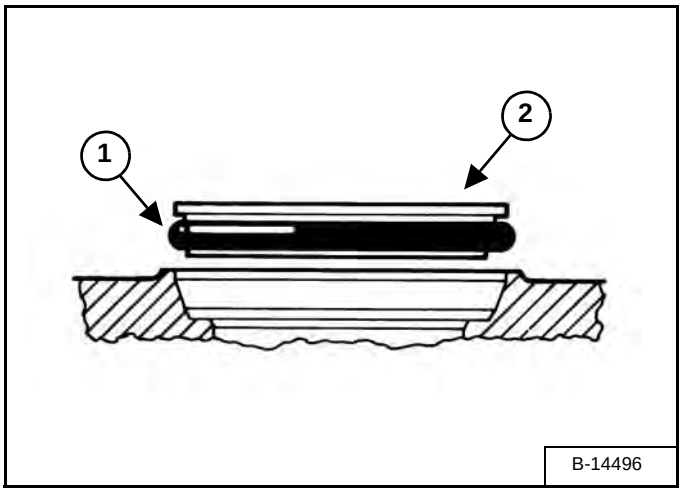
Front Axle Case Group Assembly (Cont'd)

Figure 40-81-130



Install the axle shaft (Item 1) **[Figure 40-81-130]**.

Figure 40-81-131



Install the O-ring (Item 1) on the seal ring (Item 2) **[Figure 40-81-131]**.

NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the seal ring making sure it is not twisted. To remove any twists, gently pull a section of the O-ring and let it snap back.

The O-ring, seal ring and gearcase assembly must be clean and free of any dust, oil film or foreign matter.

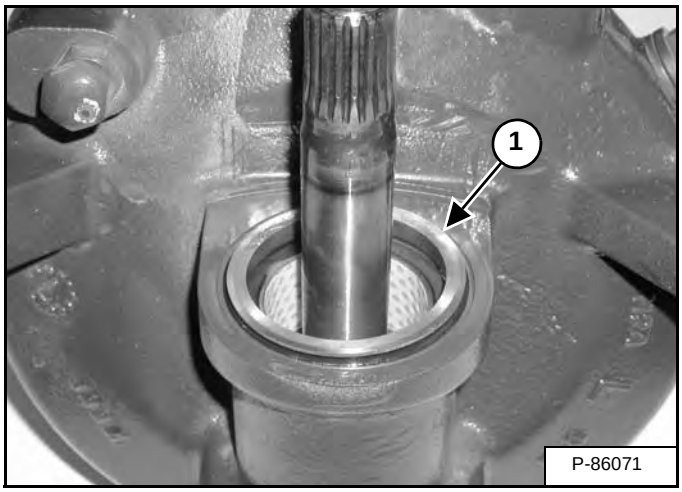
The seal ring assembly must be lubricated with alcohol, so the O-ring will slip past the housing retaining ring and seal uniform on the gear case radius.

Dip the O-ring will slip past the housing retaining ring and seal uniform on the gear case radius.

Dip the O-ring and seal ring assembly in a pan of alcohol.

Shake off the excess alcohol.

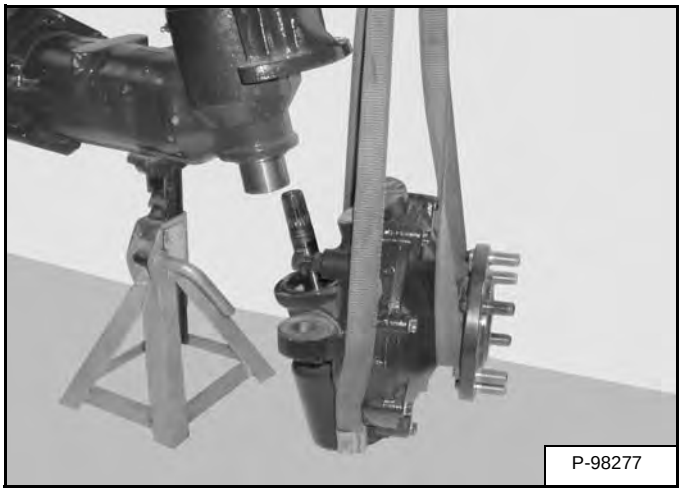
Figure 40-81-132



Use firm, even pressure to pop the O-ring / seal ring assembly (Item 1) **[Figure 40-81-132]** into the case.

Apply a light film of oil to the seal ring. Do not get any oil on the O-ring.

Figure 40-81-133



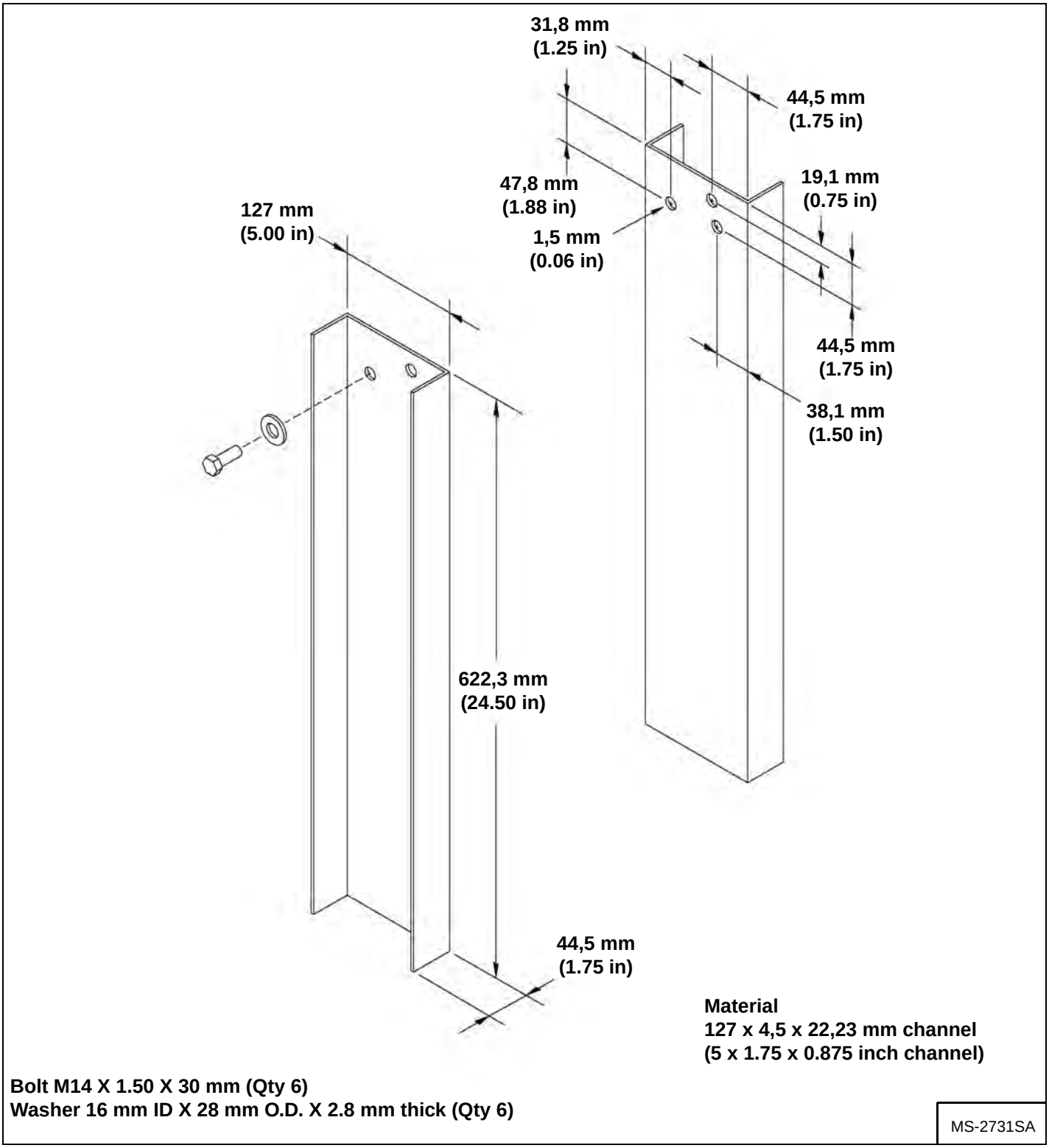
Support the axle case assembly using a hoist and lifting strap **[Figure 40-81-133]**.

SEPARATING THE TRACTOR (HST MODELS)

Procedure

Build the service stand to support the tractor. Use the dimensions shown **[Figure 40-100-1]** to build the service stand or use MEL1662 separating stands.

Figure 40-100-1



MAINFRAME

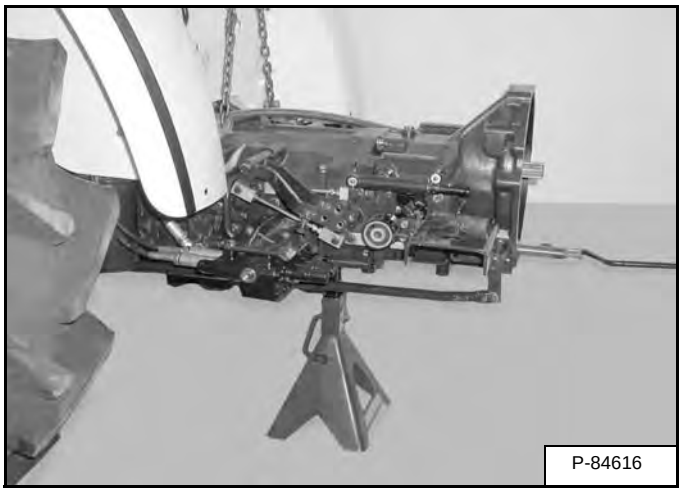
TRANSMISSION CASE (HST MODELS)

Removal And Installation

Separate the tractor. (See Procedure on Page 40-100-1.)

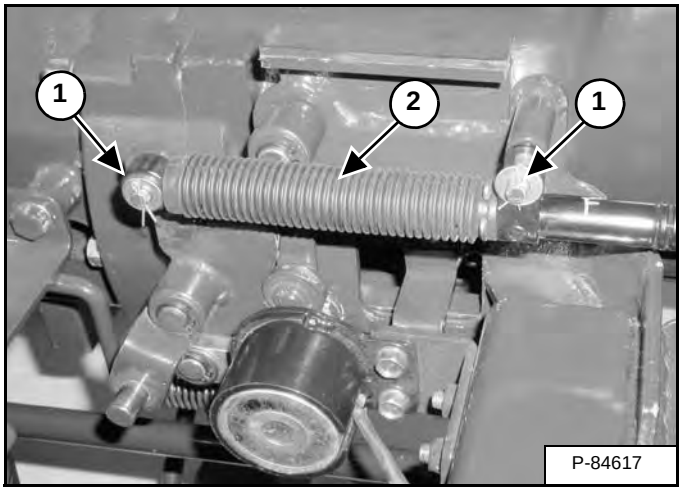
Remove both travel control pedal linkages. (See Removal And Installation on Page 30-50-1.)

Figure 50-30-1



Lift the tractor rear housing and place a stand under the middle case **[Figure 50-30-1]**.

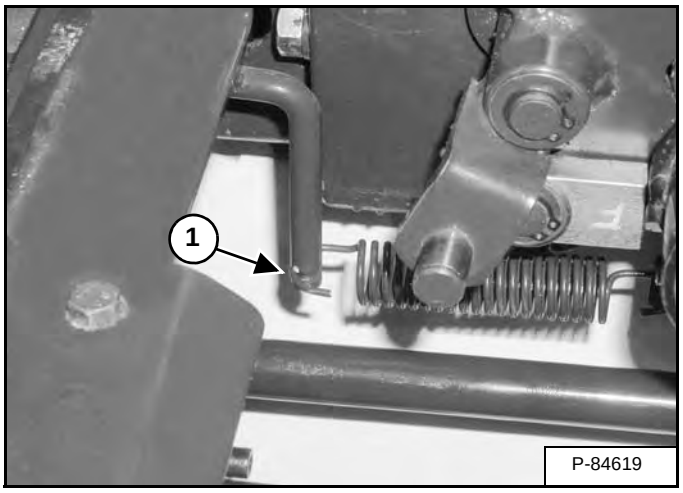
Figure 50-30-2



Remove the two cotter pins / washers (Item 1) **[Figure 50-30-2]**.

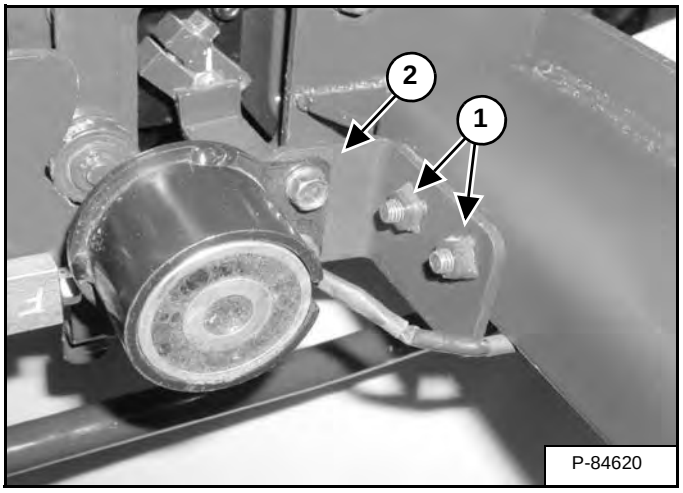
Remove the dampener cylinder (Item 2) **[Figure 50-30-2]**.

Figure 50-30-3



Disconnect the spring (Item 1) **[Figure 50-30-3]**.

Figure 50-30-4

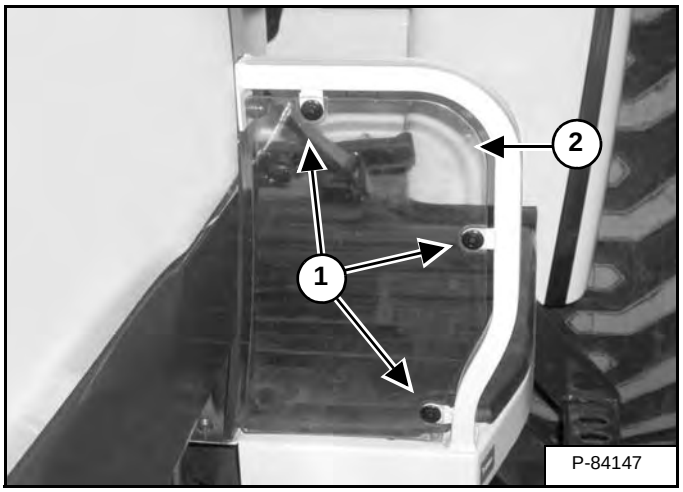


Remove the two bolts (Item 1) and cruise control assembly (Item 2) **[Figure 50-30-4]**.

SPLASH BOARD

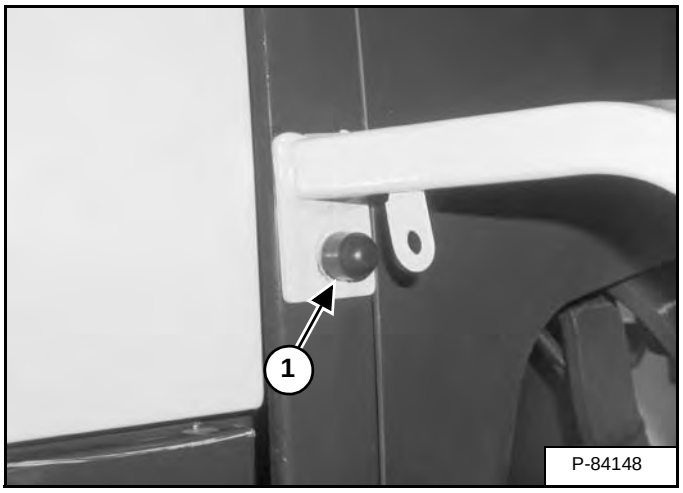
Removal And Installation

Figure 50-60-1



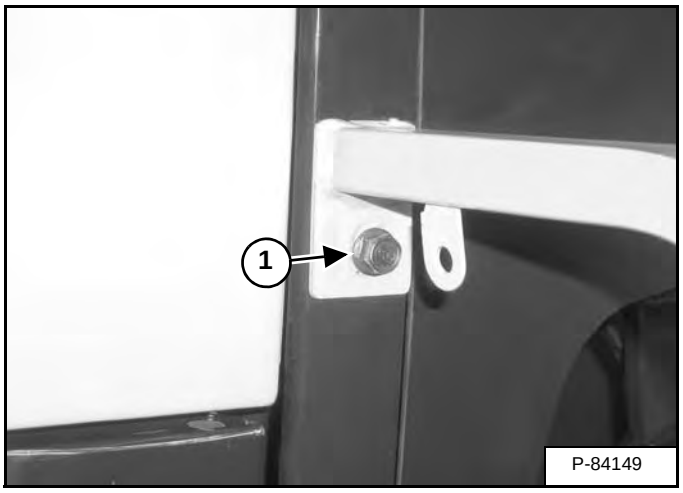
Remove the three rivets (Item 1) and remove the splash board (Item 2) **[Figure 50-60-1]** (both sides).

Figure 50-60-2



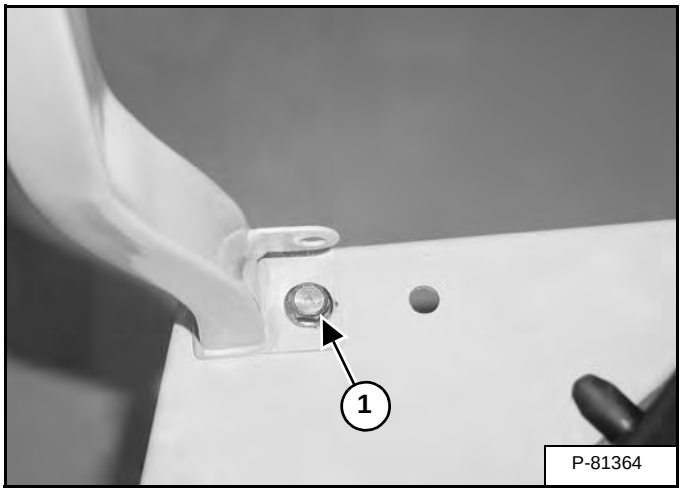
Remove the protective cover (Item 1) **[Figure 50-60-2]**.

Figure 50-60-3



Remove the top bracket mounting bolt (Item 1) **[Figure 50-60-3]**.

Figure 50-60-4



Fold the floor mat back and remove the bracket to floor plate mounting bolt (Item 1) **[Figure 50-60-4]**.

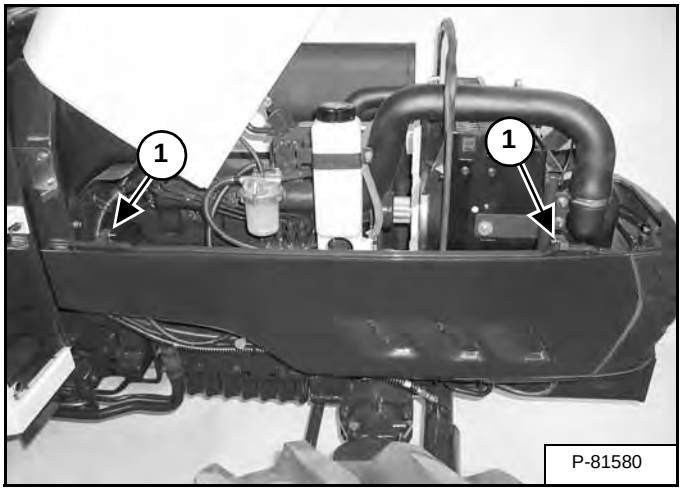
Remove the bracket.

ENGINE SIDE COVER

Removal And Installation

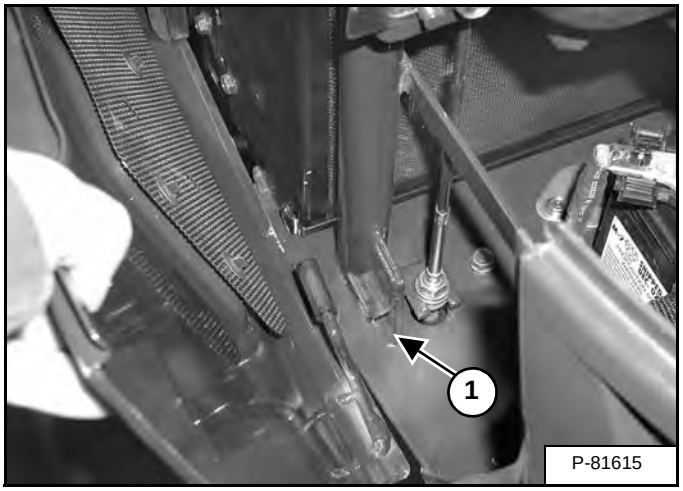
Open the engine cover. (See Opening And Closing on Page 10-20-1.)

Figure 50-100-1



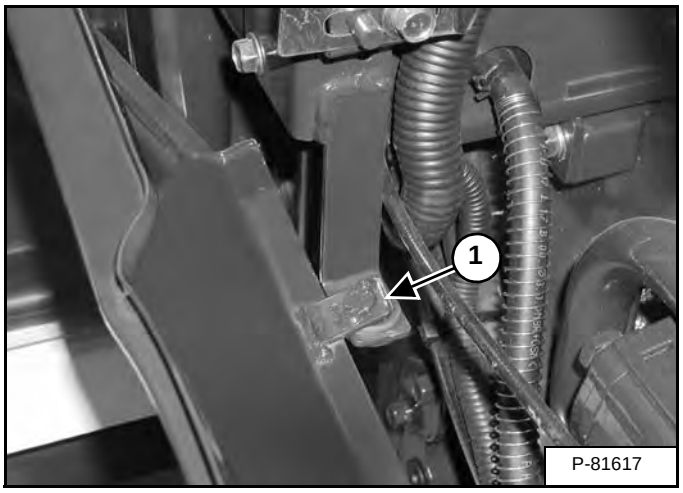
Rotate the side cover clamps (Item 1) **[Figure 50-100-1]** up.

Figure 50-100-2



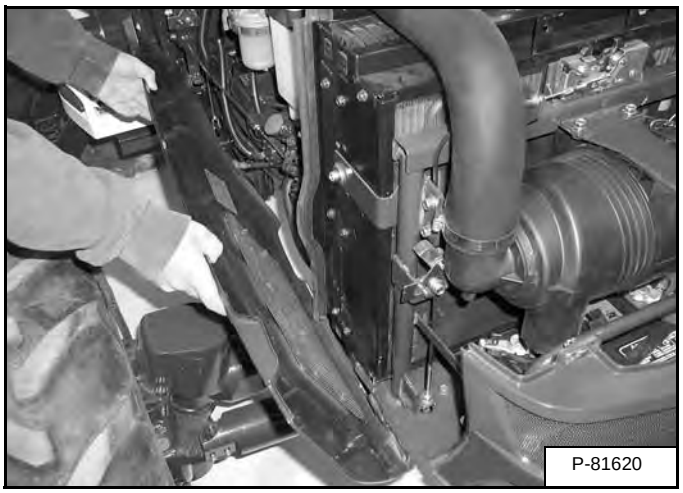
Tilt the engine side cover out and remove the front of the side cover from the bracket (Item 1) **[Figure 50-100-2]** by pulling upward.

Figure 50-100-3



Lift up on the rear of the side cover to remove the alignment pin (Item 1) **[Figure 50-100-3]** from the bracket.

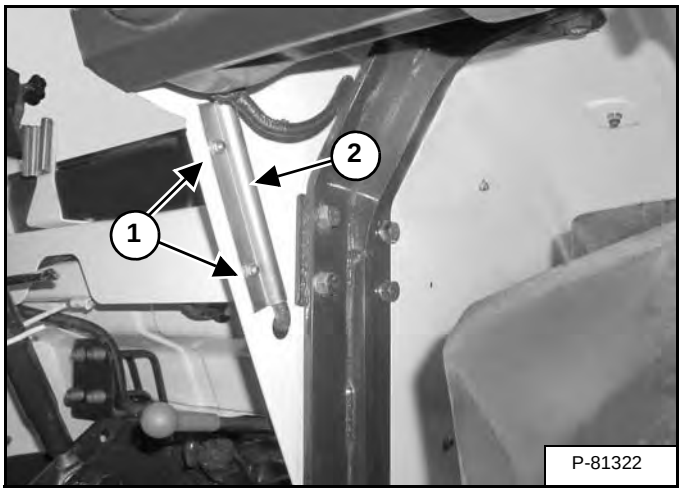
Figure 50-100-4



Remove the engine side cover **[Figure 50-100-4]**.

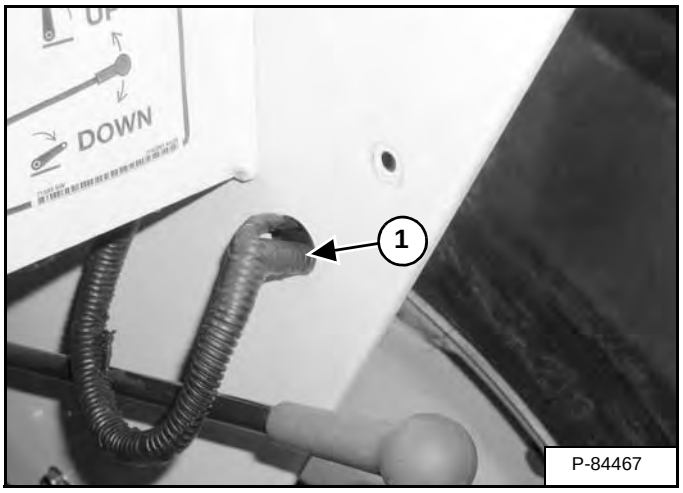
Removal and Installation (Cont'd)

Figure 50-111-8



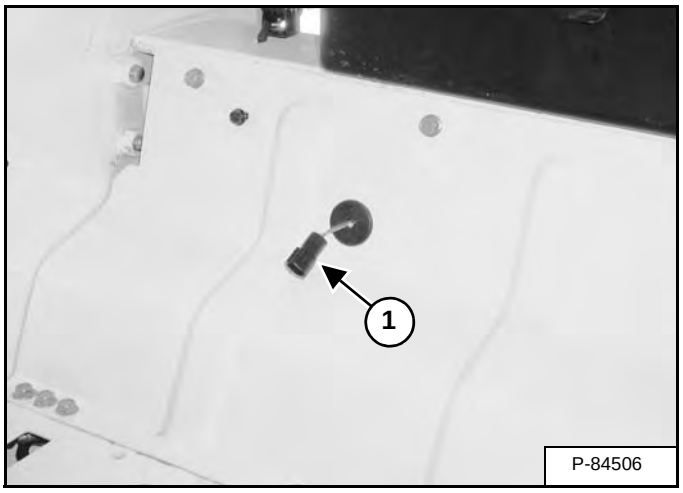
Remove the two nuts (Item 1) and bracket (Item 2) **[Figure 50-111-8]** from the fender (both sides).

Figure 50-111-9



Carefully pull the harness (Item 1) **[Figure 50-111-9]** through the hole in the fender (both sides).

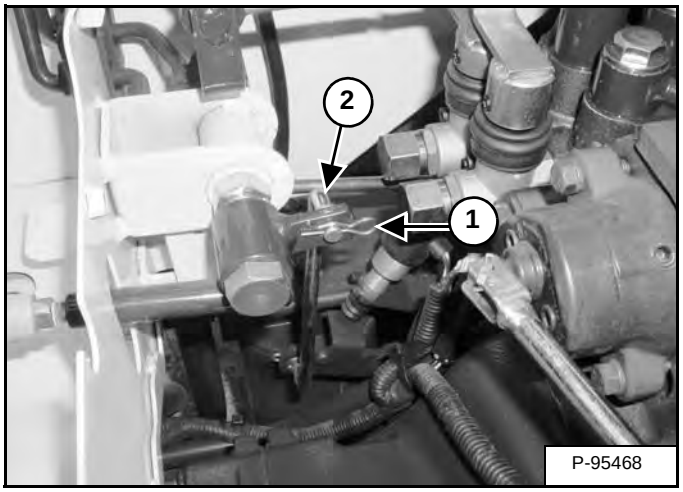
Figure 50-111-10



Remove the seat harness (Item 1) **[Figure 50-111-10]** from the grommet.

Release the main harness from the rear seat frame and lower.

Figure 50-111-11

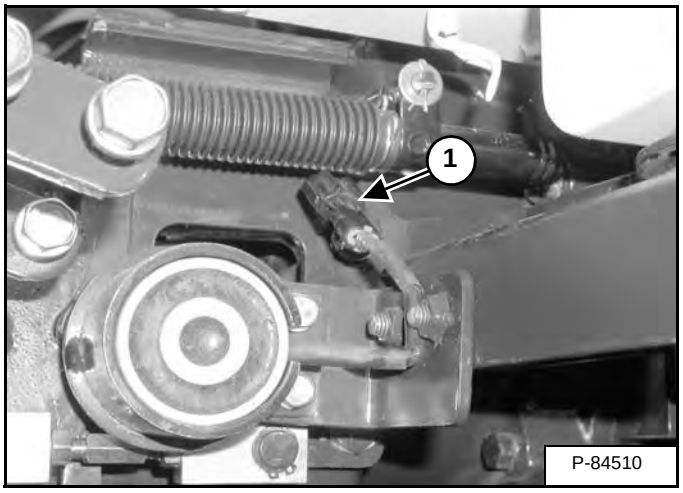


Remove the cotter pin (Item 1) and linkage (Item 2) **[Figure 50-111-11]** from the mid PTO lever.

Remove the floor plate. (See Removal And Installation on Page 50-80-1.)

Removal And Installation (Cont'd)

Figure 50-130-7



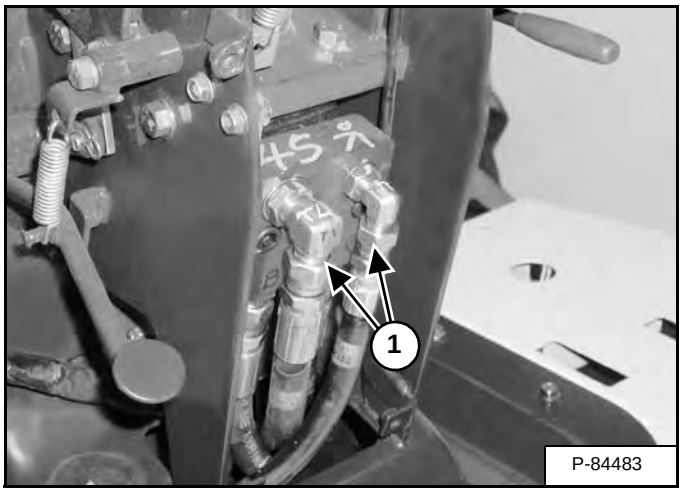
Unplug the neutral start harness connector (Item 1) **[Figure 50-130-7]** from the main harness.

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

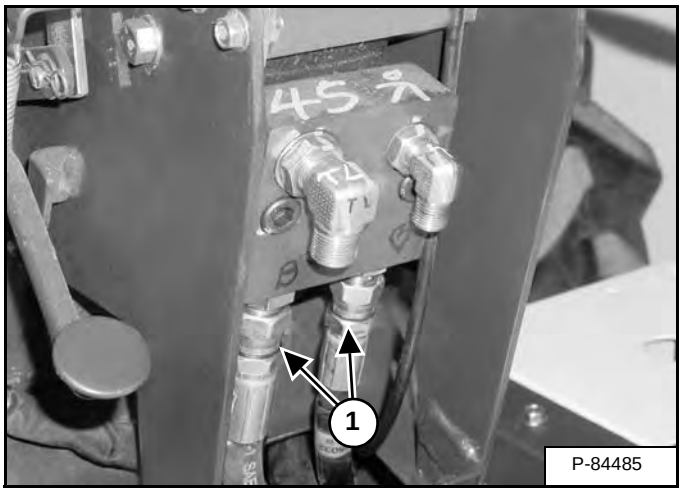
Figure 50-130-8



Remove the two hoses (Item 1) **[Figure 50-130-8]** from the steering valve.

NOTE: Mark the hoses for correct installation.

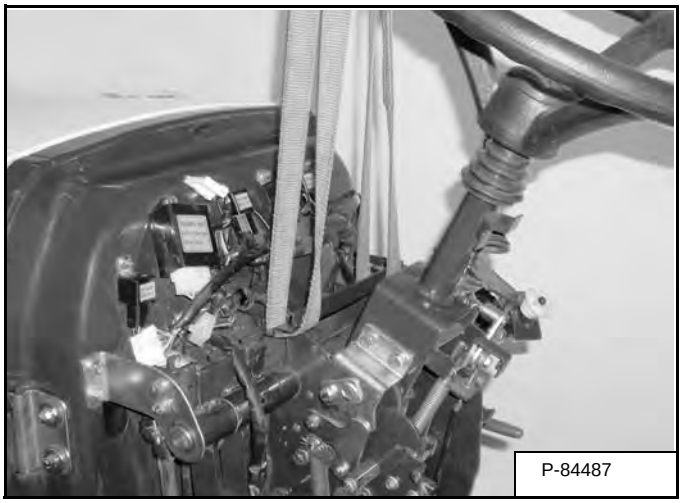
Figure 50-130-9



Remove the two lower hoses (Item 1) **[Figure 50-130-9]** from the steering valve.

Installation: Tighten the hoses to 25 - 29 N•m (18 - 22 ft-lb) torque.

Figure 50-130-10

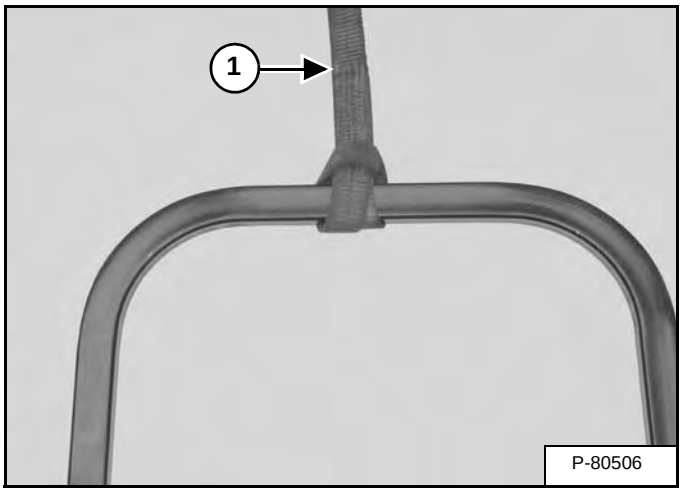


Using a hoist and lifting strap, support the firewall assembly as shown **[Figure 50-130-10]**.

ROPS

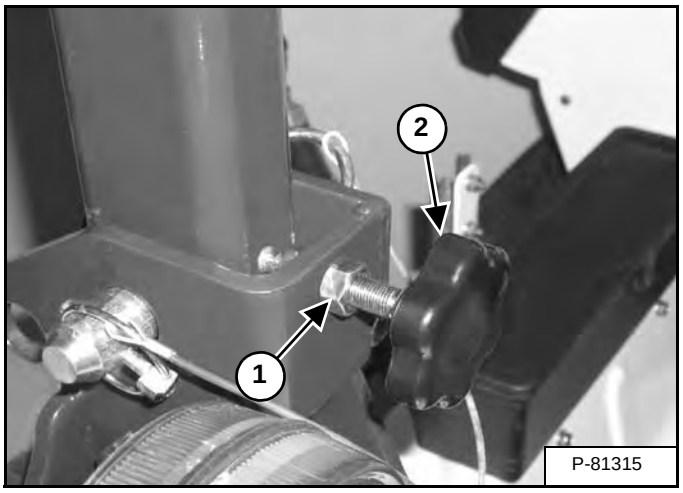
Removal And Installation

Figure 50-140-1



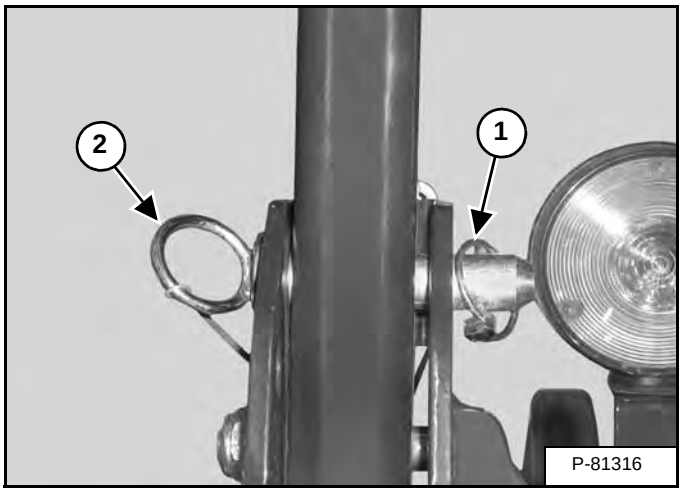
Support the ROPS assembly using a hoist and lifting strap (Item 1) **[Figure 50-140-1]**.

Figure 50-140-2



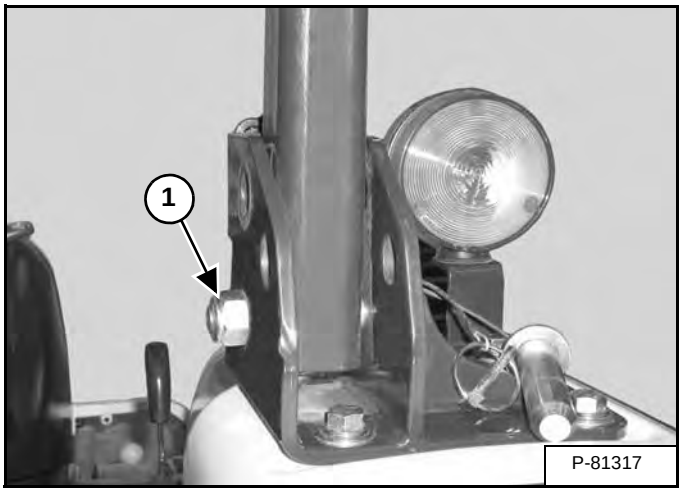
Loosen the jam nut (Item 1) and knob (Item 2) **[Figure 50-140-2]** (both sides).

Figure 50-140-3



Remove the snap pin (Item 1) and pin (Item 2) **[Figure 50-140-3]** (both sides).

Figure 50-140-4



Remove the pivot bolt / nut (Item 1) **[Figure 50-140-4]** (both sides).

Installation: Do not over tighten the bolt and deflect the mount.

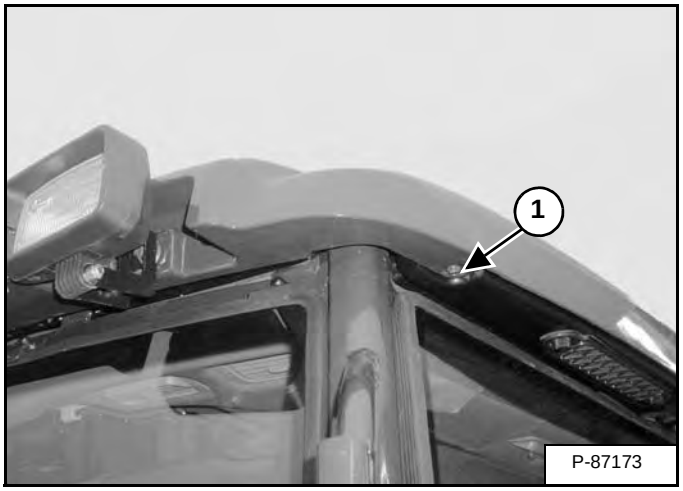
Lift and remove the ROPS.

FRONT WORK LIGHT MOUNT (WITH CAB)

Removal And Installation

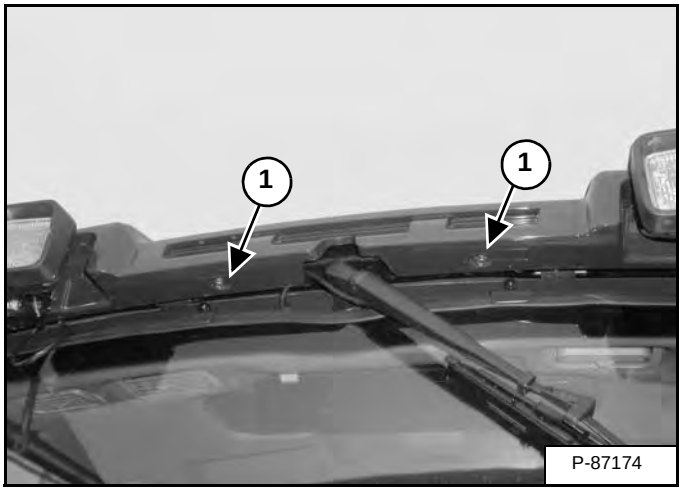
Remove the travel control pedals. (See Removal And Installation on Page 30-40-1.)

Figure 50-190-1



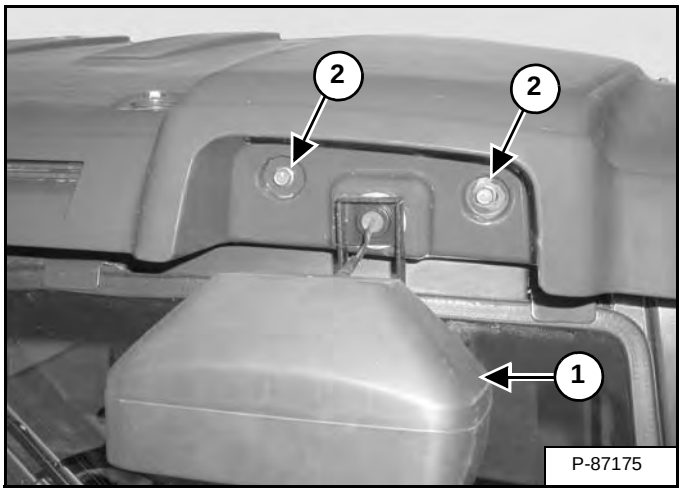
Remove the bolt (Item 1) **[Figure 50-190-1]** from both sides of the light mount.

Figure 50-190-2



Remove the two bolts (Item 1) **[Figure 50-190-2]**.

Figure 50-190-3



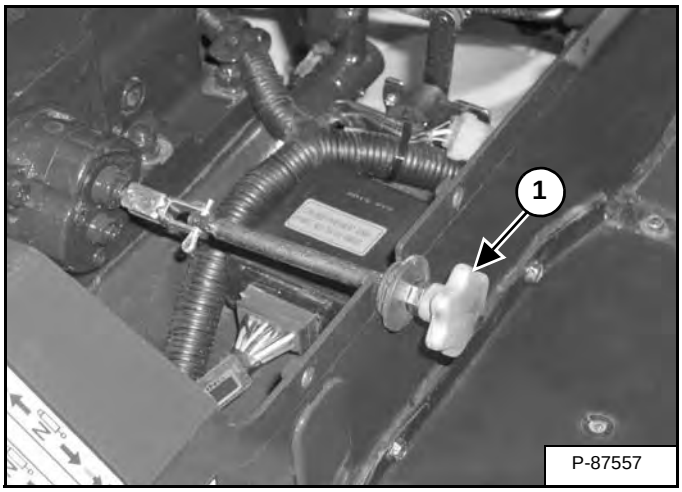
Tilt the light (Item 1) forward and remove the two bolts (Item 2) **[Figure 50-190-3]** (both sides).

Figure 50-190-4

Temporarily place the light mount on top of the cab **[Figure 50-190-4]**.

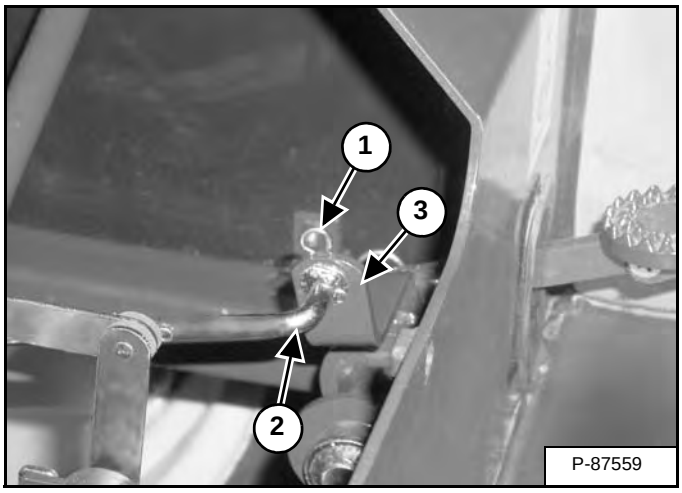
Removal And Installation (Cont'd)

Figure 50-230-8



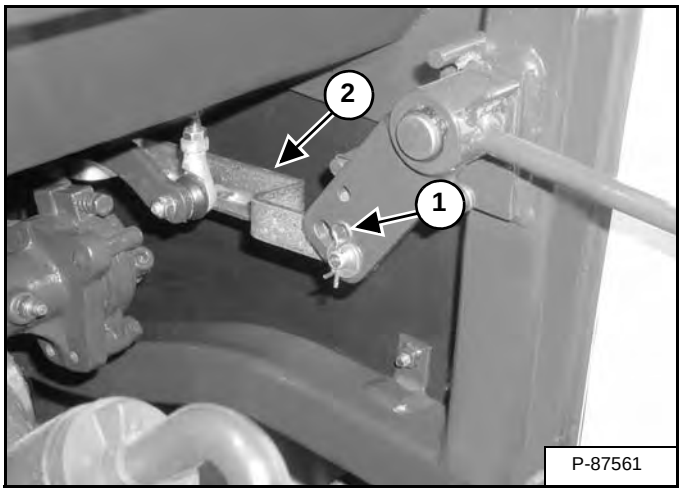
Reposition the MLS control shaft (Item 1) **[Figure 50-230-8]**.

Figure 50-230-9



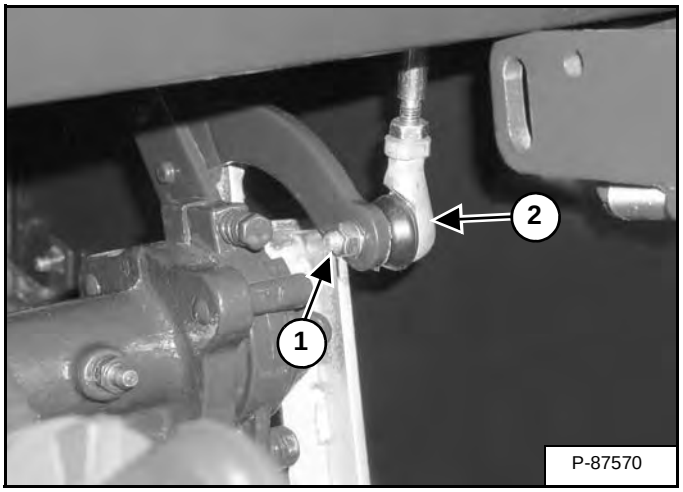
Remove the cotter pin (Item 1) and linkage (Item 2) from the differential lock pedal linkage (Item 3) **[Figure 50-230-9]**.

Figure 50-230-10



Remove the cotter pin and washer (Item 1) (both ends) and remove the linkage (Item 2) **[Figure 50-230-10]**.

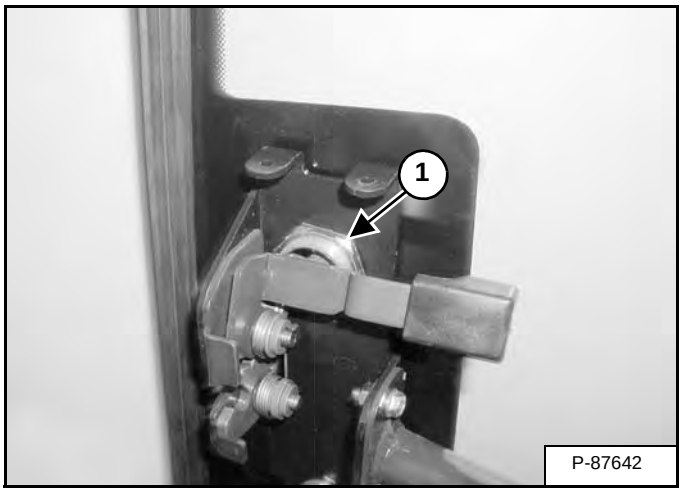
Figure 50-230-11



Remove the nut (Item 1) and linkage (Item 2) **[Figure 50-230-11]**.

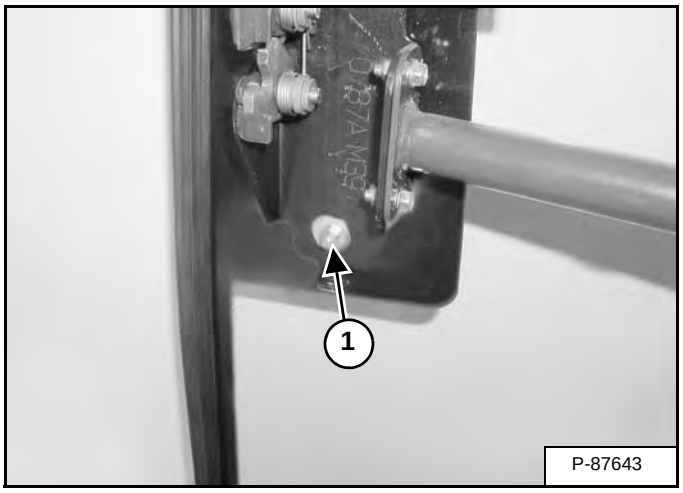
Door Glass Removal And Installation (Cont'd)

Figure 50-230-53



Remove the large nut (Item 1) **[Figure 50-230-53]** from the latch.

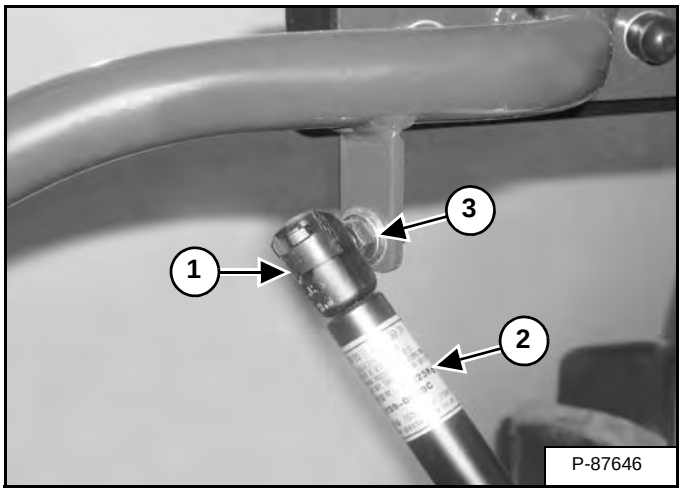
Figure 50-230-54



Remove the nut and washer (Item 1) **[Figure 50-230-54]**.

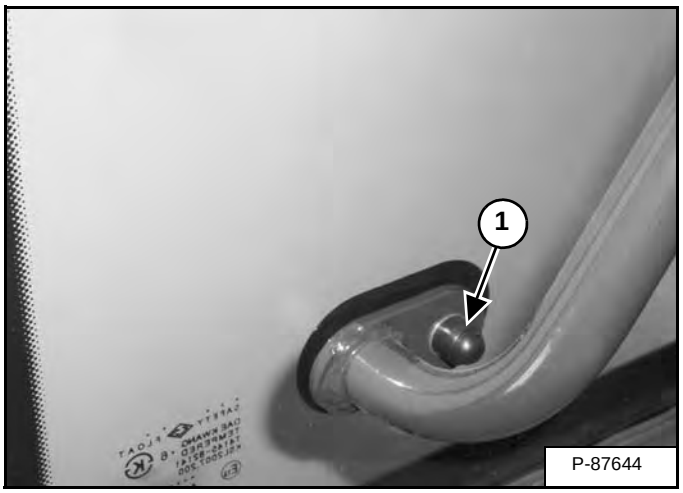
Remove the latch assembly.

Figure 50-230-55



Slide the gas cylinder retainer (Item 1) up and remove the gas cylinder (Item 2) from the post (Item 3) **[Figure 50-230-55]**.

Figure 50-230-56



Remove the plastic nut cap (Item 1) **[Figure 50-230-56]**.

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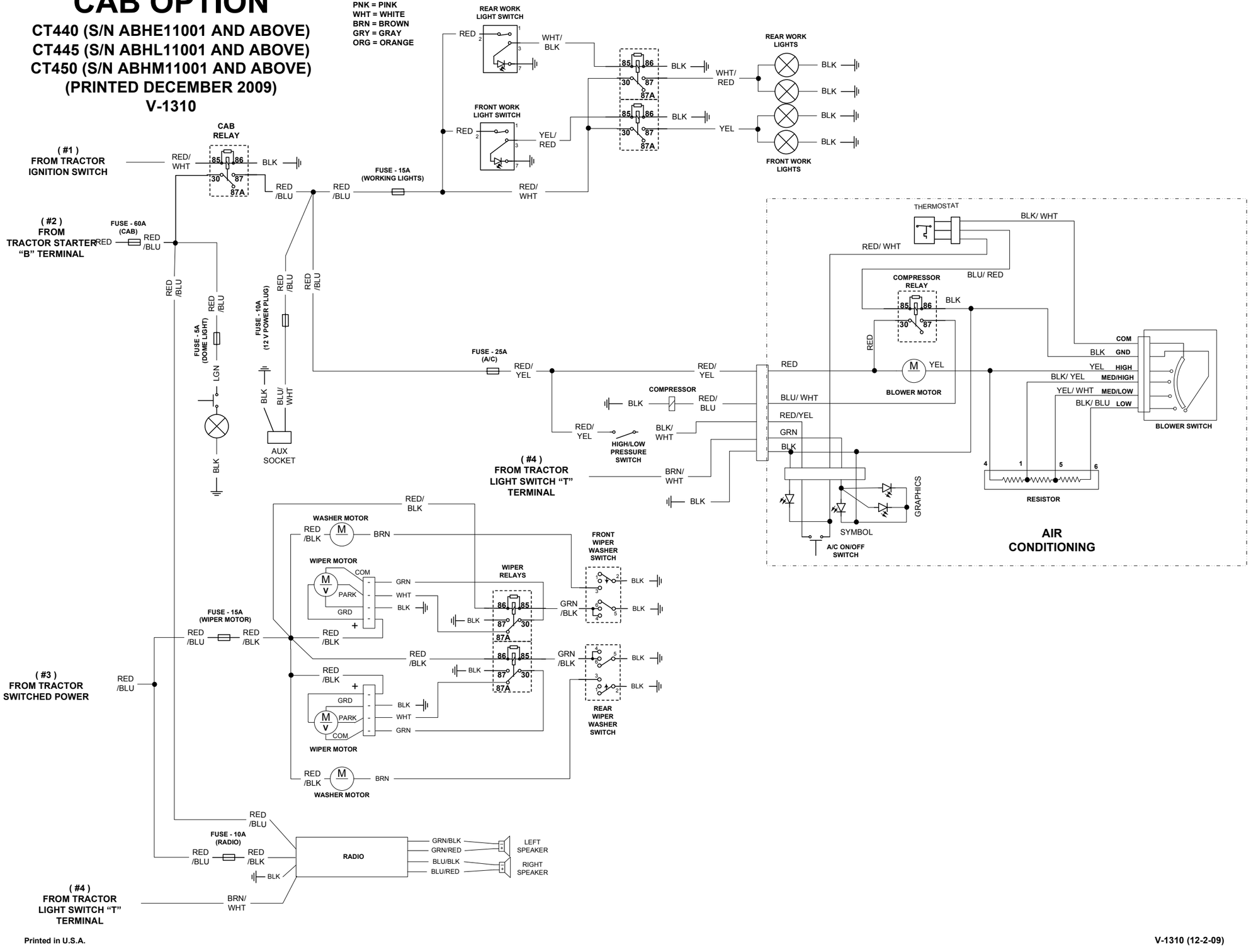
WIRING SCHEMATIC
CAB OPTION

CT440 (S/N ABHE11001 AND ABOVE)
CT445 (S/N ABHL11001 AND ABOVE)
CT450 (S/N ABHM11001 AND ABOVE)
(PRINTED DECEMBER 2009)
V-1310

RED = RED
BLK = BLACK
BLU = BLUE
GRN = GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
GRY = GRAY
ORG = ORANGE



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V-1310 (12-2-09)


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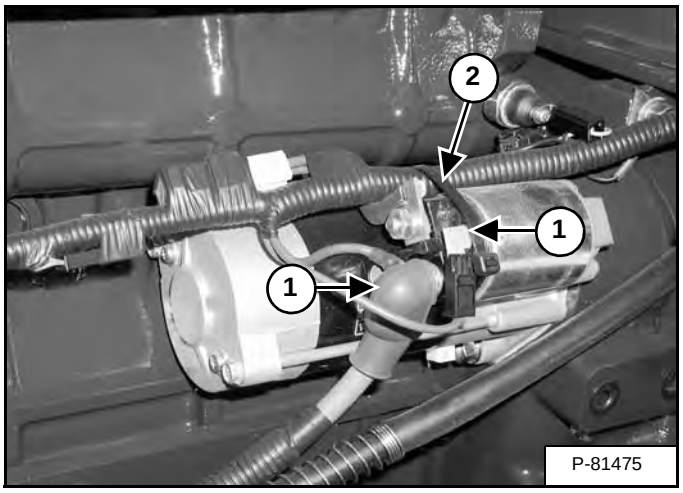
STARTER (CONT'D)

Removal And Installation

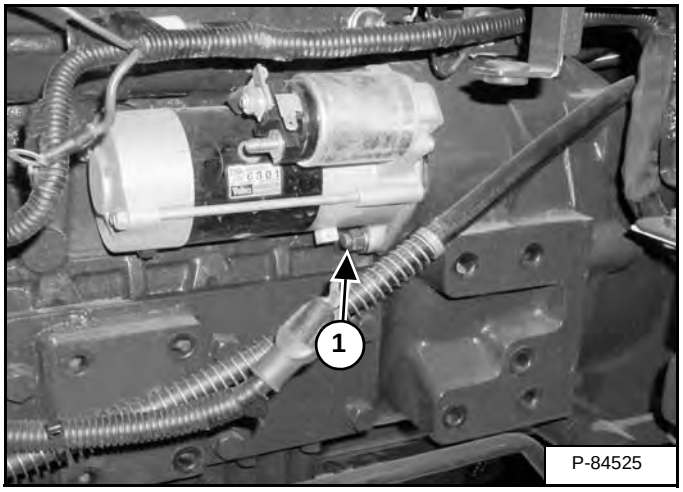
Disconnect the negative (-) cable from the battery.

Figure 60-40-3



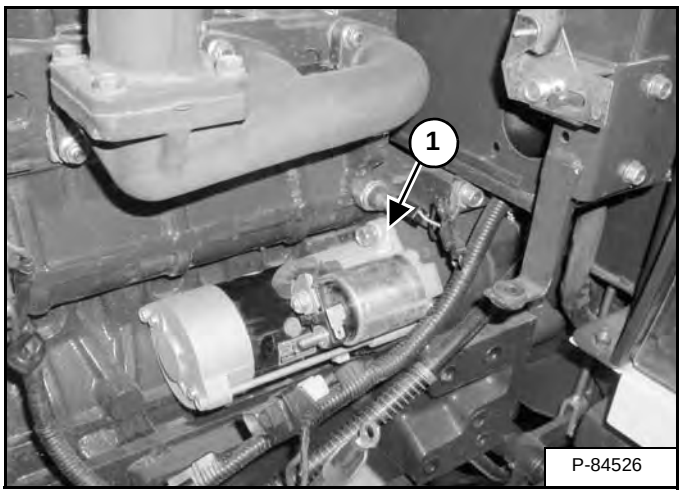
Disconnect the wires (Item 1) from the starter. Cut and remove the cable tie (Item 2) **[Figure 60-40-3]**.

Figure 60-40-4



Remove the bottom nut (Item 1) **[Figure 60-40-4]** and washer.

Figure 60-40-5



Remove the top bolt (Item 1) **[Figure 60-40-5]**.

Remove the starter.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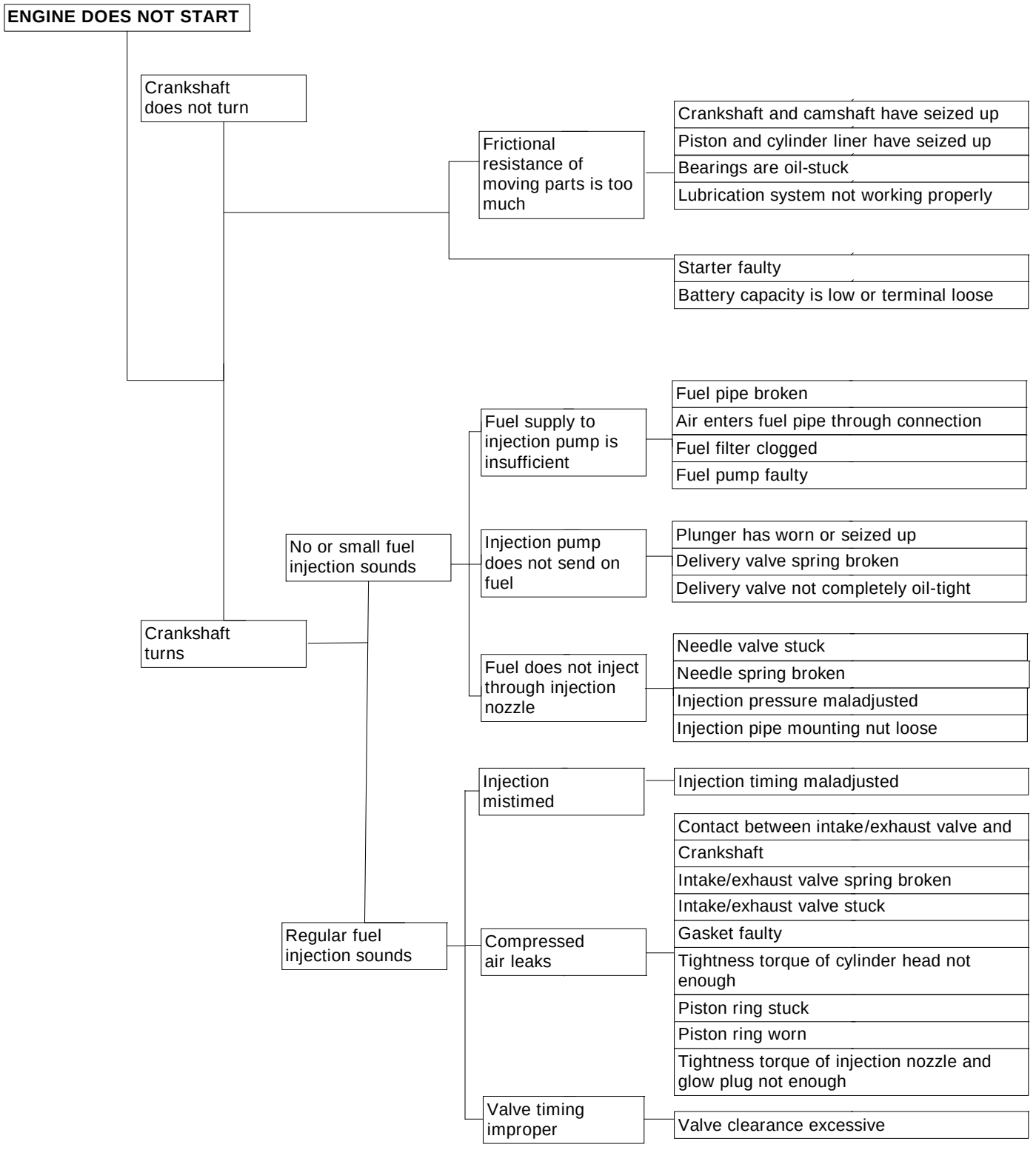
Troubleshooting

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



V-0915-1

Specifications

Cylinder Head

Item	Factory Specification	Allowable Limit
Cylinder Head Surface Flatness		0,05 mm / 100 mm (0.002 in / 3.94 in)
Top Clearance	0,7 - 0,9 mm (0.0294 - 0.0354 in)	-
Thickness of gasketFree	When tightened 1,18 - 1,28 mm (0.0465 - 0.0504 in)	-
Compression Pressure (When cranking with starting motor)	33 - 38 kgf/cm2 3.24 - 3.73 MPa (469 - 540 psi)	26 kgf/cm2 2.55 MPa (370 psi)

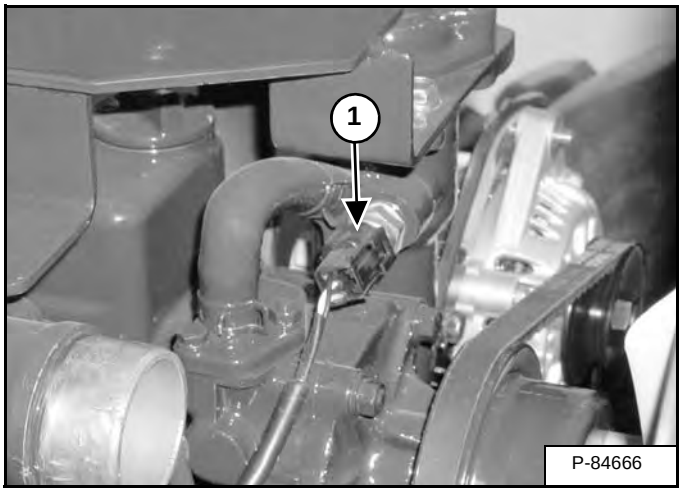
* Variance of compression pressure among cylinders should be 10% or less.

Valves

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)	IN. EX.	0,25 mm (0.010 in) 0,30 mm (0.012 in)	0,05 mm (±0.002 in) 0,05 mm (±0.002 in)
Valve Seat Angle	IN. EX.	0.785 rad. 45° 0.785 rad. 45°	-
Valve Face Angle	IN. EX.	0.785 rad. 45° 0.785 rad. 45°	-
Valve Recessing		0,2 - 0,5 mm (0.0079 - 0.0197 in)	(0,8 mm) (0.0315 in)
Clearance Between Valve Stem and Valve Guide		0,040 - 0,070 mm (0.0016 - 0.0028 in)	0,10 mm (0.0039 in)
Valve Stem O.D		7,960 - 7,975 mm (0.31339 - 0.31398 in)	-
Valve Stem I.D		8,015 - 8,030 mm (0.3156 - 0.3161 in)	-

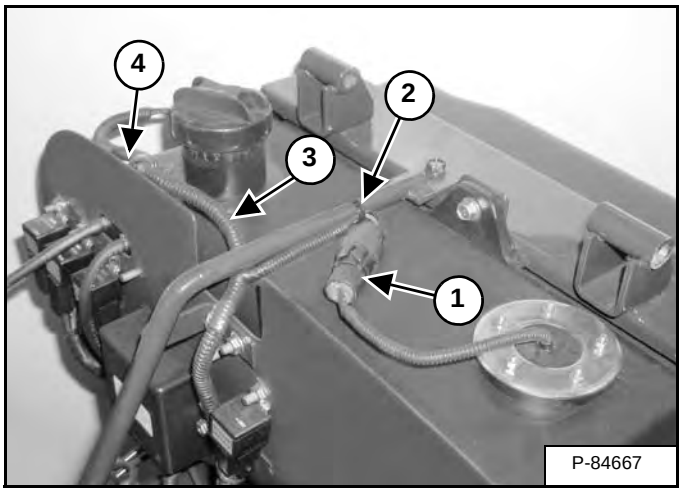
Engine Removal And Installation (All Models) (Cont'd)

Figure 70-11-5



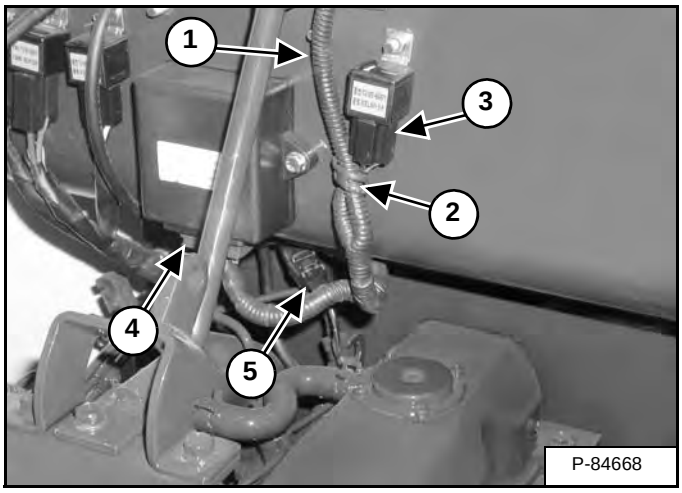
Disconnect the wire (Item 1) **[Figure 70-11-5]** from the thermostat housing.

Figure 70-11-6



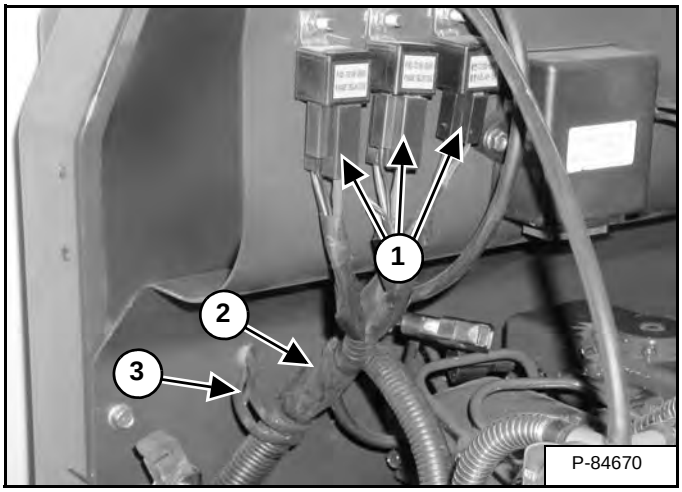
Unplug the fuel sender (Item 1), cut the tie strap (Item 2) and release the harness (Item 3) from the clamp (Item 4) **[Figure 70-11-6]**.

Figure 70-11-7



Release the harness (Item 1) from the clamp (Item 2) and unplug the relay connector (Item 3), operating control unit connector (Item 4) and fuel sending unit connector (Item 5) **[Figure 70-11-7]**.

Figure 70-11-8



Unplug the three connectors from the relays (Item 1) and release the harness (Item 2) from the clamp (Item 3) **[Figure 70-11-8]**.

Remove any tie straps securing the wire harness to the firewall.

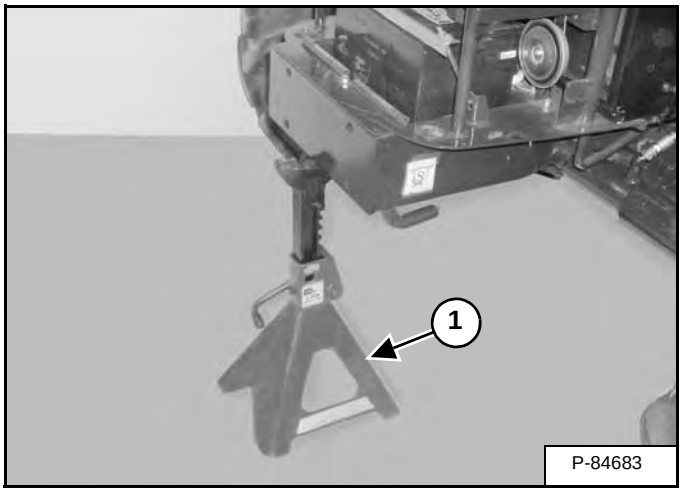
Specifications (Cont'd)

Crankshaft

Item		Factory Specification	Allowable Limit
Crankshaft alignment		-	0,08 mm (0.0031 in)
Clearance between	Crankshaft and crankshaft bearing 1	0,040 - 0,118 mm (0.00157 - 0.00465 in)	0,20 mm (0.0079 in)
	Crankshaft O.D	51,921 - 51,940 mm (2.04414 - 2.04488 in)	-
	Crankshaft bearing 1 I.D	51,980 - 52,039 mm (2.04646 - 2.04878 in)	-
Clearance between	Crankshaft and crankshaft bearing 2	0,040 - 0,104 mm (0.00157 - 0.00409 in)	0,20 mm (0.0079 in)
	Crankshaft O.D	51,921 - 51,940 mm (2.04414 - 2.04488 in)	-
	Crankshaft bearing 2 I.D	51,980 - 52,025 mm (2.04646 - 2.04823 in)	-
Clearance between	Crank pin and Crank pin bearing	0,035 - 0,093 mm (0.0014 - 0.0037 in)	0,20 mm (0.0079 in)
	Crank pin O.D	43,959 - 43,975 mm (1.73067 - 1.73130 in)	-
	Crank pin bearing I.D	44,010 - 44,052 mm (1.73268 - 1.73433 in)	-
Crankshaft side clearance		0,15 - 0,31 mm (0.0059 - 0.0122 in)	0,5 mm (0.020 in)

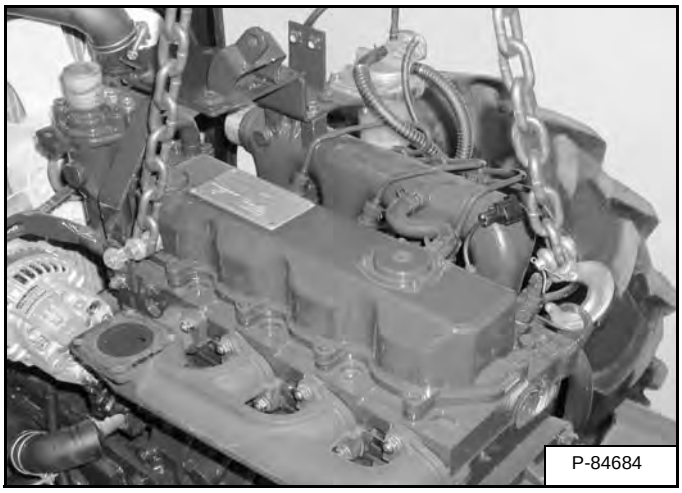
Engine Removal And Installation (All Models) (Cont'd)

Figure 70-12-21



Place a stand (Item 1) **[Figure 70-12-21]** under the front of the frame.

Figure 70-12-22



Support the engine using a hoist and lifting chain **[Figure 70-12-22]**.

Figure 70-12-23

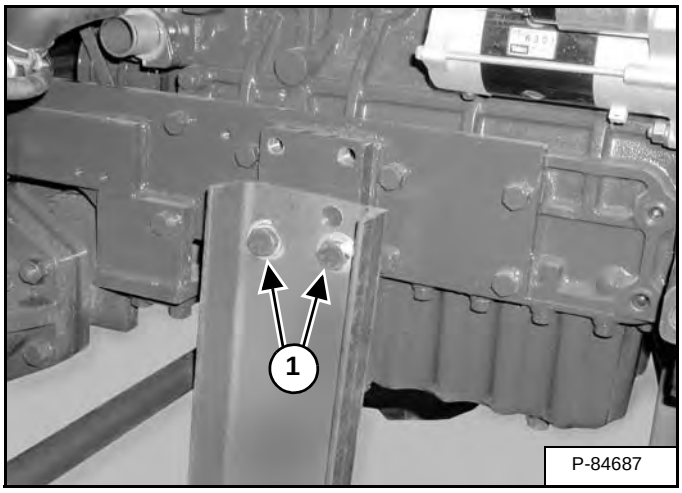
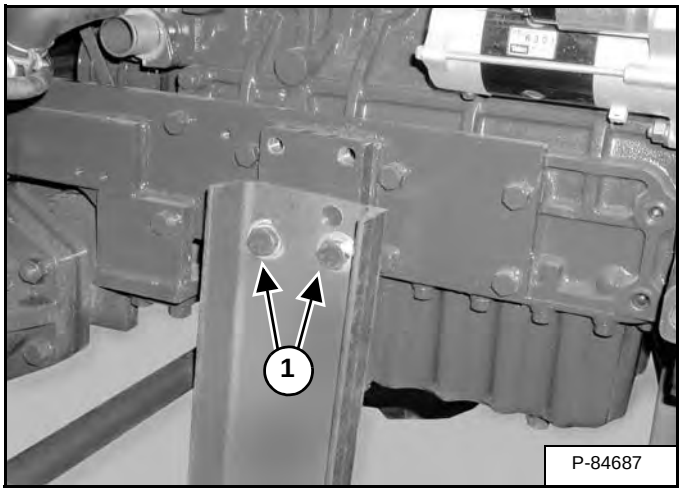


Figure 70-12-24



Raise the engine with the hoist. Remove the support stands (both sides) from the flywheel housing and install onto the left side using the two bolts (Item 1) **[Figure 70-12-23]** and right side using the two bolts (Item 1) **[Figure 70-12-24]**.

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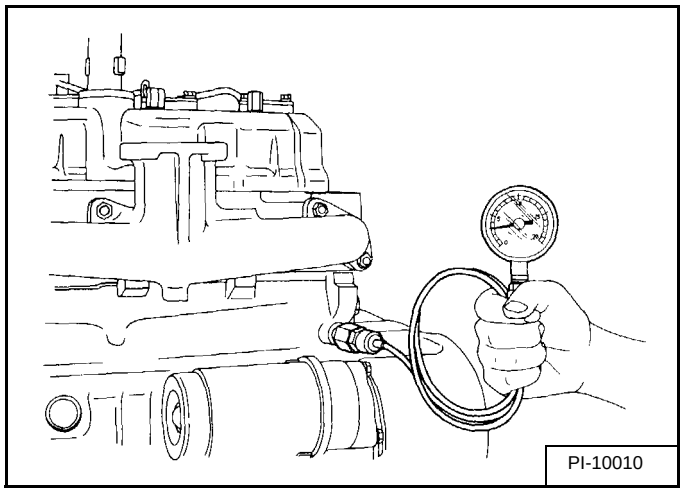
Engine Oil Pressure - Testing

Figure 70-60-8



Remove the oil pressure switch. Install the adapter and pressure tester in its place **[Figure 70-60-8]**.

Start the engine and run until it is at operating temperature. Measure the oil pressure at both idling and rated speed.

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

* Engine Oil Level Low
* Oil Pump Defective
* Oil Galley Plugged
* Oil Strainer Plugged
* Excessive Clearance at the Rod And Main Bearings
* Oil Pump Relief Valve Stuck

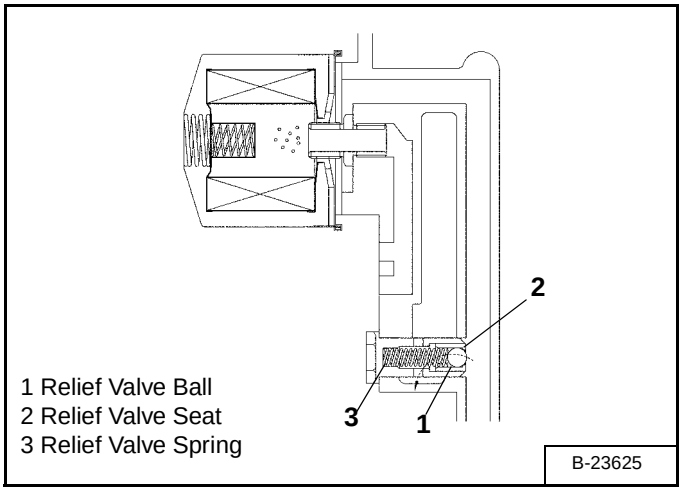
Engine oil pressure	At idle speed	Factory spec		More than 69 kPa (0,69 bar) (10 psi)
	At rated speed		Factory spec	248 - 441 kPa (2,50 - 4,41 bar) (36 - 64 psi)
			Allowable limit	248 kPa (2,45 bar) (36 psi)

When reinstalling the oil pressure switch, tighten to 15 - 20 N•m (11 -15 ft-lb) torque.

Oil Filter

Remove the oil pressure sender.

Figure 70-60-9



Drain the engine oil and remove the oil filter to check it **[Figure 70-60-9]**.

Check the relief valve for dirt, and the seat (Item 2) and ball (Item 1) **[Figure 70-60-9]**.

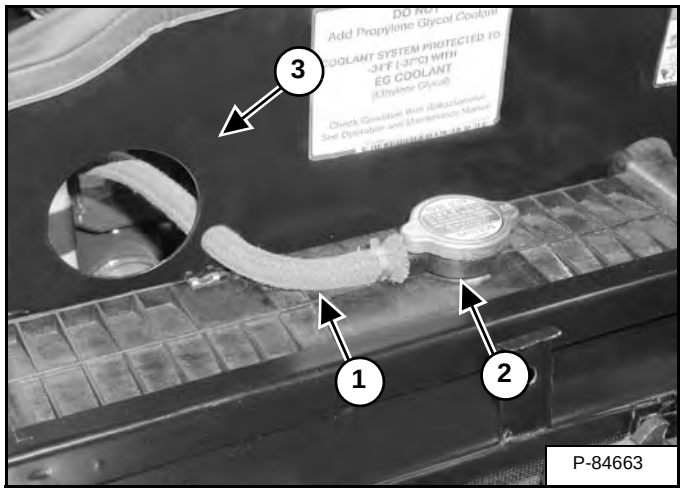
If damaged, replace the filter.

Check the free length of spring (Item 3) **[Figure 70-60-9]**.

Spring free length	Factory spec	35 mm (1.38 in)
	Allowable limit	30 mm (1.18 in)

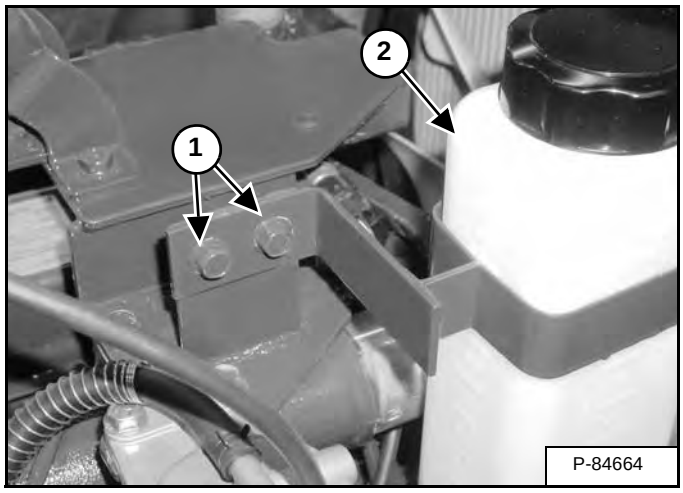
Fuel Injector Removal And Installation

Figure 70-70-33



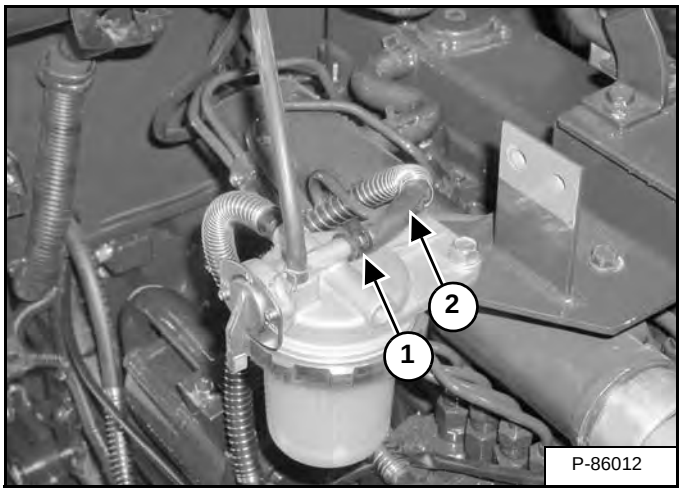
Remove the overflow hose (Item 1) from the radiator (Item 2) and bracket (Item 3) **[Figure 70-70-33]**.

Figure 70-70-34



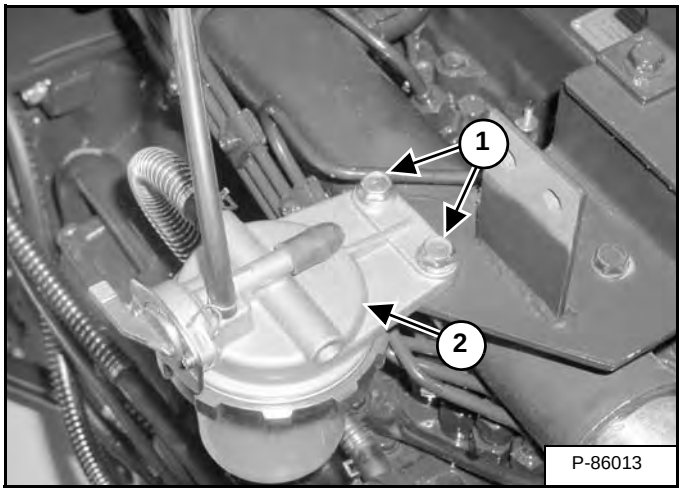
Remove the two bolts (Item 1) and reposition the overflow tank (Item 2) **[Figure 70-70-34]** to the front of the radiator.

Figure 70-70-35



Loosen the clamp (Item 1) and remove the fuel line (Item 2) **[Figure 70-70-35]** from the fuel filter.

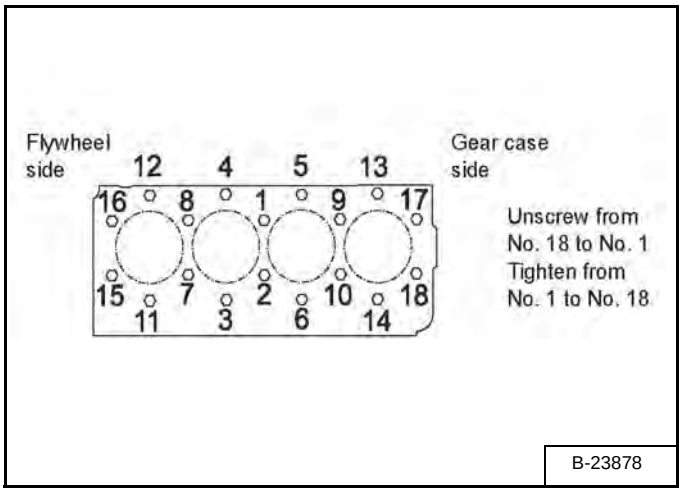
Figure 70-70-36



Remove the two bolts (Item 1) and reposition the fuel filter and bracket (Item 2) **[Figure 70-70-36]**.

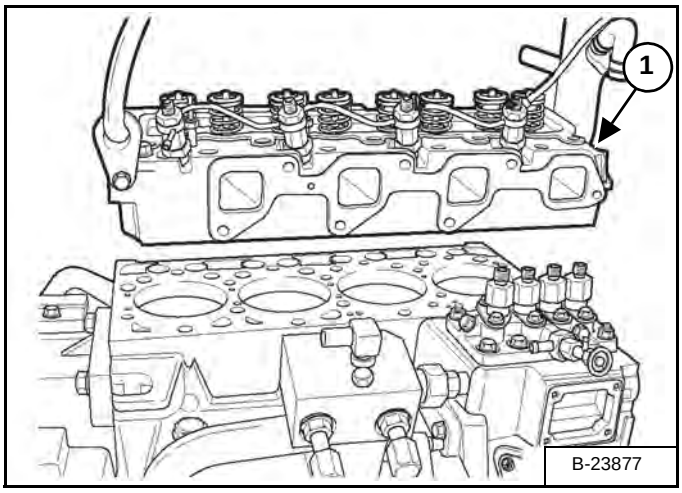
Cylinder Head Removal And Installation (Cont'd)

Figure 70-80-15



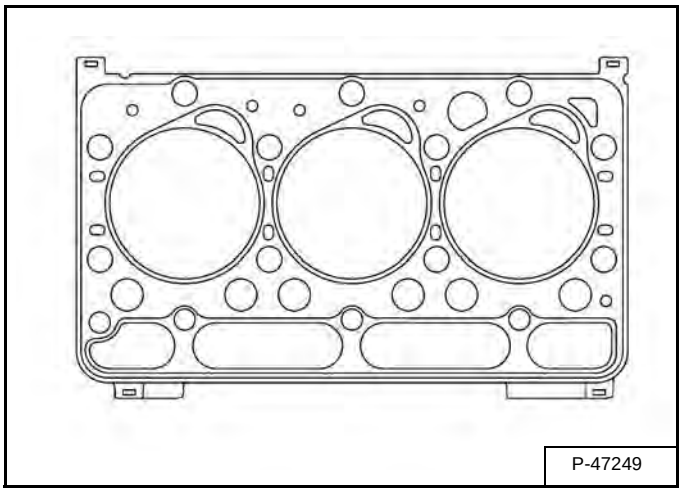
Remove the cylinder head bolts in order of #18 to #1 **[Figure 70-80-15]**.

Figure 70-80-16



Remove the cylinder head (Item 1) **[Figure 70-80-16]**.

Figure 70-80-17

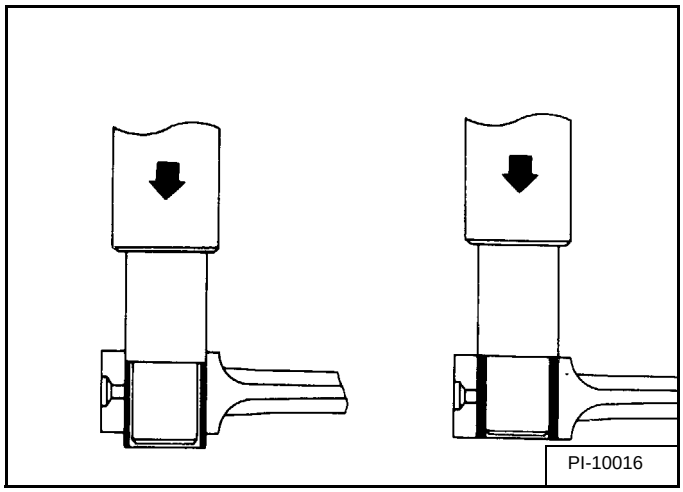


Replace the head gasket with a new one and place on the cylinder block, be careful of its direction and side **[Figure 70-80-17]**.

When using the head gasket shim, install the shim on the cylinder head prior to the gasket.

Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-90-10

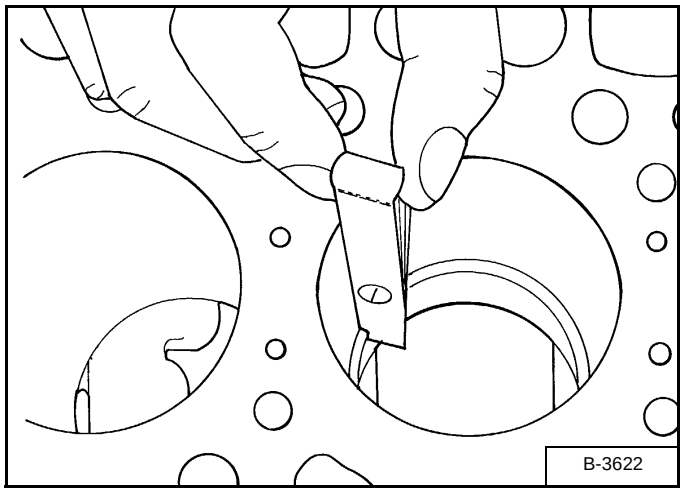


Use a press and special driver tool to remove the small end bushing **[Figure 70-90-10]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 70-90-10]**.

Important: Align the oil holes of the connecting rod and bushing.

Figure 70-90-11

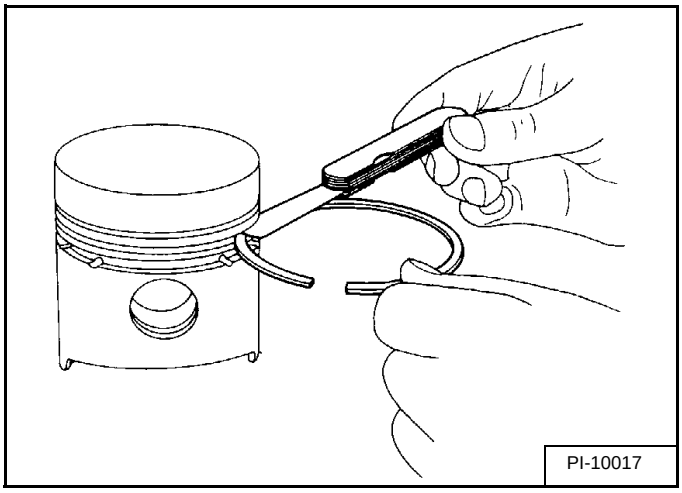


Install a piston ring into the lower part of the cylinder bore. Measure the ring gap with a feeler gauge **[Figure 70-90-11]**.

If the gap exceeds the allowable limit, replace the ring.

Piston ring end gap	2nd ring	Factory Spec.	0,55 - 0,70 mm (0.0217 - 0.0276 in)
		Allowable limit	1,25 mm (0.0492 in)
	Top ring, oil ring	Factory Spec.	0,025 - 0,40 mm (0.0098 - 0.0157 in)
		Allowable limit	1,25 mm (0.0492 in)

Figure 70-90-12



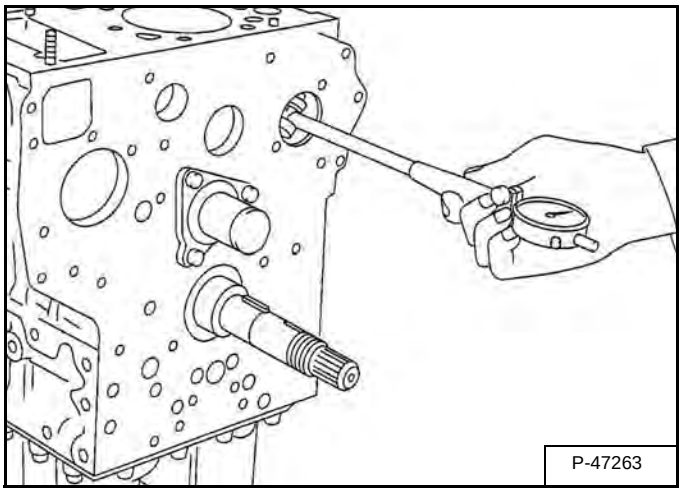
Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-90-12]**.

If the clearance exceeds the allowable limit, replace the ring. If the clearance still exceeds the allowable limit, replace the piston.

Piston ring clearance	2nd ring	Factory Spec.	0,04 - 0,08 mm (0.00157 - 0.00315 in)
		Allowable limit	0,15 mm (0.0059 in)
	Oil ring	Factory Spec.	0,02 - 0,06 mm (0.00079 - 0.00236 in)
		Allowable limit	0,15 mm (0.0059 in)

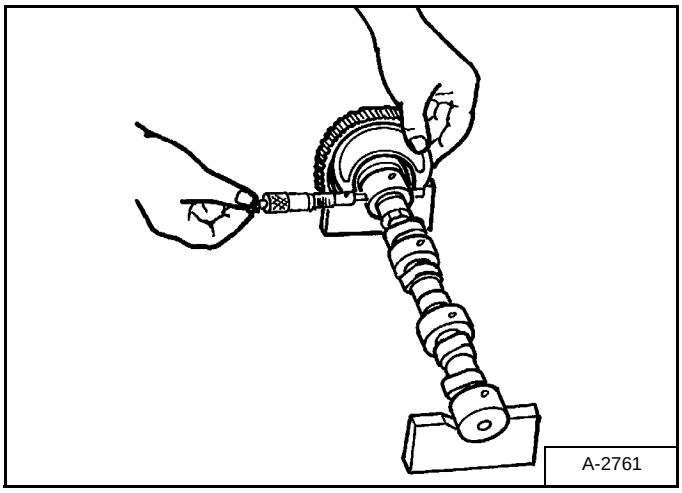
Camshaft - Servicing

Figure 70-100-15



Measure the cylinder block bore in the engine block **[Figure 70-100-15]**.

Figure 70-100-16

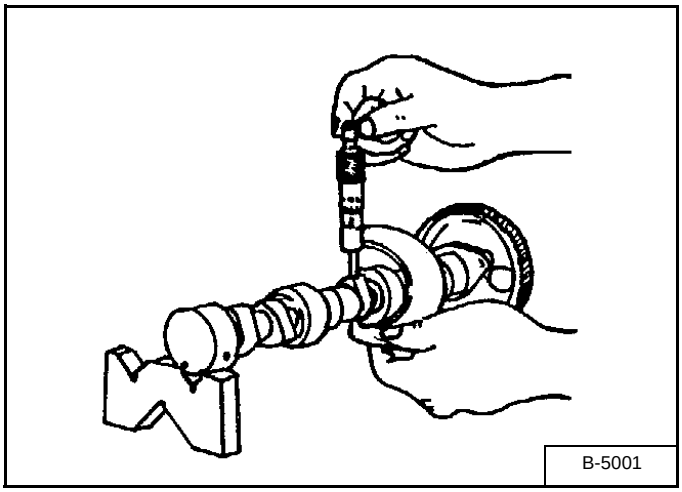


Measure the camshaft journal **[Figure 70-100-16]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the camshaft.

Oil Clearance	Factory spec	0,050 - 0,091 mm (0.00197 - 0.00358 in)
	Allowable Limit	0,15 mm (0.0059 in)
Journal O.D.	Factory spec	39,934 - 39,950 mm (1.57221 - 1.57284 in)
Bore I.D.	Factory spec	40,000 - 40,025 mm (1.57480 - 1.57579 in)

Figure 70-100-17



Measure the cam lobes at their highest point **[Figure 70-100-17]**.

If the measurement is less than the allowable limit, replace the camshaft.

Cam Height	(IN.)	Specification	33,59 mm (1.3224 in)
		Allowable Limit	33,54 mm (1.3205 in)
	(EX.)	Specification	33,69 mm (1.3264 in)
		Allowable Limit	33,64 mm (1.3244 in)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